

THE ENGINEERING AND MINING JOURNAL.

RICHARD P. BOWEN, C. E., M. E. } Editors.
ROSSITER W. RAYMOND, Ph. D.

NOTE.—Communications relative to the editorial management should be addressed to Mr. BOWEN. The articles written by Mr. Raymond will be signed with a star.

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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.

AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

The next meeting of the American Institute of Mining Engineers will commence on Tuesday evening, February 27, at 8 o'clock, at the rooms of the American Society of Civil Engineers, No. 4 East Twenty-third street, New York City.

A session will be held at the Columbia College School of Mines, corner of 4th Avenue and 49th street, at 10:30 A. M. on Wednesday; and the session of Wednesday afternoon, if any is held, will be at the same place.

On Wednesday evening there will be, at the rooms of the Society of Civil Engineers, a *Conversazione* in which the members of both Societies will take part. Subject for informal discussion—Is it desirable and practicable to introduce the metric system of weights and measures as the exclusive legal standard in the United States?

Further arrangements will be announced from time to time during the meeting, and will be posted at the rooms of the Society of Civil Engineers.

For the benefit of visiting members who have not selected their hotel, the Spingler House, on Union Square near 14th street, is named as very convenient. It is kept on the European and American plans, and offers special rates of \$2.50 per day to members of the Institute, or \$1.00 for rooms to those who prefer the European plan.

THE meeting of the Institute promises well. At some one of the sessions, which the Council will no doubt fix to suit the convenience of members interested, the question of the new international nomenclature of iron and steel will come up. We learn also that a session will probably be held at the Stevens Institute of Technology in Hoboken, where Prof. THURSTON will have much to show in his mechanical laboratory, and concerning the tests of materials upon which the U. S. Commission is engaged. There are also some social festivities in contemplation of which it is premature to speak, and a select party of cool-headed or hot-headed persons may essay the East River foot-bridge if it likes.

THE REPORT OF THE PHILADELPHIA AND READING RAILROAD COMPANY.

The report which Mr. GOWEN, the President of the Philadelphia and Reading Railroad Company, has recently submitted to the stockholders is in many respects the most full, satisfactory and able statement of the kind we have ever seen.

There never was a time in the commercial history of this country when honesty and courage in managers were more needed or could be better appreciated than at the present. When business is prosperous and companies are able to declare large dividends with unfailing regularity, stockholders are only too ready to accept without question or investigation any statement made to them by those whose management has been productive of such agreeable results. This lack of interest is demoralizing, and under it the management is very apt to cease furnishing the data that should be given in every case to stockholders. When, however, the dividends cease, through any cause, the stockholders become indignant, and sometimes unreasonably impeach the business ability, if not the integrity, of the management. The absence of full and explicit annual statements of the business undoubtedly lends force to these accusations and injurious insinuations, and even when these are not demanded, and when they might disclose facts which would subject the management to annoying adverse criticism, it is none the less a positive duty to make them,

and a benefit more especially to the management itself. It is not from those who praise, but from those who criticise our acts that we learn, and the man who knows so much that he does not need to learn, or who is so self-possessed that he cannot profit by criticism of his acts, is unsuited to manage efficiently a large business or to command men.

There is no more efficient cause of distrust and suspicion than secrecy, and no more assuring and encouraging course than frankness in stating the actual condition of affairs.

Mr. GOWEN seems to realize fully these facts, for in this report he has, so to say, taken the roof of his house completely off, and invited the public to see exactly how the business of his company is managed. In the fullness and frankness with which all information requisite for a clear understanding of the actual condition of the company and the value of its property is given, this report is by far the most complete and valuable that has ever been made in this country. It is indeed a very model, which we warmly commend to the presidents of our other coal and mining companies for imitation; and we venture to say that if each of our companies made annual reports as full and explicit as this, their positions would not present the lamentable features they do to-day. It would lead beyond the limits of the space at our command to go into particulars of all the points of interest in this report, but we may cite a few which have attracted special attention, not only because of their intrinsic importance, but because they have been totally ignored in the reports of the other great coal companies.

The Philadelphia & Reading Coal and Iron Company's coal estate, according to the report of the company's mining engineer, HENRY PLEASANTS, Esq., has an area of 156,238 acres, of which 95,714 acres contain workable veins of anthracite coal. The quantity of workable coal in this property is estimated at 4,476,000,000 tons, 44 per cent. of which is within 600 feet of the surface, and all of it within easy minable depth. There are 101 mines on the company's land, not including a number of small openings.

The following elaborate table gives the total production of coal from the mines worked by the company since January 1, 1873:

Statement showing the tonnage, expenses, and average cost per ton for coal at collieries worked by the Philadelphia and Reading Coal & Iron Company for the years 1873, 1874, 1875 and 1876.

Months.	For Year 1873.			For Year 1874.		
	Tonnage.	Expenses.	Cost per ton.	Tonnage.	Expenses.	Cost per ton.
January.....	11,353 11	\$82,202 45	\$7 31	10,915 04	\$91,066 26	\$8 34 3
February.....	29,388 03	151,482 00	5 15 4	50,816 07	176,780 49	3 47 9
March.....	92,689 01	257,187 54	2 77 4	110,748 12	312,285 86	2 81 9
April.....	128,505 18	325,924 74	2 53 6	129,323 10	309,952 99	2 39 6
May.....	123,492 10	316,948 91	2 57	142,777 00	321,971 28	2 25
June.....	127,206 09	318,772 52	2 50 5	145,759 15	319,998 19	2 12 6
July.....	126,793 12	312,720 94	2 46 6	64,415 19	211,997 15	3 29
August.....	140,481 18	328,826 46	2 34	88,309 17	236,610 80	2 67 9
September.....	160,957 06	349,221 18	2 17 6	158,228 05	352,044 78	2 21 9
October.....	167,249 03	362,041 23	2 16 3	226,267 16	450,200 70	1 98 9
November.....	148,196 14	330,469 31	2 23	167,016 06	364,472 16	2 18 2
December.....	92,524 03	249,352 40	2 71 3	80,212 05	217,527 71	2 71 2
Total.....	1,348,838 08	\$3,385,149 68	\$2 51	1,374,790 16	\$3,364,908 37	\$2 44 8

Months.	For Year 1875.			For Year 1876.		
	Tonnage.	Expenses.	Cost per ton.	Tonnage.	Expenses.	Cost per ton.
January.....	5,907 14	\$41,840 96	\$7 08 2	42,274 19	\$132,015 09	\$3 12 2
February.....	5,411 09	50,347 84	9 30 4	26,882 10	133,765 29	4 97 9
March.....	6,413 17	67,937 75	10 59 2	49,097 08	183,750 29	3 74 4
April.....	5,790 09	72,597 08	12 53 8	28,686 07	359,703 93	1 48 4
May.....	9,256 09	81,596 61	8 81 1	206,103 00	276,338 39	1 34
June.....	92,974 13	215,645 03	2 31 9	117,746 16	173,274 47	1 47 1
July.....	260,312 04	424,431 33	1 63	122,469 01	169,276 40	1 38 2
August.....	256,546 12	441,424 95	1 72	177,767 02	229,404 88	1 29
September.....	266,150 19	452,129 57	1 59 7	264,637 19	276,664 27	1 02 3
October.....	290,019 06	447,989 68	1 54 4	316,974 14	316,696 11	99 9
November.....	228,895 04	308,249 32	1 36 8	320,724 05	314,574 12	98 9
December.....	82,893 15	155,419 39	1 87 4	198,411 14	219,449 94	*1 10 6
Total.....	1,510,572 11	\$2,821,609 51	\$1 86 7	2,051,775 15	\$2,728,933 18	\$1 33 3

* This cost includes all dead work and all winter work at idle collieries, including cost of pumping, watchmen, etc.

The company's fiscal year ends with November 30, but by the courtesy of the President we are enabled to give the figures of cost for December also, which thus complete the table. This exceedingly valuable statement shows the effect of large production in reducing cost, and it also shows the effect of the break in the Coal Combination in August last, in a sudden decline of nearly 27c. a ton in the cost of mining.

While the reduction of wages in 1876 from those ruling in 1874 was only about 26 per cent., the average cost of mining was reduced about 46 per cent.—a result due, we are told, "to the renovation and improvement of the old, and to the successful development of the new collieries."

The average cost of producing coal for the year just past has been \$1.33 per ton, and in this it must be remembered are included the high prices preceding the break of the Combination. The engineer thinks that without further reduction in wages, the cost for the coming year will average less than \$1 a ton.

"The cost per ton given in the above table includes every item which enters into the production of coal, its preparation and delivery in the railroad cars, and includes all repairs of mines and machinery. The amount of dead and preparatory work is greater than ever before."

The yearly capacity of all the collieries worked by the company, based on ten months of full work, is estimated at 4,000,000 tons, and of the collieries on the company's lands, which are worked by tenants, at 2,000,000 tons, or a total

of 6,000,000 tons per annum. It is also estimated that the capital required for the opening and equipment of new collieries will be about \$1 for every ton of annual product.

The accompanying table of accidents, in which the proportion of lives lost to tons produced has constantly diminished, speaks volumes for the skill and discipline with which the company's mines are managed:

Accidents at the collieries Worked by the Philadelphia and Reading Coal & Iron Company for the years 1873, 1874, 1875, and for eleven months ending November 30th, 1876.

Year.	Total tonnage.	Total persons seriously injured.	Number of tons mined per person injured.	Total lives lost.	Number of tons mined per life lost.
1873.....	1,348,838	132	10,294	44	30,655
1874.....	1,374,791	96	14,320	36	38,188
1875.....	1,510,572	80	18,882	30	50,352
1876.....	1,853,364	75	24,711	30	61,778

Year.	Number of employees.	Total persons seriously injured.	Per cent. seriously injured.	Total lives lost.	Per cent. lives lost.
1873.....	5,000	132	2.64	44	0.88
1874.....	8,000	96	1.20	36	0.45
1875.....	9,000	80	0.89	30	0.33
1876.....	9,110	75	0.82	30	0.33

Notwithstanding the favorable showing of the mining branch of the company which the above figures would indicate, the amount of capital invested in the coal estate is so enormous that the financial results of the year's business were disastrous. The policy of accumulating such an enormous quantity of high-priced coal lands that must necessarily remain unavailable for many years to come—a policy also followed by other of our large companies—is one which is quite open to question, and which, in the extent to which it has been carried, we cannot endorse. We leave this, however, and other questions for another occasion; at present we confine ourselves to the more pleasing duty of testifying to the uncommon fullness, honesty and value of this report, and to our admiration for the personal ability and sterling integrity that even his enemies (and who has none?) have always conceded to President GOWEN.

THE REPORTS OF THE DELAWARE & HUDSON CANAL COMPANY AND THE DELAWARE, LACKAWANNA & WESTERN RAILROAD COMPANY.

These companies published this week statements of their business which, it is to be supposed, they intended to reassure the doubting and bring back confidence in their financial stability. It is strange that with the example of the effect on New Jersey Central and other concerns, of partial, incomplete and misty reports, the management of these corporations should have committed the blunder of making a statement which afforded the bears the very opportunity they desired for inculcating distrust as to their solvency. The public has lost all confidence in the unsupported assertions of presidents or other interested officers of companies, and any reference to "past record" is totally ineffective. It is not that persons doubt the individual integrity of the gentlemen making the reports, but they require the full details of the facts upon which the statements are based, for experience has shown that presidents are exceedingly sanguine gentlemen and often see promise and hope in facts which to the average stockholder are discouraging, and which time has over and over again shown to be delusive.

THE DELAWARE AND HUDSON CANAL COMPANY.

This company, which recently carromed on a receivership, made a report of which we give below the essential figures. This statement has received severe, and in some cases quite unfounded, criticism. It would go much beyond the limits of the space we have at our disposal to make a full analysis of this report, and to investigate the value of the various items of assets, therefore we shall confine ourselves to the coal question and the general policy.

The report is quite unsatisfactory in not furnishing in sufficient detail the several items, but it is full as compared with that of the Delaware, Lackawanna & Western Railroad Company. We have no doubt whatever but that the fullest explanation of any item will willingly be given to stockholders at the office of the company, but this is not sufficient; the report should contain its own explanation, for it alone is accessible to the general public and those who may become stockholders. In not giving the necessary information, it affords room for criticism which, though perhaps not warranted by the facts, is justified by the published statement.

STATEMENT OF THE BUSINESS OF THE DELAWARE AND HUDSON CANAL COMPANY.

DR.		CR.	
Coal on hand December 31, 1875—tons, 26,545,315	\$737,627 55	Sales of coal, December 31, 1876	\$6,495,427 69
Coal purchased	120,599 47	Canal tolls	43,444 59
Mining coal	2,754,778 20	Profits of miscellaneous railroad earnings in Pennsylvania	306,911 42
Coal transportation and repairs	542,155 54	Interest on investments	338,932 43
Freight of coal and canal expenses	1,032,430 79	Miscellaneous profits	381,047 81
Rondout expenses	142,755 38	Coal on hand December 31, 1876—tons, 240,322	698,758 15
Freight paid other lines	428,899 53	Total	\$8,264,522 09
Harbor and yard expenses	59,861 74		
Taxes	221,177 69		
Salaries, rent and miscellaneous and law expenses	172,984 04		
Interest	1,187,886 07		
Loss on leased lines, see table below	555,405 90		
Balance—profit	308,020 19		
Total	\$8,264,522 0		

CONDENSED BALANCE SHEET.

DR.		CR.
Cost of canal		\$6,339,210 49
Cost of railroad and equipment		6,195,511 87
(1) Cost of real estate		8,532,873 35
Cost of opening mines and improvements		2,373,264 76
Cost of mines, fixtures and equipments		293,584 29
Cost of boats, barges and steamboats		684,712 28
Cost of coal-yards and fixtures, tools, implements, etc.		232,860 96
Cost of Lackawanna and Susquehanna Railroad		1,021,153 45
Cost of Telegraph lines		14,734 80
(2) Cherry Valley Railroad (originally cost \$700,000)		320,118 62
Lackawanna Palace-Car Company		54,675 36
Supplies on hand at machine-shops, etc.		1,319,604 88
Coal on hand, 240,322 tons		698,758 15
Advances to leased lines (payable in stock or bonds)		427,500 88
(3) Miscellaneous assets, viz.:		
Bonds—		
Rhinebeck and Connecticut Railroad, 300 bonds	\$300,000 00	
Jefferson Railroad Company, 124 bonds	103,050 00	
Boston, Hartford and Erie, 1,420 bonds	1,254,268 83	
Albany and Susquehanna Consolidated, 420 bonds	420,000 00	
Sundry small assets	145,972 67	
Total	\$2,223,291 50	
(4) Stocks—		
New York and Canada Railroad, 39,218 shares	\$3,597,086 51	
Albany and Susquehanna Railroad, 9,000 shares	900,000 00	
Rensselaer and Saratoga Railroad, 7,529 shares	750,912 50	
Sundry stocks, 1,298 shares	96,244 75	
(5) Advance royalties	\$5,344,242 74	\$8,088,714 56
Cash on hand		\$624,584 19
Cash assets, being accounts and bills receivable		2,063,237 05
Total		\$39,285,099 89
CR.		
Capital stock	\$20,000,000 00	
Funded debt	15,116,000 00	
Being bonds 1877	\$1,500,000	
1878	372,000	
1884	3,500,000	
1891	5,000,000	
1894	4,744,000	
(3) Sinking Fund (Boston, Hartford and Erie bonds)	274,545 19	
(6) Interest and dividends payable January 1, 1877	760,765 90	
(6) December bills, paid in January	502,590 71	
Depositors	634,318 99	
(6) Taxes payable in January	57,833 54	
Dividends and interest unclaimed	35,721 80	
Bills payable	855,000 00	
(7) General profit and loss	1,048,323 76	
Total	\$39,285,099 89	

The most important asset of the company is its coal estate; yet there is no where any statement as to the area or availability of this. The President makes the entirely unsupported statement that the company's coal lands are actually worth, at the present low values, \$20,000,000, while the balance sheet places all the real estate at cost, \$8,500,000 in round numbers, of which we understand about \$5,000,000 is represented by coal lands.

We learn through a letter in the New York World, written in defence of the company's report, and, presumably, under official inspiration, that the coal lands amount to 25,000 acres. We are not told upon whose surveys this estimate is based, nor how much of these lands actually contain coal; and every one familiar with the mining regions knows that much of what is bought and classified as coal lands lie, in part, outside of the coal basins, and contain no workable seams. It would therefore have been well to give the exact area containing workable veins of coal; and not only this, but to have stated, on expert authority, how many such seams and what average thickness of workable coal exists upon the company's lands. The Delaware & Hudson Canal Company undoubtedly possesses a magnificent estate, including some of the finest coal lands in the Wyoming and Lackawanna valleys, but a large part of its property lies in the Carbondale district, where there is, in many places, but a single workable vein, and other portions contain but two or three small beds. It is of the highest importance, therefore, to state not only the area, but to give a well-founded estimate of the amount of workable coal on the lands embraced in the table of assets. These lands, we are told by the World correspondent, are worth \$700 an acre; or, according to the company's report, assuming them to cover 25,000 acres, \$800 an acre. Much of this property was bought years ago at very low prices indeed. The lands in the Eastern or Carbondale end of the Wyoming coal fields, being practically controlled by this company alone, never reached the inflated prices obtained in other portions of the field. It is also true that some of the company's lands lying near Wilkes-Barre, and among the finest in the coal regions, were purchased at very high figures; but no such average value as \$800 or \$700 can be placed on any large coal property. The Philadelphia & Reading has estimated its coal lands, which contain more coal to the acre than those of the Delaware & Hudson Canal Company, and are nearer tidewater markets, as worth \$500 an acre, but we are inclined to think that even this is more than any property which cannot be mined for many years to come can possibly be worth.

Nothing short of accurate maps and full descriptions by able and disinterested mining engineers can be considered as satisfactory data on which to estimate the value of such property; and the bare assertion of any man, however eminent he may be, that the company owns 25,000 acres of coal lands, and

that they are worth \$700 or \$800 per acre, will not be accepted as a satisfactory basis for "assets."

Some years ago there was a question raised as to the value of the coal property of the Lehigh Coal & Navigation Company; and its officers wisely had careful surveys, sections and estimates prepared by a mining engineer and presented this report to its stockholders. There has never since been any question as to that item of the company's assets. We commend a similar course to the Delaware & Hudson Canal Company, the Delaware, Lackawanna & Western, and some other corporations.

Among the items given in the statement of the D. & H. Co.'s business we find coal on hand Dec. 31, 1875, as 265,454 tons, valued at \$737,627, or \$2.78 per ton. At the close of 1876, after the enormous decline in the market value and in the cost of production of coal, we find the average price of coal on hand was \$2.91 per ton, or 13c. a ton more than at the beginning of the year, and but little less than the market value of the coal in New York at the close of 1876, while a considerable quantity of the stock was at Honesdale, the freight from which place to New York would be about \$1.25 per ton.

We find from the statistics furnished us that the company sent to market about 1,997,000 tons of coal, a portion of which it purchased. The average cost of mining, it would seem, was about \$1.42 per ton, or about 9c. per ton above that of the Philadelphia & Reading Coal and Iron Company, and we have here no information as to whether the proper items of dead work, repairs, etc., etc., are included in this figure, \$1.42. It would be well for the company to follow the example of the Philadelphia & Reading in this as in many other particulars, and state the average cost in each month of mining coal.

There is an item of \$521,179 for advanced royalties which would appear unnecessary, considering that the company claims to own 25,000 acres of coal land and to have a productive capacity of about double the amount of coal mined during 1876.

The advanced royalties would amount to more than 26c. per ton on all the coal brought to market by the company during the year, and is one-tenth of the whole cost of its coal estate as given on the balance sheet.

We presume the company can give satisfactory answers to these and other questions which a perusal of this unsatisfactory report naturally suggests; and if this be so, the officers surely cannot fail to perceive the importance of giving such information as would make unfair deductions impossible.

THE DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY.

If the Delaware & Hudson Canal Company's report is incomplete and unsatisfactory, what can be said of the following parody on a report which is offered to convince stockholders and the public generally, of the stability of the company:

THE ANNUAL REPORT OF THE DELAWARE, LACKAWANNA AND WESTERN RAILROAD Co.—At the Delaware, Lackawanna and Western Railroad Company's meeting on Tuesday, votes were cast on 260,000 shares. The officers elect are—President, Samuel Sloan; Secretary, Andrew J. Odell; Treasurer, Frederick H. Gibbens; Managers, William E. Dodge, Moses E. Taylor, George Bulkley, John I. Blair, Simeon B. Chittenden, John Brisbin, George Bliss, Percy R. Pyne, William Walter Phelps, James Blair, Wilson G. Hunt, Marcellus Massey, Alfred L. Dennis, Benjamin G. Clarke. President Sloan presented the following report:

Capital stock.....	\$26,200,000 00
Funded debt:	
Convertible mortgage bonds.....	\$1 635,000 00
Convertible mortgage bonds.....	600,000 00
Lackawanna and Bloomsburg bonds...	587,100 00— 2,820,100 00
All other liabilities:	
Including interest and rentals on leased lines up to Jan. 1, 1877.....	4,281,555 75
Less cash on hand, bills and accounts receivable, coal on hand at cost, cash advanced on coal to be received.....	3,401,240 02
Balance liabilities.....	880,315 73
Surplus reserved.....	5,213,437 78—\$35,113,853 51
To represent the above the company owns 195 miles of main line of railroad, of which more than 107 miles is double track, being a total of 302 miles of main track, 195 miles of which is laid with steel rails. In addition thereto it owns over 60 miles of lateral railroads, 153 locomotives, 15,800 cars, machine and car shops, with machinery and fixtures; 15,000 acres of selected coal lands in fee, upon which the improvements cost over \$3,000,000, with a capacity to produce 4,000,000 tons coal annually. The company also holds under lease at low rentals over 4,000 acres of coals lands.....	
Real estate in cities of New York, Rochester, Buffalo, and Chicago.....	\$29,118,248 46
Stocks and bonds valued at.....	335,535 36
Materials on hand at cost.....	4,383,837 46
Barges and equipment.....	1,209,650 51
Revenue for 1876:	66,581 72—\$35,113,853 51
Net earnings from all sources.....	\$4,001,861 46
Less interest on bonded debt and rentals of leased lines to January 1, 1877.....	3,280,036 50
Net profit for 1876.....	\$721,824 96

The stocks and bonds in the statement which are estimated as assets are those of the Morris & Essex Railroad, which is one of the leased appendages of the company. The bonds are guaranteed by the Delaware, Lackawanna and Western Company.

The assets of the company are lumped so that no one can ascertain their value, but it would appear as if the 15,000 acres of coal land the company claims to own enters into the total as nearly one-half. No such statement as this can possibly do otherwise than create a feeling of distrust in the soundness of a concern that fears to let the public know the manner in which it "figures up" its assets. What amount of workable coal does the company possess? What does it cost to mine its coal, and how much to transport it to market? What

value does it put on its coal lands? We would suggest to the management of this company also the desirability of furnishing maps and an expert's report showing the extent and value of the company's coal estate. And it will be the part of wisdom to supply this and much other information before that want of confidence which this report is admirably calculated to inspire has gained such strength as to endanger, if not altogether destroy, the financial credit of the company. The ability of any number of eminent financiers to sustain the market value of the stock under the weight of such a statement must find a limit, unless, indeed, they conclude to buy and hold it all; and when they cease supplying the abnormal stimulus, the reaction will be all the greater.

NEW PUBLICATIONS.

THE REPORTS OF THE VIENNA COMMISSIONERS.—Vol. III.

Continuing our notice of these reports, we come to the third volume, which is principally occupied with the report on Machinery and Manufactures by Prof. ROBERT H. THURSTON. The admirable volume on the Machinery and Processes of the Industrial Arts, and the Apparatus of the Exact Sciences, contributed to the Paris reports by President BARNARD, set up in this department a standard which might well have daunted his successor. But a comparison of the two treatises serves to show the excellencies of both, without disparagement to either. One is the work of a thorough physicist, the other of a thorough mechanical engineer. This difference causes them to be in some respects mutually complimentary—as, for instance, in the discussion of hot-air and gas engines. Prof. THURSTON is, on the whole, more frank in criticism of the forms and utility of machines; and this feature, together with the later date of his work, and the survey of European manufacturing districts which it includes, make it perhaps still more practically useful to mechanical engineers in this country than the hitherto unrivalled work of President BARNARD. The immense advantage to the arts of such publications is evident enough upon a study of either.

Prof. THURSTON had this advantage over other American reporters at Vienna, that the exhibits of the United States in the department of machinery was, if not adequate, at least entirely creditable and characteristic. But he has fully appreciated his duty as a critic, taking pains to discover and record the excellence of foreign nations. He says, in summing up his survey of the field, that national differences were always plainly observable, and sometimes very striking. "The usual characteristics of the South Europeans were elegance and lightness of form, with beauty of external finish. The North Europeans appeared to best advantage where simplicity of form, strength of parts, and general adaptation to useful purposes, demanding no display of fine art, were requisites. The British and Americans both excelled in originality, the former displaying the highest excellence of workmanship and promise of greater durability, and the latter the most remarkable ingenuity and capacity for making the most of the resources." We venture to add that the tendency of international exhibitions has been, in our judgment, to diminish these national differences. American ingenuity may long continue to keep the lead it has obtained; because it is the result, not of intellectual traits which no other race possesses, but of the institutions and conditions of our country. Unfettered domestic competition, freedom from traditions, protection to inventors, high wages, and the practicability of introducing devices for saving labor without permanent distress to the laboring population, are great advantages in this respect; and foreign nations lacking any of them are heavily handicapped. But we shall find them not slow to follow us, at an interval of time which is certainly small, compared with the rate of progress in past generations. Prof. THURSTON finds that European practice in the building of stationary steam-engines has in the main followed American practice for twenty years; and that in the matter of expansion-gear, governors, cut-offs and valve-motions, there is in Europe, as there has been here, a swarm of complicated and objectionable devices. He ranks the British at the head of foreign manufacturers in this line, and says that in the small horizontal slide-valve engine with the Meyer valve-gear they surpass all nations, not excepting our own. Of the compound stationary engines shown at Vienna he speaks in decided disparagement. The Swiss engine which took the highest prize was, he says, a modified Corliss engine, with ingeniously complicated valve-gear, embodying some of the features of the Sickles, Corliss, and Greene inventions, and Porter's governor.

Under the head of Marine Engines, there is an interesting discussion of the loss of power by the "slip" and oblique action of paddles. Prof. THURSTON expresses his surprise that chain-traction, so common abroad, has not been used on our inland water-ways instead of towing. His view on this point has been confirmed by the recent experiments on the Erie Canal. Certainly we cannot boast of superiority to European nations in this particular while we continue to drive superannuated horses along our tow-paths, and to experiment with devices which foreign nations have long surpassed and discarded.

In locomotives we do lead the world, but we sent none to Vienna. The foreign designs here discussed offer a few interesting novelties, but not usually of a kind to be adopted in the United States.

Road-locomotives and steam-carriages are used abroad, but not here. The principal difficulty with us is the lack of good roads.

In portable steam-engines, Prof. THURSTON puts Great Britain at the head, pronouncing the economy of some of the little engines of this class exhibited by British builders at Vienna to have competed closely with that of the largest

compound marine engines—a result which he may well pronounce astonishing, and which he ascribes to careful designing, exact proportions and workmanship, and skillful handling. The best type of American steam fire-engines was not exhibited.

We cannot follow in detail the chapters on boilers, air, gas and hydraulic motors, turbines, pumps, metal and wood-working machinery, etc., etc. In all of them, Prof. THURSTON takes the exhibition as a text, on which he bases judicious estimates of the stage of progress shown by various nations. The second part of the report is a survey of the manufacturing districts of Switzerland, Germany, Belgium, France and Great Britain, which, though not exhaustive, is extremely valuable and suggestive. In a word, it is rare to see a work of this kind so free from chaff and so packed with really useful matter.

In the same volume are Mr. FAIRFIELD's brief and not specially thorough or discriminating report on sewing-machines (a subject as difficult to treat as that of pianos), Mr. WATSON's report on Civil Engineering and Architecture—confined to a few interesting specialties, and the report of Mr. DAVIS on Hydraulic Engineering, which also is merely an account of the exhibits in that department.

The fourth volume we must reserve for further notice. *

THE INTERNATIONAL REVIEW, March-April. Published by A. S. BARNES & Co., New York.

This is unquestionably one of the most able of our periodicals in a literary sense. Its reviews of American and European books are very able and exceedingly instructive, while its list of special contributors numbers many names of world-wide reputation. Among the articles of special interest in the present number is one on Theory and Practice in Architecture, by JAMES C. BAYLES.

The University of Upsala, by Prof. K. M. THORDEN, is a very readable article on Scandinavian Universities. A suggestive and revolutionary paper is that on Responsible Government, by Prof. VAN BUREN DENSLow, to read which would certainly enlighten to their benefit a great many of our enthusiastic admirers of irresponsible Republicanism.

The *International Review* should be read by every one who, in these busy days, cannot afford the time to read all books as they appear, and who yet desires to keep informed upon literary matters, and to know the best works to which the time at his disposal may be devoted.

THE LEAD AND SILVER WORKS OF THE MECHERNICH MINING COMPANY.

The greater portion of this sketch consists of a translation of two papers written by the officers of the company for distribution among the members of the Association of Mining Engineers who, on the occasion of their meeting in 1875 at Liege, visited these extensive and interesting works.

The lead deposits of the Eifel, in the vicinity of Mechernich, were worked at a very early date, it is supposed by the Romans, before the occupation of the country by its present inhabitants. The proof of this lies not only in the quantity of old Roman tools, vases and coins found, but also in the circumstance that the well-known Roman canal, built to carry the mountain springs of the Eifel to Cologne, is carried through and over old waste dumps, and that sand from the latter was used in its construction.

The object of this old work was principally the galena found in the crevice of the overhanging limestone in Tansberg, rather than the nodular ore found in the sandstone beds of Mechernich, on which the large works of the Mechernich Mining Company are based.

In the immediate vicinity of Mechernich the old works were limited to the so-called "wackendeckel," a conglomerate overlying in considerable thickness the nodular sandstone on the western limits of the grant, and containing coarse particles of galena cemented together with carbonate and silicate of lead.

The mining of those deposits, difficult on account of the hardness of the rock, was rendered easier by a previous burning of the rock, by which it is softened, and the separation much facilitated. This method was followed by the best results, and will be adopted by the present company in utilizing the rich "wackendeckel" lying west of the company's present works.

The nodular sandstone itself, the special object of present operations, is for the greater part very soft, much of it might even be called compact sand; it possesses in its upper part an average thickness of 22 meters, and contains on an average only 1½ to 2 per cent. lead, which is very irregularly distributed. The lead exists, mainly as galena, in a finely-divided state, cemented together with equally fine quartz sand, forming nodular, from the size of a pea to a pin head, and to some extent even finer to fine sand, or even to slimes. The sandstone contains white lead ore only at or near its outcrop on the surface.

In the present workings in the Meinertzhagen grant, the overlying waste material, consisting of gravel, sometimes very compact, having a depth of forty to fifty meters, is entirely removed; the work is therefore a quarry rather than a mine.

The earliest recorded work on this nodular sandstone was begun in 1629, in which year the Herren von Meinertzhagen received from the Duke of Aremberg the permission to drive a drain tunnel, and the exclusive right to utilize the ores from the Petereid, Bach Schaftsberg and Kohlhau districts. In the year 1690 a further right was obtained to drive a second tunnel, and, according to the records of the Cammer Bergamt, in the year 1759 this tunnel, which is the same as the present Meinertzhagen or Elizabeth tunnel, was declared to be the principal one, and permission was received to abandon the first.

By this tunnel, which has a length of 2,700 meters, and a difference of level of 3 meters, the waters of the Bach district are drained to a depth of 90 meters below the head of the Shaftsberg hoisting-shaft. Later this tunnel was extended 1,770 meters in a westerly direction, and at a level 8 meters higher than the first part, in order to drain the so-called Julichschen mine.

In 1870 was completed still a third tunnel, extending from the Burgfeyer valley to the Shaftsberg shaft, draining the bottom to a depth of 113 meters; and in 1875 the same had been extended to the new Virginia shaft, which it intersects at a depth of 95 meters, the entire tunnel having a length of 5,284 meters, and a total fall of 7 meters.

Till the middle of this century the mining of the nodular sandstone was car-

ried on only under, round and on a small scale; the present extended works dating only from the open-air work begun in 1852. In the beginning the undertaking was rendered much easier by the near approach of the sandstone to the surface. In the establishment of the new quarry near the Virginia shaft, about one mile in a westerly direction from the Shaftsberg shaft, a large amount of overlying material, about 450,000 cubic meters, must be removed; of this amount 400,000 cubic meters had been removed in July 1875.

Since 1852 the magnitude of the operation has been much increased. The first hoisting-shaft connected with the quarry by a tunnel dates from 1853, and the establishment of the first steam-engine from 1854. As in 1872, this shaft, the "Bachrevier," was destroyed by fire; the hoisting was changed to the Shaftsberg shaft, a double shaft sunk in 1862 for pumping machinery and waste hoisting, and designed also for ore hoisting when necessary.

At the western limit of the grant there was begun in 1870 a new quarry with hoisting shaft, pumping machinery and concentrating machinery; there will also be some underground mining carried on in connection with this quarry. The new works called the Virginia works will probably be in operation early in 1876. The Virginia shaft is connected by means of the Burgfeyer tunnel with the Shaftsberg shaft, thus conducting to a more perfect drainage and more perfect utilizing of the water for the purpose of concentration.

The entire grant has an extension of 35,500,000 square meters, equivalent to 8,773.3 acres, of which up to July, 1875, only 2,700,000 square meters (667.5 acres) have been proved to be worth working, and 580,000 square meters (143 acres) actually extracted.

At present the principal extraction takes place in the Bachrevier quarry; also to some extent underground in tunnels leading out from the same. The quarrying is done mostly in the usual manner by steps or stages; the material being transported on temporary tramways and dumped into cars which are forwarded on a steam railway through a tunnel 800 meters long, on the level of the Burgfeyer tunnel to the Shaftsberg hoisting shaft.

The two shafts at Shaftsberg and Virginia are fully sufficient to utilize all that portion of the sandstone lying between them, as also that lying west of the last-named shaft.

THE CONCENTRATION OF THE SANDSTONE.

It would at first sight seem very easy to separate galena from quartz, especially as the nodules have almost invariably a rounded form; but it must be borne in mind that the nodules themselves are not composed of pure galena, but contain only 20 to 30 per cent. lead; they are in fact composed of fine, often exceedingly fine, particles of galena cemented with equally fine particles of quartz.

The concentration or dressing consists of two distinct operations. 1st—The separating of the nodules from the quartz. This operation, which in no case would be attended with any great loss in lead or other difficulty, is made still easier by the use of the new "Strom apparatus," invented and put in practice by Herr Osterpey, which will be further described below. This first stage of the dressing takes place directly at the mouth of the hoisting shaft, from which the nodules are transported by railway to the Bachrevier, when they are submitted to the second operation. The great peculiarity of the sand concentration is the immense quantity of material handled, amounting to 2,400 cubic meters or 4,000 tons each 24 hours, and its very low percentage in lead averaging in 1871 only 1.8 per cent. 2nd—The separation from the nodules of a galena sufficiently pure to be smelted with advantage, say 60 per cent., is, owing to the finely divided state of the minerals, attended with greater difficulty and greater loss; indeed, in the new works at the Bachrevier, to be in operation early in 1876, the extremely fine portion of the crushed nodules is to be settled in vats and smelted with a percentage of 20 to 25 per cent., the increase of smelting costs being less than the loss incurred by further concentration.

First process, or the separation of the nodules from sand. The sandstone, by far the greater portion of which is so thoroughly disintegrated as to require no crushing, is first dumped on a punched iron plate, in which the holes are 25 mm. diameter, when it is subjected to a strong sprinkling of water. The results are:

1st—Material remaining on the plate which is sorted by hand, the little galena or ore it contains are picked out and sent respectively to the furnace or to the crushing rolls.

2nd—Material passing through, I judge not less than 90 per cent. of the entire mass, which goes to the Trommel system.

TROMMEL CLASSIFICATION.

All that material passing through the plate mentioned above is divided by the trammels or drum-sieves into the following sizes, of which the disposition is also given:

25 to 15 mm. diameter	goes to sorting (a)
15 " 10 " "	" " (b)
10 " 9 " "	continuous jig A
9 " 8 " "	" " B
8 " 7 " "	" " C
7 " 6 " "	" " D
Under 6 " "	automatic Strom apparatus.

In the sorting (a) are produced:

Nodules, ready for the second or nodule concentration.

Gangue, which is thrown away.

In the sorting (b) are produced:

Nodules, for the second concentration.

Nodules with sandstone, which is crushed between rolls, sized and jigged in the same manner as A, B, C, D.

Gangue, which is thrown away.

The continuous jiggling machines, A, B, C, D, have each two sieves, a length of stroke or movement of plunger of 27 to 15 mm., and make 150 strokes per minute, and yield the following results:

Nodules, for second concentration.

Intermediate product crushed between rolls and returned to the trammels.

Gangue, which is thrown away.

To the Automatic Strom apparatus comes all that material from the trammels under 6 mm. in diameter, constituting, I should judge, more than one-half the entire material classified. The results are:

Overflow, sand which flows out as tailings, thus getting rid of the greater portion of the sand.

Precipitate, consisting of nodules with sand, flows into a drum-sieve with openings 1½ mm. diameter.

From this last mentioned trommel the results are:

Nodules, larger than 1½ mm. in diameter, which go to second concentration.

Nodules with sand, smaller than 1½ mm., which passes to a second Strom apparatus.

From this last mentioned machine the results are :
 Overflow, which goes to stationary round buddle.
 Precipitate, which passes to continuous four-sieve jigging machine.
 From the jigging machines are produced :
 Nodules, for the second concentration.
 Intermediate products, which are a second and third time jigged.
 Gangue, which is thrown away.

Second concentration, or the treatment of the nodules obtained by the first operation.

The treatment indicated by experience for this, and which is to be put in practice in the early part of 1876 in the new works being built for the purpose at the Bachrevier, is as follows. The nodules are crushed wet under stamps, the pulp flowing to a small spitzkasten (a). The results are :

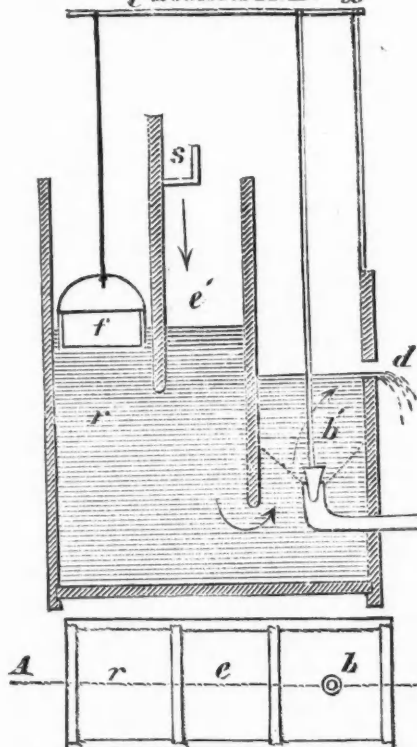
Overflow, goes to large spitzkasten (b).
 Precipitate, flows to Storm apparatus.

From the Storm apparatus (4 in number) the results are :
 Overflow, goes to large spitzkasten (b).
 Precipitate, goes to continuous jigging machine.

The continuous jigging machines, which have three sieves, and are worked with a bed of the same material, give the following results :
 Galena, ready for smelting.
 Intermediate products, a second and third time jigged.
 Gangue, which is thrown away.

The large spitzkasten (b) produces :
 Overflow, which flows into vats is settled and dried ; this contains 20 to 25 per cent. lead, and is so smelted, not admitting further concentration.
 Precipitate, which is further concentrated on Rittinger shaking table.

Section A.B. x



The automatic "Storm apparatus," much used in the dressing works, is the invention of Mr. Osterpey, the engineer in charge. It consists of a deep box, whose length, about three times its width, is divided into three nearly equal parts by two partitions, which, however, do not extend to the bottom. The first division, *b b'*, see sketch, which is square, is furnished with a funnel-shaped false bottom, composed of wire screen, whose mesh is smaller than the material to be worked, and terminated by a bent pipe leading out through the end of the box as shown ; the inner end of the pipe being closed by a conical plug connected by a rod with the lever *l x*. In the third compartment, *r r'*, is suspended a float, also connected with the lever *l x*. Into the middle compartment, *e e'*, clear water is introduced through the trough *s*. This passes to the bottom of the box up through the false bottom, and escapes by the discharge opening *d*.

The operation of the machine is as follows: The material to be concentrated is introduced by means of a stream of water into the compartment *b b'*, where it is met by the ascending current of clear water ; there ensues a separation, according to the specific gravity, more or less perfect, according to the greater or less uniformity in the size of the grains introduced. So far, the working of the machine is identical with that of the "Spitzluten apparat," and also with that of an apparatus figured and described in the "Saxon Jahrbuch für das Berg und Hüttenwesen," for 1873, now in use at Freiberg, in one of the dressing works of the Himmelfahrt mine.

The important difference in this machine, which makes it an improvement on those above mentioned, consists in its automatic discharge. In order to produce an ascending current of water in the compartment *b b'*, it is necessary to have a head of water in the other compartments sufficient not only to produce the necessary velocity, but to produce that velocity against a column considerably heavier than water. The height of this head determines the position of the float *f*, and by means of the lever *l x*, the size of the discharge opening. The greater the quantity, therefore, of heavy material introduced into *b b'*, the larger the opening of escape for the concentrations. When properly regulated at first, the machine adjusts itself to any ordinary change in quality or richness of material.

TO BE CONTINUED.

PRICES OF COAL AT THE PITS IN GERMANY are given in the *Colliery Guardian* as follows :

	s.	d.	s. d.		s.	d.	s. d.
Best lump coal	9	0	@ 10	Coking (fine screened)	4	8	@ 5 6
Gas coal	7	0	@ 8	Coke, 1st quality	10	6	@ 12 0
Machine coal	6	0	@ 6 6	" 2d quality	9	0	@ 9 6
Boiler and fine coal	4	6	@ 5 0				

SPEED OF MINE VENTILATORS REGULATED BY THE RISE OR FALL OF THE BAROMETER.—M. Timmermans, the Engineer of the Société Marcinelle et Couillet, at Charleroi, Belgium, has devised a method of regulating the speed of ventilating fans, or rather of the engines driving them, by the movement of the barometer. As the barometer falls it opens the steam valve and allows the engine to run faster, but a rise of the barometer does not diminish speed ; this has to be done by the engine-driver. It is easy to conceive a variety of ways in which the movement of the barometer may be made to regulate the speed of the engine, and the subject is well worthy the attention of those in charge of our fiery mines.

AN ACCOUNT OF AN EXPLOSION OF FIRE-DAMP AT THE MIDLOTHIAN COLLIERY, CHESTERFIELD CO., VIRGINIA.*

[WITH SUPPLEMENT.]

By Oswald J. Heinrich, Superintending Engineer.

The responsibility resting upon the owners and managers of mines where fire-damp is generated, renders it a matter of imperative duty that a full and correct statement of any explosion that occurs should be given to the public. But such a statement must be based on the testimony of impartial eye-witnesses or trained experts. Then a sad experience may result in the adoption of effective preventive measures in the future.

In the absence of any official and professional body of mining experts in the State of Virginia, the writer desires to submit to his professional brethren of the American Institute of Mining Engineers an account of an explosion which recently took place in a colliery under his management, and earnestly desires a thorough and impartial discussion on the facts submitted.

DESCRIPTION AND PLAN OF THE MINE.

The "Grove shaft" is situated at the nearest point 825 feet from the last old workings upon the Midlothian property, south of the old Pump shaft works. The shaft was sunk by the former company some thirty years ago to the depth of 622 feet. An incline over 230 feet long, starting in a northwest direction at a depth of 105 feet above the shaft bottom, had been driven to explore the coal on the dip.

A return of very small dimensions had been driven round the shaft on the south side, entering the upcast chamber. With the information obtained from the former company that a seam of coal about four feet thick, at a depth of 490 feet, had been found, and with the information obtained by the present proprietor, R. T. Burrows, of Albion, N. Y., by means of two boreholes on the dip west of the old shaft, in both of which workable seams of coal at various depths had been ascertained, the clearing out and thorough retimbering of this shaft were commenced in March, 1873.

Borehole No. 1, at a depth of 477½ feet from surface, revealed a seam of coal. This borehole was afterwards carried to a depth of 1,140 feet to the granite, without finding any other seam of coal. Borehole No. 3, at a depth of 608 feet, revealed the first coal seam, 14½ feet thick ; at 633, the second 12 feet thick ; at 662 feet the third 1 foot thick, and at 692 feet the fourth 4½ to 5 feet thick. The borehole was stopped at a depth of 715½ feet.

The coal in the shaft was found at 485 feet. No. 1 Borehole being 211 feet distant from the shaft on the dip, the coal was found to be 7½ feet nearer the surface ; and at No. 3 Borehole 594 feet distant on the dip, the coal was found 123 feet lower than at the shaft. All of this indicated considerable irregularities in the shape of saddles or dislocations. Therefore it was at once decided to clean out the shaft to the bottom, and drive a crosscut tunnel to No. 3 Borehole from the shaft bottom to develop the different basins, and to get a productive shaft in operation previous to sinking another deep shaft still further on the dip, which would probably not be less than 950 or 1000 feet deep.

The Grove shaft, from the beginning, had been provided with a substantial centre brattice, dividing it in a downcast and upcast chamber, the downcast chamber being again subdivided into two hoist chambers. The shaft is in its narrowest section 10½x10½ feet square, allowing an area of 50.7 square feet for the downcast, and 52½ square feet for the upcast chamber. The old return around the shaft was materially increased in capacity, and had not less than 50 square feet at its narrowest section. The old incline, forming formerly the main return from the lower works, has very irregular dimensions, but at its narrowest place is not less than 35 square feet.

The main intake tunnel was started near the shaft at an area of 80 square feet for a double track and turnout, diminishing to 72 square feet at the first level north, called the incline level, having there an area of at least 35 square feet, regulated by doors. At the face of the level it has a return brattice of 18 square feet. From thence the intake tunnel, at its narrowest place, is not less than 56 square feet in area to its west end.

During the progress of winning the pit, successive connections, first at the incline level (called California), second at the 4-foot seam further west, third at the 12-foot seam, and ultimately at the 14½-foot seam, were made with a return tunnel, partially passing through leaders of disturbed ground, or intersecting the saddle connecting with the old incline as a main return.

After the lowest, or 4-foot seam, and the second, or 12-foot seam (which level is also called the big stall), were in progress further south, top levels, 29 feet perpendicularly from floor of lower level, were carried on, and connected respectively at 88 and 78 feet from centre to centre by upsets (at 35-40° pitch), 12x4 feet (48 square feet), and 12x6-7 feet (72-84 square feet) in area, connecting by overcasts with the main return tunnel 56 square feet in its narrowest place.

The dimensions of the main bottom level in the 4-foot seam are 55 sq. feet, leaving a clear area of 35 square feet intake and 12 square feet of return at the brattice in the face. The corresponding top level has an area of 40 square feet. The dimensions of the 12-foot level are 150 square feet, with a clear area of 90 square feet intake and 42 feet return behind the brattice at the face. The corresponding top level has an area of 60-70 square feet, being only driven in the top bench of the coal.

From the incline seam, north of the old incline, another upset for an independent return 50 square feet in area had been driven to the upper levels previous to the explosion, in order to increase the capacity of the returns. The coal in this basin being a very rich gas coal, and known for many years to eject a good deal of gas in the mines, necessitated from the beginning of the work provisions for more thorough ventilation by mechanical contrivances. For this reason a substantial fan-house, built of solid masonry and brickwork, was provided in the main engine-house and connected with the upcast chamber by a tunnel near the surface, also lined with brick. This fan-house received a Guibal's fan 23 feet diameter and 7 feet wide, driven by an independent engine of 14 inches diameter steam cylinder and 30 inches stroke, all of which were within about three days of completion, and actually completed in that time after the explosion.

Previous to the use of the fan, and up to the time of the explosion, natural ventilation had to be resorted to, which was accomplished by means of a cupola 38 feet high and 40 square feet area, placed temporarily over the return arched tunnel to fan-house, 32 feet east of upcast chamber. The greatest number of men employed in this mine had never exceeded thirty to forty per shift. The work was carried on day and night in three relief shifts. The ventilation of the mine, except on very warm and sultry days, had been fully sufficient to work under proper care with open lights throughout the main workings ; the

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

safety lamps were only needed for examinations, which were strictly ordered twice in every shift. In case of greater depressions in the atmospheric pressure, or when extra large feeders of gas were encountered, or shots had to be fired in gaseous headings, proper notice was given and the hands withdrawn from the working places. All of this is fully substantiated by testimony given at the investigation held by W. J. Clopton, Judge of Chesterfield County.

On the 6th of March, after the overcast in the 4-foot seam had just been completed, but before the air was freely circulating, through the neglect of the boss in charge of the Monday morning shift to examine the part of the overcast where it is upon its descent to the lower return and where gas most likely would lodge, the gas was fired by a boy sent for some tools, causing an explosion by which four men were burned, of whom one (a colored boy) died, while the others revived. It is proper to mention that the day previous had also been very warm and sultry.

The map accompanying this report is a true representation of the mine in all its details previous to the day of the explosion, which occurred May 20th at 1:22 P. M. It is plotted from actual surveys of the Superintendent regularly kept up.

CIRCUMSTANCES PRECEDING AND CONDITIONS PRIOR TO THE EXPLOSION, AND THE CAUSE OF THE EXPLOSION.

On the 9th of May the main work for raising coal in this mine had been stopped for want of sales, it also being decided to introduce mules for motive power in the lower gangways. Two sets of hands were kept at work in the 4-foot and incline bottom levels to heighten the same for said purpose. Additional timbering had also to be done in upcast chamber of shaft, and the fan to be completed. Accordingly all work had ceased in the 12-foot seam. The connections for ventilation being kept up and the works examined, no one was permitted to enter except by permission of the boss. The incline bottom level ejected a considerable quantity of gas. It was formerly, before the various overcasts had been completed, worked by return air, and was found often to make gas very freely after passing some distance north of the old incline. It was decided now to work this section of the pit hereafter by a "split," and consequently an overcast had been constructed of strong timber work, passing from the main return tunnel over the incline level into the old incline. Previously a second independent return for the incline bottom level had been driven north of the incline to the upper level.

Each seam in the pit, and each wing of the same north and south of the main intake tunnel, received, therefore, its fresh air directly and independently, having its collective return for the south wing as well as for the north wing of the pit. All of this work was within less than a day of completion previous to stopping the underground work temporarily, to assume it again with all facilities for cheap transportation and thorough ventilation. The pit had been examined between the hours of 10 and 11 A. M. by the Superintendent in the 4-foot and incline bottom levels and as far as the stables, everything being in the finest state for comfortable work. The weather being very warm and sultry on that day (thermometer at 86°), the head underground boss had been notified of the fact, and had even been out of the pit about 12 M. The previous night more gas than usual had accumulated in the suspended ground of the 12-foot seam. It had been noticed at 10 o'clock P. M. by the boss making his round, to be nearly at the bottom of the first upset in said level, bringing it below the collar of the timber, or about 8 or 9 feet from bottom of level.

During the night it had again entirely cleared itself, and the relief boss at 5.30 o'clock P. M. reported the pit clear throughout, having made his trip all around. All of this has been substantiated by the evidence given at the investigation.

An order was given by the Superintendent in the morning to gravel the bottom of the new roads laid with fine rock in the rear works. No doubt the head boss entered these works after dinner with some of the putters and his deputy, and while he went on his rounds to examine the back works south of the main intake in the 12-foot seam, previous to his relief from the shift, he sent his deputy with two putters north in the return to haul out the gravel. At all events the dreadful report was brought to the Superintendent about 1.40 P. M. that the Grove shaft had exploded. Hastening to the scene of the accident, about 3/4ths of a mile off, he found the relief boss for the 2 o'clock shift, who had been sitting close to the shaft when the explosion occurred. Two men had come out after the explosion through the main hoist chamber upon the cage, operated by the steam-engine; one man (working in the upcast chamber of shaft) had been hoisted up about 350 or 400 feet by the horse whim used for said chamber temporarily. They reported more men alive at the bottom, and soon the signal from below was heard by the rapid striking of the hammer. Two facts were at once ascertained:

1. The downward cage had hung in the shaft, while the upward-bound cage had come to the top, and probably doubled up the slack rope.
2. Both chambers of the shaft were casting up black damp very rapidly, all of which indicated a break in the shaft.

Mr. George Jones, the relief boss, had already made one attempt to go to the bottom before the Superintendent had arrived. On account of some obstacle in the shaft, and in consequence of the foul air prevailing, he could not accomplish his object. The great need was to restore the current of air to relieve the men yet alive at the bottom of the shaft, and then to ascertain the extent of the damage and to repair it.

For this purpose a waterfall was put in operation with the means at hand. A temporary change could soon be noticed in the shaft. The attempt was now made by means of a temporary rigging from the horse whim to descend the shaft to ascertain the extent of the damage, and if possible to bring relief to the men at the bottom. The former was accomplished by Mr. Jones and James Hall, it being ascertained that just at the entry of the main top return to the upcast chamber of shaft about 20 feet of centre brattice had been broken out after the last cage had passed, destroying the entire course of ventilation. This centre brattice consisted of main needles across the shaft 8x10 inches, placed 6 feet 8 inches from centre, with corner and centre posts 6x8 inches, and lined with 2-inch planks tongued and grooved, the sides being closed by brickwork and cement against the sides of the shaft. To accomplish the latter, i. e., to go down to the bottom to the men, could not be ventured yet, the two men making the first attempt being nearly overcome by black damp, one being rendered almost helpless. Orders were now given to get long blankets in order to restore a temporary brattice. The timber being knocked out, it was impossible to restore the brattice with planks. During this time the wire rope connected with the cage hung in the shaft had been pulled down. A more rapid communication was again restored, and the waterfall being kept in constant motion at such places where men were not working in the chamber, furnished air enough to enable the men to remove the broken timber in the shaft and go to the bottom, where the groans of living men could still be heard by nightfall.

Two colored men were thus rescued alive, but senseless from black damp; also the body of the miner precipitated down the shaft was carried up to the surface. The temporary brattice of blankets being now made closer by stitching them together, the interior works could be entered without extra risk, but under great fatigue, by relief squads of men.

The body of the head boss was found at the end of the main intake (at C) in a very mangled condition. His broken watch pointed at 1h. 22m. P. M. as the time of the explosion. A putter (or trailer) was found in the return (at G H), the deputy and another putter (at H & M) also in the return behind the ventilating doors. The pit was searched after the explosion with the temporary brattice restored within the forehead of the 4-foot and incline bottom level, and within the second upset of 12-foot bottom level, although portions of the regulators for the ventilation were destroyed.

Three men were still missing. Some of them having been seen at the shaft bottom by those who had come out after the explosion, it was supposed that they might have ventured to escape up the old incline. This was opposed as a matter almost impossible, and no more volunteers were to be found to aid in making such a venturesome trip. But it was now ascertained, about 4 o'clock A. M., from one of the rescued men who had returned to consciousness, that they were last seen by him crawling in the shaft sump to get fresh air. Search was therefore made in the sink of the shaft, and soon the three dead bodies were discovered and brought up to the surface. They had no doubt been killed by the rising of the black damp, hastened by throwing down the water. It is also most likely that in taking this most unfortunate position in the pit, their deaths might have been hastened by the chilling effect of the waterfall. About 6 o'clock A. M., after sixteen hours of hard and dangerous work to save their fellow-workmen, or at least to recover their bodies, the object was accomplished, and all except those left to attend the two feeble rescued men left for their homes.

In contradiction to public statements made, it may be remarked here that with the exception of one miner, John Kindler, from the Black Heath mines, who rendered very efficient services, being one of the first that entered the shaft after the explosion, all the aid rendered in the pit was by men working at the Midlothian mines. One other miner from Black Heath, William Marshall, who had lost a son by the accident, although in feeble health from a prolonged sickness, made the attempt to go down and search for his son, but failed to reach the shaft bottom, being overtaken by black damp. But it must also be stated that at the surface the employees of the company worked untiringly the night through, freely assisted by people of the neighborhood, in relieving the poor sufferers, or in taking care of the unfortunate victims of the accident.

The examination of the mine after the explosion revealed the following facts: Nearly all of the damage was done in the 12-foot seam levels; most of it at the first and second upset; nearly all of the timbers between those points were kept in position, also those near the face of the level. The doors in the lower return were blown out, also the top part of a wall at the stables, and the overcast to the old incline. Otherwise, except the destruction of the brattice in the shaft before mentioned, no damage of any consequence had been done. The four men were killed outright in the rear works at the places designated; three men escaped from the breast of the 4-foot seam bottom level unhurt to the shaft, two coming to the surface, one being secured afterwards with the ladder at the shaft. They hardly had felt the explosion; even their lamps were not blown out. Three men escaped from the rear of the incline level (their caps and lamps being found at G C), coming unhurt to the shaft, and were only afterwards suffocated by crawling in the sink. The two men working in the upcast chamber were lifted off from the scaffold; one fell in the shaft, the other caught the rope and was brought up unhurt.

Of the four men killed in the rear works, the foreman, found at C, was badly mangled and burnt in the face. The one found at G H was not burned at all, but showed indications of being choked by after damp. The two found at H and M, behind the doors, were very badly burnt.

From the above we may assume the following as the prime cause of the explosion:

It was known that the first upset in the 12-foot level had been full of gas the night previous, probably extending to some extent north in the overcast, but had cleared itself again during the night, and was found free of gas in the morning. The day being a very sultry one, it had no doubt filled itself again up to dinner-time. The boss, making his examination, went, it is supposed, as usual, with the open lamp as far as that upset. Here, either the gas had come lower down in the bottom level than at any previous time, and through bad judgment he ventured up too high with his open light (both the common and the Davy lamp having been found with his body), or by some accident, as by climbing up a platform, he might have slipped, and fired the gas in his fall. The body was most probably thrown through the level to the place where he was found. The line of fire passed through the upset, and splitting in the top level, following the gas, came down the second upset, making the destruction in rear of the level. In passing north it burned the men behind the doors; but finding there the impediment, the other was suffocated by after-damp. The men in the incline level were saved because the destructive power had to be exerted upon the overcast first, and had, therefore, more time to pass up the incline in a straight direction than by passing north into the bottom level.

This point should be particularly noticed, because during the course of the investigation, as no other subject of blame against the proprietor or the manager could be raised, it was positively asserted by interested parties that this overcast and the opening of the doors from the main intake into the incline bottom level were the prime causes of the accumulation of gas in the mine, and the rear level particularly, and therefore, whoever had given the order to open those doors, was responsible for the slaughter of the men.

As this subject involves the somewhat perplexing question of "splitting the air," and the effects upon the ventilation, it will be necessary to restate the following facts:

The whole area of the downcast shaft is.....	50.7 sq. ft.
The area of intake, as far as the incline level.....	72 "
" doors to incline level, 25.6 sq. ft.; its return ...	18 "
" intake to west end.....	12 "
" 4-foot bottom level, 35 sq. ft.; its return.....	56 "

At the time of the explosion this level in rear was only supplied with fresh air by an air-pipe 2 square feet in area, and found fully sufficient for all purposes:

Area of 12-foot bottom level, 90 sq. ft.; its return.....	44 sq. ft.
" return in upset of same level.....	25 "
" overcast at incline, at its narrowest point.....	35 "
" upcast chamber in shaft.....	52.5 "

Suppose now the pit was worked with return air. We would have the following sum of areas :

At 4-foot seam return	12	sq. ft.
At incline stopping, 2/3 of 35=	17 1/2	"
At incline level=	18	"

Total

Against an area of the intake equal to

On the contrary, if the pit is worked by the split, we will have the sum of the following areas :

Narrowest return (at brattice) in incline bottom level.....	18	sq. ft.
" " " in 4-foot seam	12	"
" " " in overcast at old incline.....	35	"

Total of returns.....

Against an area of intake of.....

In the former the sum of areas of return is less, in the latter greater than the intake, as it is required by laws of nature, and even by some State laws.

If we take into consideration the distance the air has to travel, the following figures must be considered :

DISTANCES FROM SHAFT BOTTOM TO BOTTOM OF UPCAST CHAMBER.

By 12-foot seam level direct up the old incline.....	2,066	feet.
" " " through incline bottom level if return air is used	2,234	"
Difference in favor of direct air-course.....	168	"
By 4-foot seam level direct up the old incline.....	2,116	feet.
" " " through incline bottom level if return air is used	2,284	"
Difference in favor of direct air-course.....	168	"
Distance from shaft bottom direct through incline bottom level to upcast	1,007	feet.
Distance to pass the air through 12-foot seam.....	2,234	"
Difference in favor of direct air-course.....	1,227	"

The distance for return air, in all instances is therefore greater, and for the incline bottom level over double the distance, and this in contracted returns besides.

Without entering further into the mathematical calculations of this subject, these figures will speak for themselves. The amount of friction will increase in proportion to the distance the air has to travel ; the air is, moreover, fouled already by the return from two main workings.

To avoid the natural consequences of such a loss of motive power due to friction, thus fouling the air unnecessarily, and, furthermore, to increase the very limited return afforded by the old incline, the system of splitting the air at the first north level, giving it an independent return, was adopted and practiced the day on which the explosion occurred, the rear works not being manned by workmen. Instead of entering into the lengthy calculations of the various effects of this or that system with which all present are well acquainted, a few facts may be mentioned to make the true policy more plain to the public.

One of the witnesses in the investigation (Andrew Jewitte) stated that while working in the incline bottom level a day or so previous to the explosion with the doors closed (working by return air), so much gas accumulated in this level that he could not work in it with an open light, and reported it. When the doors were opened he could work with all safety and comfort with an open light.

Another (Thad. Crump, deputy) stated that the night previous to the explosion, although the upset in the 12-foot level had been full of gas, it had cleared itself again, with the doors left open.

A third witness (G. Jones, boss, and an old miner in gaseous pits) stated that in his opinion more air would enter the back levels with the doors closed, but that from his experience the pit was as safe with the doors closed as opened. Others contested furiously for the closed doors.

To show the effect of temperature when working with return air, even by the use of a fan, the following statement of thermometrical observation made on the 9th of June after the explosion, may be of interest. The fan was run at thirty-five revolutions, and passed about 23,000 cubic feet of air through the pit :

Temperature at 10 A. M. at the surface	79°	Fahr.
" " " at the shaft bottom	89°	"
" " " at 4-foot seam bottom level at face, two men at work using powder.....	80°	"
Temperature at 10 A. M. at 12-foot seam bottom level in front of the men, 9 men at work with double sets of lights (Davy lamp).....	70°	"
Temperature at 10 A. M. at the face of the incline bottom level, one man at work in return air (overcast not repaired yet).....	82°	"

—showing the highest temperature in the face nearest to the shaft, but supplied only by return air. The effect of splitting the air was practically demonstrated at Shaft No. 5 of the Mine Le Couffre, near Châteliman, ventilated by a fan of Fabry's system. Four independent sections were worked by splits which, being again connected and worked alternately by return air, made either one, two, three or four independent returns. The proportional results referred to by Ponson were, per minute :

Number of revolutions required by the fan.	Depression.	Motive power required.	Volume of air delivered.
By 4 splits 30°.....	10'	10'	16'
" 3 " 35°.....	18'	17'	9'
" 2 " 30°.....	23'	19'	8'
" 1 " 33°.....	31'	27'	7'

When we consider, further, that in a gaseous pit the return air was taken from the most productive source of gas and used again at points making gas also freely, the former not being in active operation, while at the latter men were required to work, at a time, moreover, when the motive power for ventilation was naturally lessened, it seems to me that the decision what was best to be done could not be a very difficult matter for a disinterested and impartial judge.

With a sincere wish that for public information the members of the Institute may freely express their opinions as disinterested experts, the preceding statements have been more minutely given than may be considered necessary by such as are not familiar with this important subject.

June 20, 1876.

DISCUSSION.

MR. E. B. COXE remarked that if the subject had not been brought up by a well-known member of the Institute he would hardly believe that in the present state of mining engineering such opinions could exist. The advantage of splitting the air even to a greater extent than was done by Mr. Heinrich has been

well proved by experiment and calculation. He would prefer even a greater number of splits than Mr. Heinrich had made to carrying through the mine in a single continuous current all the air together with the gases formed or given off in the workings.

MR. ROTHWELL remarked that while there can be no question of the advantage of splitting the air, it was possible to carry the division too far. The current may be so weakened that it could not mix the air and the explosive gas, or sweep this out, as the miners term it. The total quantity of air circulated would of course be smaller, but the velocity of the current at a given point might be greater, by reducing the number of splits, and velocity as well as quantity is sometimes wanted. He also pointed out the necessity and advantage of Government inspection of mines, especially when the inspector happens to be as capable as his friend Mr. Williams, the Inspector of the middle district of Luzerne County, Pa., whom he saw present. In the absence of figures he was not prepared to say the splitting had been carried to excess in this case, and Mr. Heinrich was a good judge as to that; but he merely wished to note the fact that it is possible to carry even a very desirable practice to excess.

MR. J. H. HARDEN asked Mr. Heinrich what was the total amount of air entering the mine, and how was it split.

MR. HEINRICH—I do not know exactly. No instruments were at command to measure the velocity of current, which was only ascertained by the common lamp.

MR. HARDEN—We cannot discuss this question without a knowledge of the amount of ventilation at the time of the accident.

MR. HEINRICH—It is fully admitted that the current of air passing at the time was weak, probably not exceeding 50 feet velocity p. m. in the main intake. But it was as much as the circumstances admitted. I am also well aware that the principle of splits may be carried to an excess. But the question here is, in cases when a mine cannot be fully supplied with air, and such cases may occur in the best regulated pits, is it not the duty for the time being, until the proper remedy can be applied, to supply those places where men have to perform work with the full amount of fresh air, and let such parts of the mine temporarily idle be the suffering territory, if such parts by order of the manager are only to be entered by the man charged with examining the same to detect danger.

MR. T. M. WILLIAMS remarked that he fully agreed with Mr. Rothwell, and quoted "Atkinson on Ventilation and Gases," which states that owing to the resistance offered by the shafts, we dare not have more than a limited number of splits in a mine, because although every split adds to the total quantity of air circulating, still in each separate split the quantity ultimately becomes less and less, and if the number be too great, the current of each becomes too feeble and slow to sweep into the holes, corners and places driven in advance of the actual current. Besides this, powder smoke is a long time in being carried away from the workmen. It is also well known that the benefit to be derived depends upon the length of the said splits, and the relation they hold to the main and undivided split, or in other words, the relation of the depths and areas of the shafts to the lengths and areas of the air-ways forming the workings of the mine.

The objects to be attained by splitting the main currents of a mine into several separate splits are as follows: To increase the aggregate quantity of air, and in consequence to secure more air for each person depending for his health and safety upon the same. And again, to lessen the dangers from explosions of carburetted gas, by confining its train of evils to the territory of one split or part of the mine, and not to the whole, as when one continuous current is used. It is seldom that splitting of air-currents in mines is attempted, unless by persons who understand the benefit to be derived therefrom. There have been thousands of lives lost for want of a proper and systematic splitting of air-currents to one lost by an excess of splitting.

As regards the explosion, it might have been caused through deficient ventilation—caused by a defective system of ventilating, or from want of capacity in the ventilator. Again, it might have occurred independently of any of these causes, through the oversight of some person or persons in executing the orders of the manager or other officers in charge, or by an error of judgment.

Cases had come under his own notice where sober, efficient and trustworthy subordinate officers and workmen had been the cause of sad calamities, where their own and other lives had been sacrificed.

STOCK GAMBLING IN 'FRISCO—QUICKSILVER MINES OF CALIFORNIA.

TO THE EDITOR: Sir—The eyes of the public in California are beginning to be opened to the ruinous chances against them when they enter the lists on the Stock Exchange against inside manipulators; and when the people once realize that they have no chance in the contest, they will let Greek fight Greek, and the rings will end either like the Kilkenny cats, or more sensibly conclude to work the mines in a legitimate manner when they find there is no chance of cornering simpletons. The ring system is like the ancient colossus, of which, though the front was of brass, the feet were but clay. Who could have foretold the sudden collapse of the Tweed regime in New York a short time before it occurred? In operating on the San Francisco Stock Exchange, a man who has a large disposable capital, a sufficient insight into the customary manipulations, and who is callous enough to employ these means to beggar a few hundred families of flats at each new "deal," is as secure with ordinary precaution as the operator in thimble-rig. A rumor of good or bad developments artfully stated on the street, and backed by the impenetrable mystery enforced at the mine, and which prevents outsiders from being able to estimate the value of such rumor, serves all the purpose of covering the advance or retreat of the skirmishers. The mines are used as counters, of what real value we may judge by remembering that outside the two bonanzas there is hardly one on the Comstock that has paid dividends within several years. I have mentioned in a previous letter that nearly all the Comstock lode has been pretty well proved to a depth of from 1,200 to 2,000 feet, and any further great developments are very problematical. To be sure it will be said that every one declared the vein was "played out" before the discovery of the last and greatest bonanza in the Consolidated Virginia and California, but again we must remember that this was exactly the part of the vein which had been neglected owing to little or no ore having been found on or near the surface at this point.

There is another part of about the same length along the vein, and of the same width, which has never been touched, and which, like the bonanza mines, shows no ore on the surface, and may be very rich or very poor in depth; but as it is not considered part of the Comstock vein by resident experts, who, if

anything, are believers in their own superiority to all outsiders, that settles the question. Some new shafts are being sunk to cut the lode at 3,000 and 4,000 feet. I think such works are quicksands which will soak in some millions of somebody's money without further result. The experience they are having in the Savage, Hale & Norcross, and the C. and C. shaft, with the amount of water they are likely to have, making no mention of the extreme heat, will after a time act as a very efficient damper on their ardor.

A facetious correspondent of the New York Times has lately been amongst us acting the part of a "chiel takin' notes," who seems to have a very low opinion of our bonanza aristocracy. One of these celebrities he describes as having "the luck of a black cat, with the manners of a hog." The scene enacted at the yearly meeting of Consolidated Virginia stockholders would seem to prove that the individual alluded to did not stand alone in the possession of those qualities; though it would be a mistake to think that all mining kings are so low down as "Gar" would put them. Some, on the contrary, might rather come under the description of the Corsair—

"As mild a mannered man as ever scuttled ship or cut a throat."

A question of the greatest importance for the future of California has been on the tapis by a suit for damages by one of the farmers on the tributaries of the Sacramento river against the hydraulic miners on their upper waters, which is regarded as a test case. Judgment has been given in favor of the plaintiff, but it will no doubt be appealed. Most of the roaders of the ENGINEERING AND MINING JOURNAL know that vast quantities of gravel, washed out from beds 100 feet and more in thickness, have for many years been run into the different water-courses for the purpose of collecting the gold which is mostly found on or near the bed-rock of these ancient deposits. The result naturally is that the farming tracts on the low lands are covered during floods by a sterile layer of sand and gravel which is constantly fed in increasing ratio by the hydraulic works, which are increasing in number and in the scale of operation. Even this is not the worst result, as an engineer has calculated that in about 25 years, if I mistake not, Suisun and San Pablo Bays will be filled, and then will come the turn of the noble harbor of San Francisco, which cannot resist very long, and will remain dry land, like the ancient harbors of Carthage and Miletus. On the second centennial year we may expect that Alcatraz will rise from the surrounding plain just as the ancient island of Lade is now surrounded by green pastures where formerly the navies of Persia and Greece fought for victory. Then where will be the supremacy of the queen city of the Pacific? This ought to be made a national question when we remember that from Puget Sound to Acapulco there is not another first-class harbor. How to reconcile clashing interests in this matter is a difficult question, as many millions have been invested in these hydraulic works, and vast sums of gold remain to be extracted; yet a remedy must speedily be found, else the destruction of the best farming lands and of the harbor will be accomplished. It strikes me that a sufficiently simple method can be found to avoid these calamities, though I do not know the circumstances of the case sufficiently to be sure I am right. As I understand it, these gravel beds are so hard as to require the running of drifts and the excavating of chambers to blast and shatter the mass before playing the hose and washing away the resulting loosened gravel. The vastly greater proportion of the gold is, I believe, found near the bed-rock. Now, under these conditions, there could be no difficulty in working out the rich stratum at bottom by gangways and chambers, or by any of the other methods used in coal mining, leaving the superincumbent mass in place. The bed-rock would insure a solid foundation for the timbering. In this way not one-tenth of the present amount of gravel would have to be moved, and the gold could be extracted at probably no greater expense than at present.

Being on the subject of mines, I may make mention of those of quicksilver, which are numerous and rich, and supply a very important material for gold and silver miners. Previous to the last 30 years the supply of this article was monopolized by the mines of Almaden in Spain and Idria in Austria. Since then, New Almaden and New Idria, situated about 60 miles south of San Francisco, have become serious rivals, and within the last few years the mines of Lake County, some 100 miles north of San Francisco, have again almost rivaled the latter. These mines are all, I believe, worked on fissure veins, with the exception of that called the Sulphur Banks on the shore of Clear Lake, and in this the unique phenomenon is presented of a hill of 100 or more acres composed of a mass of volcanic tufa containing from 1 to 5 or 6 per cent. of cinnabar. The whole mass is worked in quarries or rather excavations, the ground being so soft as to require but pick and shovel to work it. This deposit seems to have been formed by the condensation of the vapors of mercury ascending from a crater situated about a mile off, which vapors were condensed by the water of the lake into which the lava stream flowed; these condensed vapors, filling the pores of the spongy lava, were thus preserved like honey in the comb. There is a great proportion of free sulphur also associated with the cinnabar, and this forms the greatest obstacle to the separation of the mercury from the other ingredients of the mass in the furnace. In the deep excavations gases boil up, the greater part of which are probably fumes of sulphur, judging from the strong smell. Owing to the extraordinary facility of working this deposit, as well as its abundance, the cost of production of quicksilver is at a minimum, and the amount produced is only limited by the number of furnaces the owners may choose to erect. These new discoveries explain the great fall in the prices of this commodity, which now rules at about 50 cents a pound in San Francisco.

D. COGHLAN.

ABSTRACTS OF LECTURES ON MINING.—No. XXIX.

By Prof. W. W. Smyth, M.A., F.R.S., Royal School of Mines, London.

(From the London "Mining Journal.")

The next thing we have to consider is the means of getting access to the interior of the mine by means of shafts, a shaft (French, *puits*, or *bure*; German *Schacht*) being a more or less vertical opening, as compared with a level. Where a definite plan of work can be arranged beforehand, with a prospect of its being carried out, the deciding on the best position for the shaft is a very important matter. In a colliery or working where you can by boring, etc., make out the structure of the ground, there would be no excuse for the engineer not applying his judgment and consideration to the placing of the shaft in the best possible position. But in consequence of the great uncertainty and irregularity about metalliferous repositories, it is impossible at the outset to say where the principal workings will be, and we must accustom ourselves to see one shaft after another which was intended to become the principal abandoned, or used for some subsidiary purpose. It will generally be considered best to have the principal shaft (or the sump shaft, as miners call it, because the greater portion of the water is raised from it) placed nearly in the

middle of the set, so that you may work to one side or the other. Till you get down to from 80 to 150 fathoms, according to circumstances, you can scarcely look on any one of the shafts as the principal centre of the mine about which you will centre most of your arrangements for surface operations. The best position of the shaft will be regulated by a variety of considerations; it will depend in great measure on the configuration of the surface, and the nature of the ground. Of the various shafts the sump shaft is the deepest; it is sometimes called the engine shaft, the engine being there for pumping. The shaft for winding will be termed the whim shaft, the whim being the term used for the apparatus for raising; in the shaft it may be necessary to pump as well, either by a separate engine or by horizontal rods from the sump shaft; in the latter case it is termed a flat-rod shaft. Besides these, subsidiary shafts are sunk at intervals of 20, 30, or 40 fms., these being generally termed winzes, and these may be for the purpose of subdividing the ground for the convenience of working, or for ventilation of the levels. These winzes (or sumps as they are sometimes conveniently termed) are analogous to what in colliery workings are called staples, or blind shafts, small shafts between two levels, which are very important in ventilation, and which form a means of escape for the men in case of accident, a matter of no small importance. It is true that mines have often been carried out to a considerable extent with only one shaft, but it is a question how far this should be allowed to go on; most metallic mines commence and work for some time in this condition. In the time of Buddle and Wood, working was carried over scores of acres from only one shaft, but since the Hartley accident, where from an interruption in the only shaft all the men perished, it became necessary by Act of Parliament to have two shafts as soon as the mine had advanced to a certain distance. The German mining terms for the different shafts are corresponding to our main shaft, *Haupt-schacht*; drawing shaft, or highest shaft, *Forl-r-schacht*; engine shaft, *Kunst-schacht*; air shaft, *Licht-loch-schacht*. Shafts may be in some instances perpendicular, in others inclined; in the collieries they are in almost all cases vertical, in other mines it is a matter of great doubt and great discussion as to which kind is the best.

As regards the form of section, the rectangular is most common in metalliferous mines, and is used in some collieries, as in those of Pembrokeshire and Scotland, and in many continental ones. Where brick or stone work is applied, the sides may be arched, and the arches abutted against one another, and thus you bring in a great element of safety. These curved sides are common in some parts of the Continent. Probably this modification led to the introduction of circular or elliptical shafts, the former being the most common form in Great Britain, the latter very common in South Wales. In Belgium and North France polygonal shafts are common, sometimes with 18 or 20 sides, and this is generally combined with a particular method of securing them. The deepest mine at present, where the depth is attained simply by one perpendicular shaft, is the mine at Przibram. In a colliery at Charleroi, in Belgium, a depth of over 1,000 metres has been obtained, but it is now working only at 800 metres.

If the lode inclines considerably from the perpendicular there may be reason for sinking in the lode rather than in dead ground, and to such shafts the terms inclined, oblique, or underlay shafts are given; while to distinguish the perpendicular shafts the term "right" is applied. These inclined shafts are principally in favor in Saxony, in Cornwall and in some other British mining districts. The reason seems to be that in lodes of moderate breadth, and country of moderate strength, by opening out the lode to a certain length you have a shaft the breadth of which corresponds with that of the lode, and under favorable circumstances the ore thus obtained will pay the expenses of the shaft. This is an important point; you see as you go on what the lode is like, and you can set off your levels at the most favorable points, and begin to work on a larger scale. There are other cases in which you find a tendency to sink perpendicular shafts away from the lode, driving out cross-cuts at intervals to explore it. At first sight this is not very inviting, because you have to meet very great expense and loss of time before you can get down to the lode. In the Schemnitz district, in Hungary, in the Harz Mountains, in the mines of Nevada, especially in the Comstock Lode, we shall find that these perpendicular shafts have got to be almost universally used, and these are all districts in which the lodes are of unusual size, and the ground unusually soft. In some cases the shaft is sunk by the side of the lode, and the lode is cut from time to time, as by a level driven along the side. If we begin to sink on the back of a lode it becomes awkward when the lode changes its underlay; and if this takes place suddenly there is a very great deal of inconvenience in putting in cranks at these angles, so much so that in some cases it is advisable to cut away the angle on the foot-wall side. Again, in lodes where you have a slip in particular kinds of ground, it becomes a question whether it will be best to drive the shaft in the first portion or at some distance away, so as to meet the second portion of the lode, and then you are not sure but that there is still another slip, and the lode continuing in that. So that if it be founded on a knowledge of the ground, it may be best to go away from the first part of the lode altogether to sink. In these cases such shafts will always remain behind a well sunk perpendicular one. In some cases it would be difficult to deal with the shaft otherwise than by these inclined ones; they may be held to be serviceable to a certain depth, after which they ought to be replaced by perpendicular shafts. In the western parts of England, where the mines have attained great depths, it will commonly be found that the first operations have met this difficulty fairly in the face; that having reached a certain piece of productive ground by means of an inclined shaft on the lode, they go to the expense of commencing a new arrangement, and sink a perpendicular shaft from the surface to intersect the lode at a depth of 100 to 150 fms., according to the nature of ground. At the Tresavean Mine the shaft intersects the lode at a depth of 250 fms. Every angle you have in a shaft renders it more impossible that the workings can be carried out beyond a certain depth. One of the most remarkable cases the lecturer knew of changes of direction in the shaft was the following: A rectangular shaft was carried down to the adit level at a depth of 20 fms., there it met the lode dipping towards the south, and was sunk on it till at the 14 (?) fm. level it met a lode dipping the other way; they preferred the look of the latter, and sunk on it pretty regularly down to the 112 fm. level, where it again met with a lode dipping in the opposite direction and followed it. It is a most exaggerated case, and ought never to have been allowed to exist. Where, as in Cornwall, the levels are sometimes carried to a considerable distance under the sea, an inclined shaft from the shore may be sunk to some distance, giving you an efficient means of ventilation, at the same time that it enables you conveniently to load into the wagons.

As to the size of the shafts, they vary very much. In the older districts it will be found that they are on an extremely small scale, as compared with newer shafts. Thus, in some old collieries in the neighborhood of Bath there are curious examples of shafts not more than 4, 4½, 5, or 6 feet in diameter. You may

see also in some old tin mines of Cornwall shafts only 3 or 4 feet long and 2 to 2½ feet broad. The lecturer had seen not long ago in West Germany some shafts put down for the purpose of getting phosphorite no larger than those mentioned near Bath, and lined merely with pieces of withy stick, plaited into one another, like basket work. Such shafts as these are useful only for very shallow deposits. At the present day it is usually the case that in metal mines they have dimensions of 6 by 5 feet, or 8 by 5 feet, or 8 by 6 feet; and engine shafts for pumping and for the passage of men 11, 12, or 13 feet by 6 or 8 feet. We do not in England generally have them on such a large scale as on the Continent. Some of the most notable in Hungary and the Harz are as much as 5 feet wide between the timbers and 20 feet long. The length may be decided by the presence of natural joints, etc., giving greater facilities for the cutting. In the great mines of the Comstock district the main shafts run from 20 to 24 feet long by 4 to 6 feet wide. Turning to the colliery districts we shall find that they have increased very notably of late years. Not more than 20 or 30 years ago shafts of not more than 5 to 8 feet diameter were put down; now shafts of 14 or 15 feet diameter are frequent, and in some of the larger collieries as much as 20 feet. Some of the elliptical shafts of South Wales are as much as 22 feet long by 16 feet broad. One use of these larger shafts is that you can use different divisions for particular kinds of apparatus.

Supposing you have a lode coming up on the side of a hill, which you imagine will do well at a certain moderate depth; if it dips with the hill (in the same direction as the slope), the shaft will be put down on the foot-wall side, to intersect the lode at a certain depth. But if the lode dip against the hill, then there will be a choice of three methods, either to sink in the lode itself, thus proving it all the way, or to sink in the higher ground a perpendicular shaft to intersect the lode, or one on the foot-wall side, and to drive out cross-cuts. In the second case you would have a larger shaft to sink than in the last case; the sinking is more expensive than driving. If large quantities of ore are extracted, too, the shaft sunk in the lode itself will be sure to succumb. That on the hanging-wall side would require to be very extensively supported, that on the foot-wall side would not be affected. So that there are more reasons for sinking on the foot wall side of the lode, although the lode dips away from the shaft more than at first sight would be imagined.

MINING NOTES.

THE COMSTOCK MINES

From the *Gold Hill News* of the 14th inst., we condense the following.

The Consolidated Virginia Mine is producing about 300 tons of ore per day. On the west drift from the C. & C. shaft, on the 1,600-foot level, slow progress is making. The heat in the face of the drift is intense. The air for the use of the workmen has to be carried a long distance through pipes heated by contact with the hot walls of the drift, so that by the time it reaches the face its temperature is raised to blood heat or over. In addition to this the steady inflow of hot water from the face, sides and roof of the drift in the ore vein, slacks the ore and creates a suffocating steam, to work in which, at any very rapid rate of speed, is almost an utter impossibility. This drift has now penetrated the ore eighty five feet. The ore so far is indisputably rich, choice specimens being fairly coated with stephanite and native silver and glistening with gold. The assays show the ore so far as penetrated to be very rich in gold; in fact carrying a much larger percentage of gold than it did on the levels above. The daily ore yield of the California is about 550 tons; operations in this mine are greatly impeded by the most intense heat, and a steady drainage of hot water from the roof and sides. The supply of air that can be carried through the pipes to the workmen is limited, and hot when it reaches them, and the steam and vapor arising from the decomposition of the ledge matter when exposed to the air is so dense as to completely obscure a light placed in the face of the drifts, at a distance of a very few feet. Justice is promising to develop a valuable addition to her ore resources. The great center of interest at this time is, of course, the west drift from the C. & C. shaft, which is tapping the great bonanza at the 1,650-foot level. This has penetrated it a distance of 85 feet, all the way in rich ore, some of which is of extraordinary richness and the face continues in the same. Owing to the great heat the work progresses slowly, and the opening out and development of this level will be necessarily slow until connections are made with the other drifts and openings of the mine. The flow of water in the Imperial Consolidated is easily handled by the pumps, the extra flow of water from the 1,700-foot level of the Bullion being passed on through into the Yellow Jacket shaft and taken up by the pumps of that mine. Of the Bullion the flow of water on the 1,600-foot level, although slowly decreasing, is yet considerable in quantity. The great heat and steam created by the steady flow of so large a volume of water interferes very much with the rapid prosecution of work in the mine. The pumps in the Hals & Norcross are kept steadily running, and manage to hold the water at a point 21 feet below the 1,900-foot station. The heat is so great that no work can yet be done below the station in the main incline. The Belcher Mine yields 125 tons of ore per day. The Chollar Potosi is yielding about 600 tons of milling ore per week which assays \$25 per ton. The *Sutro Tunnel* has been mortgaged to the London firm of McAlmont, Bros. & Co., for \$124,321 in gold.

POCAHONTAS SILVER MINE, ROSITA, COLORADO.—A well-informed correspondent sends us the following notes: Operations on this mine were discontinued in July, 1876, owing to fall in price of silver and distance from reduction works to await completion of Professor Mallett's works at this place. They were completed in December last, and are in operation since with a capacity of 8 tons daily. Work was resumed on Pocahontas about January 1, 1877. The main vertical shaft is now 40 feet below the 300-foot level and completely timbered in a very substantial manner to within 20 feet of the bottom. The shaft being dry and the rock stable there is no necessity for the timbering keeping pace with the sinking. The crosscut, which is 180 feet in length from this shaft to the 300-foot level, is completed. T rail track laid. This level is opened 45 feet east and 30 feet west from the crosscut intersection, a winze raised from this to the 200-foot level and 4 stopes started from the winze, making 42 stopes now open in the mine. Only 8 men have been working on the stopes, producing about five tons of ore per day, which is assorted by three men into three grades averaging \$95 per ton. Day shift only is employed. 93 tons of ore were shipped to reduction works in January. The mine is being worked thus moderately on the stopes with a view of opening and developing ground so as to supply the reduction works of the company to be erected the coming summer. The mineral vein is much larger in the lower level than in the one above, and promises to pay handsomely, while the winze shows well from top to bottom. A new ore house, well arranged for hauling large quantities of ore conveniently, is just completed. The engine and hoisting machinery will arrive on the ground during the present month, and, when in place, sinking and development will progress rapidly. All litigation in reference to the title to this valuable property has been ended by a decree of the court, and the title fully confirmed in the parties now working it.

MERRIMAC SILVER MINING COMPANY, MASSACHUSETTS.—Mining in New England has lately had a fresh impetus by the successful working of the silver mine at Newburyport. This mine was formerly the property of the Chipman Mining Company, from whom it was purchased about a year ago by the Merrimac Silver Mining Company. The mine is now opened for a working production of at least two years, there being, according to the late report of Professor Vinton, of Columbia College, some 40,000 tons of ore now in sight in the mine. The company is paying a dividend of 1 per cent. per month. The erection of the works cost \$60,000, and the opening of the

mine \$40,000 more, yet there has been enough taken from the mine in sinking the shaft to a depth of 230 feet and mining some 1,500 feet of drifts and cross cuts to pay the cost of so doing without having excavated below the thirty-six foot level. As labor is very cheap in this vicinity—miners only receiving \$1.50 per day—the success of this mine will probably open up a new and remunerative employment for the New Englanders.

THE ANNUAL REPORT OF THE NORTH BLOOMFIELD COMPANY OF CALIFORNIA, the length of whose main ditch is fifty five miles and the cost \$442,000, exemplifies the extraordinary efforts sometimes made to obtain water. Reservoirs for impounding water and a tunnel for sluicing were constructed at an expense of \$700,000, while the cost of mining claims, &c., was about \$777,000, making a total expenditure of over \$1,900,000. The quantity of water used during the year was equal to 4,000,000,000 cubic feet, and the gross yield about \$500,000 in gold. The average product of the gravel was 5 6-10 cents per cubic yard.

NOTES.

PROTECTION IN CANADA COAL.—Ottawa Feb. 13, 1877.—Mr. McKay has presented a petition in the House of Commons in favor of protection to the coal interest of the Dominion, so that the American duty on Canadian coal may be annulled.

THE DEPRESSION OF THE GERMAN INDUSTRY.—As an indication of the hard times in Germany may be noted the fact that the thirty-two large iron and steel manufacturing companies in the country met with a net loss on last year's business of \$1,795,000, exclusive of interest and the depreciation in the value of property.

THE EXPERIMENT, so successful at the Taybridge Works, of working at night by aid of the electric-light, is being applied at Messrs. Head, Wrightson and Co.'s establishment at South Stockton-on-Tees. This expedient for turning night into day promises to be a benefit to both masters and men, by extending the hours of labor in the engineering yards.

PETROLEUM CERTIFICATES.—A recent case in the Supreme Court of Pennsylvania establishes the value of petroleum certificates as a security. The oil is generally transmitted from the wells by pipe lines to the railway routes that carry it to market, and the certificate of the "pipe line" is the authority on which the oil is bought and sold. The Supreme Court has decided that the oil deposited in pipe-line tanks is on bailment, and does not become the "property of the bailee"; that is, of the pipe line owners. These oil certificates, therefore, seem to have the same commercial position as warehouse receipts for goods. The system of buying and selling petroleum by certificate is a great convenience to the trade, and this decision relieves the petroleum represented by the certificate from any liability whilst in the possession of the pipe line owners for their debts.

PETROLEUM EXPORTS FOR 1876.—STOCKS IN EUROPE.—PRODUCTION AND CONSUMPTION.—The total exports of crude and refined petroleum (reduced to crude equivalent) from the United States in the year 1876 was as follows, the barrel being 42 gals.:

From New York	4,021,273 bbls.	From Boston	102,406 bbls.
" Philadelphia	1,929,270 "		
" Baltimore	1,296,722 "	Total exports for the year 7,497,856 "	
" Richmond	148,185 "		

The stock in Europe, located at the following points, we find to be on the first day of January, 1877—

London	37,186	Liverpool	20,600
Outports	10,000	Antwerp	34,160
Bremen	42,281	Hamburg	9,825
Rotterdam	3,124	Amsterdam	449
Stettin	20,775		

Total European stock, Jan. 1st, '77. 184,400
Against total stock for Jan. 1st, '76. 451,574
Decrease of stock for 1876. 264,174

The amount of crude produced in the United States for the year under consideration is as follows:

Penna. Oil Field proper	8,968,906 bbls.	California	32,000 bbls.
West Virginia	120,000 "		
Smith's Ferry and Ohio	55,000 "	Total production	9,175,906 "

We make the total consumption for the world to be equal to the production and depreciation of stocks at home and abroad, which is as follows:

Production	9,175,906 bbls.
Decrease in European stock	264,174 "
Decrease in producing region	999,108 "
Total consumption	10,439,188 "
Foreign consumption for '76	7,762,030 "
Home consumption, '76	2,677,158 "
Foreign daily consumption	21,269 "
Home " " "	7,334 "
Total daily consumption	28,603 "
Total daily production	25,413 "
Daily consumption over production	3,190 "

—Stowell's Reporter.

PETROLEUM PRODUCTION.—The number of drilling wells at the close of the month was 453, being 36 less than in December. The great activity displayed throughout the year 1876 in this department bids fair to be kept up without abatement for the present year, judging from the preparation now being made in all parts of the producing region. The number of rigs already commenced and in various stages of completion is 280; being 9 more than last month, and greatly exceeding the number building for the corresponding month in any previous year. The number of wells completed in January was 281, against 272 in December. While the new wells for January average 3-10 of a barrel per well over those for December, the total number producing in January fall short about 3-10 of a barrel, indicating that it will require at least 3,000 new wells this year to keep up the production to its present limit.

The production for the month is 796,390 barrels, being an increase over December of 9,300 barrels, or 300 barrels daily; all of which increase is from the Bullion Run or Scrubgrass district. It would be an act of presumption for us to say just what the maximum production at that point will be, or the length and breadth of the oil deposit of that district. But after careful observation of the developments already made there, we are confident that it belongs to the Oil Creek horizon; as the color and gravity of the oil, the uncertainty of finding the oil in any given direction, the numerous dry holes found, and the appearance of the oil being deposited in pockets favors the idea of belonging to the Creek division (which has shown so many deposits rich in production, but very limited in extent) rather than to the Butler division, with a breadth and length to its productiveness unprecedented in extent. The stock in the producing region increased 52,929 barrels during the month, there being little or no export demand except to fill orders previously given. The total stock at the close of January 1876 was 3,515,271 barrels; at the close of January 1877 was 2,604,128 barrels, showing a decrease of 911,143 barrels. We would call especial attention to our review in this number of the exports, stocks in Europe, production and consumption for 1876, showing the consumption to be in excess of production, 3,190 barrels daily. Should the consumption for this year equal or exceed that of last year it will require a daily production of nearly 29,000 barrels in order to meet the demand. The probabilities are against the present production being materially increased this year, therefore we look for a further depletion of stock in the region.—Stowell's Petroleum Reporter.

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 Feb. 17.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.*	Week.	Year.*
Wyoming Region.				
D. and H. Canal Co.....	40,307	244,620	—	240,856
D. L. and W. RR. Co.....	38,179	247,169	—	192,337
Penn. Coal Co.....	14,051	103,832	27,835	149,835
L. V. RR. Co.....	27,352	128,374	—	114,447
P. and N. Y. RR. Co.....	1,101	5,602	—	3,952
C. RR. of N. J.....	17,484	117,758	7,166	114,449
	138,474	847,245	35,001	815,886
Lehigh Region.				
L. V. RR. Co.....	47,179	279,053	11,405	263,651
C. RR. of N. J.....	18,974	104,939	1,390	138,833
D. H. and W. B. RR.....	571	2,514	1,979	5,478
	65,724	386,526	14,774	347,962
Schuylkill Region.				
P. and R. E. RR. Co.....	67,971	462,307	6,034	254,222
Shamokin & Lykens Val.....	4,971	48,441	579	24,395
	72,942	510,748	6,613	278,587
Sullivan Region.				
Sul. and Erie RR. Co.....	182	1,761	1,209	8,029
Total.....	278,322	1,746,280	57,687	1,450,464
Increase.....	220,635	295,816	—	—
Decrease.....	—	—	—	—

* Year beginning January 1st. 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.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 17,773 tons, as compared with the corresponding period in 1876.

Belvidere Delaware RR. report.

	Week.	Year	Year
	1877.	1876.	1876.
Receipts of coal at Coal Port (Trenton).....	—	—	7,422
" " South Amboy.....	15,589	50,146	80,767
Shipments at Coal Port (Trenton).....	—	—	—
" " South Amboy.....	8,128	55,280	40,000

Receipts of Coal at Boston, for the week ending Feb. 16, and years from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
From				
Alexandria and Georgetown	—	—	—	2,150
Pallidaphia.....	5,802	22,147	3,575	18,270
Baltimore.....	1,600	5,080	1,480	13,288
Other places.....	7,537	26,618	2,156	20,625
Great Britain.....	97	707	1,181	1,806
Nova Scotia.....	—	—	—	199
Total.....	15,036	54,552	7,987	56,338

Perth Amboy business:

	Tons.
Received for the week.....	24,747
Shipped for the week.....	13,875
On hand Feb. 17.....	149,495

The Production of Bituminous Coal for the week ending Feb. 17 was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Year.	Tons.
Cumberland Region, Md.			
Tons of 2,240 lb.....	22,900	—	95,152
Barclay Region, Pa.			
Barclay RR., tons of 2,240 lb.....	6,533	—	53,535
Broad Top Region, Pa.			
Huntingdon and Broad Top RR.....	2,497	—	16,179
*East Broad Top.....	1,326	—	4,220
Clearfield Region, Pa.			
*Snow Shoe.....	1,466	—	4,810
*Tyrona and Clearfield.....	23,543	—	80,029
Allegheny Region, Pa.			
*Pennsylvania RR.....	4,327	—	13,825
Pittsburgh Region, Pa.			
*West Penn. RR.....	4,376	—	16,419
*Southwest Penn. RR.....	1,808	—	6,268
*Penn. & Westmoreland gas coal, Pa. RR.....	20,971	—	76,978
*Pennsylvania RR.....	9,387	—	32,603

*For the week ending Jan. 28.

The Production of Coke for the week ending Jan. 28.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR.....	1,219	6,610
Southwest Penn. RR.....	13,817	47,931
Penn. & Westmoreland Region, Penn. RR.....	1,525	6,025
Pittsburgh, Penn. RR.....	4,551	15,934
Total.....	21,112	75,500

COAL TRADE REVIEW.

NEW YORK, FRIDAY EVENING, Feb. 23, 1877.

Anthracite.

There is no improvement observable in the demand for coal. The mild weather continues as a cause of depression in domestic sizes, while manufacturers and others are still very undecided as to what will be the future value of kinds they will require, and are still withholding their orders.

The discussion of the probabilities of a future combination has received but little attention during the week, although the report of the Delaware & Hudson Canal Company which was made public on the 20th inst. contains the following paragraph endorsing the plan of limitation of production:

"At the present time it is safe to say that the aggregate productive capacity of the anthracite region is not less than 30,000,000 tons, and until the natural increase of consumption calls for such full production, the prac-

tical relief to the trade would seem to be an arrangement proportionating the supply to the demand."

It is well known that this company has shown for some time considerable anxiety to bring this about upon a basis that would insure a faithful observance of the agreement. It is evident that such companies as the Reading and New Jersey Central can only expect to be placed upon a paying basis by the establishment of a large consumptive demand for coal, and this can only be brought about by low prices uninfluenced by abnormal causes. While the Delaware & Hudson Canal Company "can hardly conceive a condition of things that would reduce its net earnings below its fixed annual charges," it is equally difficult to conceive prices that could probably be obtained under a restricted production that would enable the Reading, for instance, with fixed annual charges of over \$5,000,000, to meet its obligations on a production of about 2,000,000 tons and a total coal transportation business to the road of about 6,000,000 tons. For the New Jersey Central there can be no chance of salvation, except upon the establishment of a trade over its lines fully equal to the present capacity of its mines, and this policy will probably have to be adopted by it even though it may take two or three years to attain that point.

There will be two auction sales on the 8th inst.—one by the Pennsylvania Coal Company at 11 o'clock, at which time the quantity to be sold will be announced, and another by the Delaware, Lackawanna & Western R. R. Co. at noon. This company will sell 100,000 tons. For further particulars see advertisements in another column.

The production of anthracite coal for the week ending on the 17th inst. was 278,322 tons as against 273,183 tons last week, and 57,687 tons for the corresponding week of 1876. The total production since January 1 has been 1,746,280 tons, as against 1,450,464 tons for the like period of last year, showing an increase this year of 295,816 tons.

The loss and gain in trade, as compared with 1876, has been as follows: Loss—Pennsylvania Coal Company, 30 per cent., and New Jersey Central Railroad Company, Company, 12 per cent. Gain—Delaware & Hudson Canal Company, 1 1/2 per cent.; Delaware, Lackawanna and Western Railroad Company, 29 per cent.; Lehigh Valley Railroad Company, 28 per cent.; and the Philadelphia and Reading Railroad Company, 88 per cent. Of the total increase this year of 295,816 tons, the Wyoming region has furnished 10,38 per cent.; the Lehigh, 12,76 per cent.; and the Schuylkill, 76,86 per cent.

Bituminous.

There is no important business in bituminous coals to report. The production of Cumberland coal has fallen off since January 1, as compared with the corresponding period of 1876, 17,772 tons, while the Clearfield region, for the first four weeks of the year, as compared with the corresponding weeks of 1876, shows an increase of 19,085 tons, or 26 per cent.

The reduction of wages in the Cumberland Region brought about a strike. The Alleghenian of the 21st inst.

says: "The several mining committees met in council yesterday, representing thirteen mines. Their meeting was secret, and no information could be had except what leaked out in general conversation. We are informed that the George's Creek Coal and Iron Company's miners were the only ones willing to accept the reduction to 50 cents, while two or three favored increasing the price to 65 cents. The result of the conference of the committee was, by a vote of 9 to 4, to demand 55 cents, and not go to work for less. Various other matters were discussed, the particulars of which have not transpired. Various opinions are given as to the ability of the miners to hold out—some asserting that they will go to work soon, while others maintain that it will be a long strike."

As intimated by us would be the case, Mr. Charles F. Meyer, of Baltimore, has succeeded Mr. Allan Campbell, of this city, as President of the Consolidated Coal Company. At the same time there was elected a board of directors composed of two gentlemen from this city, one from Troy, and seven from Baltimore. A change of policy by this company is already observable.

The annual report of the company for 1876 shows:

Receipts from all sources.....	\$1,924,255 69
Total expenses.....	1,416,155 23
	508,099 46
From which was paid interest on funded debt.....	\$182,254 03
Sinking fund.....	85,270 40—267,524 43
Applicable to dividend.....	240,575 03
Add surplus earnings of 1875.....	252,130 77
	492,705 80
Paid dividend March 15, 1876.....	256,250 00
" " Jan. 1, 1877.....	256,250 00—512,500 00
Deficit.....	\$19,794 20

The company has not published its balance-sheet since December 31, 1873, so that it is impossible to examine its standing, although there are numerous questions that will undoubtedly suggest themselves to the stockholders.

The report further says:

"The most important question in relation to the subject of mining is that of miners' wages, in which no reduction had taken place up to the close of the year 1876. While the rate of mining has been much reduced in the anthracite and bituminous coal districts of Pennsylvania and Virginia, and while the price of coal has fallen in the market, the previous rate for mining has been continued in the Cumberland region. At the opening of the last season the President of the Company took steps looking towards a reduction of wages, and the supposition and understanding that a policy so essential to the interests of all the mining companies would meet with general concurrence, actually stopped the work at our mines with the view of effecting some reduction. But, as the large number of the other companies continued to pay the former prices, the effort was fruitless, and work was resumed at the old rates after a short cessation."

The above paragraph is so adroitly constructed as to mislead those not familiar with the actual facts in the case. That the company "actually stopped work" and announced a reduction in wages, and that it "resumed at the old rates after a [very] short cessation" are facts. That Mr. Campbell realized the great necessity of a reduction in wages was certainly not indicated by his action, and was not even suspected by the representatives of most of the other companies. Had he used but one-half of the energy in bringing about the much needed reduction in wages that he did in opposing the law and ruining the Cumberland trade by making exorbitant freight charges, the movement would have been a decided success, and the net receipts of his company for 1876 would not have shown a falling off of over 50 per cent. as compared with 1875.

Reference is made to the suits of the State of Maryland and the American Coal Company against the Consolidation Coal Company, the decisions in which are now pending in the Court of Appeals. It is indicated that in the event of their being decided adverse to the latter company, the cases "may be taken to the Supreme Court of the United States."

We are also in receipt of the annual report of the Maryland Coal Company. It shows a very much reduced business for 1876, as compared with 1875, and a net profit of \$3,596.90 for the year. The balance sheet of the company shows that the cash assets would meet all its obligations and leave a balance of over \$20,000.

The remarks of the president of this company to the stockholders can be read with much advantage by not only the managers and stockholders of the other companies in the Cumberland region, but by all interested in the coal trade. In support of our views relative to the action of the Consolidation Coal Company, he says: "The example and attitude of the combined railroad and coal operator have been sufficient to defeat thus far all efforts made by the other operators of the region to secure such just regulation of labor and local transportation charges as were necessary for the protection of the trade." A thorough review of the advantages and necessities of building the George's Creek and Cumberland Railroad is made. We are now informed that a contract has been entered into with the Chesapeake and Ohio Canal Company and ratified by its stockholders, guaranteeing for a number of years a liberal rate of toll from Cumberland to tide-water on coal to be shipped over this road. The projectors of the road having now secured a certain and unrestricted outlet for their coal after its arrival at Cumberland, will immediately solicit the capital necessary to construct the road, and they express no doubt as to their success and as to the early completion of this new outlet, which will place the whole Cumberland region in a position that must bring great prosperity to it.

Retail Prices in New York.

	Anthracite.		
	Per 2000 lb.	Grate and Egg.	Stove. Chestnut.
Pittston coal, in yard.....	\$3 90	\$4 20	\$3 90
Lackawanna coal, in yard.....	3 50	4 00	3 90
Wilkes-Barre, delivered.....	5 00	5 30	4 60
Lehigh & 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 4c 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 00
American Orrel.....	"	"	11@14
Red Bank Cannel.....	"	"	10 10
Cumberland.....	"	"	10 00

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

Table with columns for Lump, Steamer, Grate, Egg, Stove, Chestnut. Lists prices for Wyoming Coals (Lackawanna, Wilkesbarre, etc.) and Lehigh Coals (Sugar Loaf, etc.).

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

Wholesale Prices of Bituminous Coal. Domestic Gas Coals.

Table listing prices for Westmoreland and Penn. at Greenwich, Philadelphia, Red Bank Canal Pa., etc.

At the mines, per 2,000 lb., 90c. f.o.b. at Greenwich, Phila., for Eastern and foreign shipments, per 2,240 lb., \$1.25 @ 35 for Sound ports, 3 50 @ 65, f.o.b., at South Amboy, N. J., per 2,240 lb., \$1.10 @ 75. Discharged, in New York, per 2,240 lb., \$1.00 @ 5 15.

Foreign Gas Coals.

Table listing prices for Newcastle, at Newcastle-on-Tyne, Liverpool House Orrel, at Liverpool, Luce Hall Canal, etc.

Baltimore, Md. Feb. 21, 1877. Specially Reported by Messrs. E. STABLER & Co.

Table listing prices for Anthracite, Wilkes-Barre "Boston" Vein, and Plymouth White Ash. Includes prices for Lump, Steamboat, Broken, Egg, etc.

Boston, Mass. Feb. 17, 1877.

Coal continues stagnant, with not a single element working in the direction of a firm, or even steady market. The appointment of receivers of the Central Railroad of New Jersey and of the Lehigh and Wilkesbarre Coal Company is expected to presage a similar fate for the Lehigh Navigation, the Reading, and possibly some of the New York companies.

We quote Boston wholesale price as follows: Anthracite, broken, 4 50 @ 5 00. Cannel, English, 14 00 @ 15 00. Do egg, 4 50 @ 8 00. Do, Buckeye, 10 00. Do stove, 5 25 @ 5 75. Lingan, 4 75 @ 5 00. Cumberland, 5 50. Pictou, 5 50. Clearfield, 5 50. Penn., 5 50. Westmoreland, 5 15. Youghiogheny, 5 25 @ 6 25. Caledonia, 4 50 @ 4 75.

Buffalo, N. Y. Feb. 23, 1877. Specially reported by Messrs. PALEN & BURNS, 246 Washington street.

No change in prices, market inactive, sales light. To Dealers: On Car or Boat. In Yard, screened. Delivered at retail. Grate, \$4 55. Egg, 4 05. Stove, 5 15. Chestnut, 5 15.

Commercial Bulletin. Brier Hill, lump, \$4 10. Brookfield, 4 15. Screened nut, Brookfield, 3 00. Nut and slack, 2 75. Reynoldsville, lump, 3 50. Buck Eye (Ohio), lump, 3 50. Cannel, 5 25. Connellsville Coke, 5 10.

Chicago, Ill. Feb. 20, 1877. Specially reported by Messrs. RENO & LITTLE.

Lackawanna Stove, \$8 00. Chestnut, 8 00. Grate & Egg, 7 50. Erie and Brier Hill, \$6 00. Wilmington & Ill., 3 50 @ 4 25. Blossburg, 7 00.

Cincinnati, O. Feb. 20, 1877. Specially Reported by Messrs. A. BUCHANAN & Co.

The following are coal quotations to-day: Per ton of 2000 lb. Youghiogheny, or Pittsburgh, adfloat, @ 100c. Pomeroy coal, @ 81c. Kanawha, 8c. Ohio River Coal, -c. Cannel coal, according to quality, @ 16c. The following are the retail prices delivered: Youghiogheny, \$3 50. Pomeroy, 3 50. Cannel, 16 @ 22c. Kanawha, 11c. Anthracite, per ton, @ 90c. Coke, hard and soft, delivered, 10c.

Cleveland, O. Feb. 20, 1877. Specially reported by Messrs. LAMBE & BATES.

The following are the prices established by the Coal Exchange until further notice: Per ton of 2000 lb. f. o. b. vessels. WHOLESALE. 1 to 10 tons upw'd. Brier Hill lump, \$4 25. Massillon and Mineral Ridge lump, 4 05. Straitsville Lower Vein, Hocking & Shawnee, 1 1/2, 3 75. Del Carbo lump, nut, 3 40. Rich Hill lump, nut, 3 50. Columbiana, lump, nut, 3 25. Lackawanna, Wilkesbarre and Pittston egg and grate, 7 00. Lehigh to be \$1 25 per ton higher. All sales to be strictly cash with order or C. O. D.

Louisville, Ky. Feb. 20, 1877. Specially reported by Messrs. BYRNE & SPEED.

per bushel. Pittsburg, 6 1/2c. Raymond City, 6 1/2c. Pine Hill, 6 1/2c. Kentucky, 9c. Screened Pittsburg per load, \$3 50. Screened Raymond City, 2 50. Pine Hill (Kentucky), 2 25. Cannel, 4 50. City-made Coke, 4 00.

Milwaukee, Wis. Feb. 20, 1877. Specially reported by Messrs. E. P. ELMORE & Co.

Retail price per ton of 2000 lb. Lehigh Lump, \$8 00. Lehigh Prepared, 9 00. Lackawanna (all sizes), 8 00. Pittston, 8 00. Scranton, 8 00. Brier Hill, select, \$7 00. Blossburg, 7 00. Cannel, 6 00. Pittsburgh, 6 50. Oak Hill, 6 00. Steam coal, 4 @ 5 00.

New Orleans, La. Feb. 19, 1876. Specially Reported by Messrs. C. A. MILTENBERGER & Co.

Pittsburg coal, wholesale, by boat-load, per bbl., 50c. Steamboats, per bbl., 75c. to manufacturers, per bbl., 75c. to families, per bbl., 81c. shipments, per hhd., \$8 00. Anthracite, wholesale, per ton, 7 @ 8 00. retail, 11 00. Virginia Cannel, retail, per bbl., 1 25. Scotch, 1 00. Mt. Carbon, wholesale, per bbl., -c. retail, -c. St. Bernard, wholesale, per bbl., -c. steamboat, 50c. retail, 70c.

Pittston, Pa. Feb. 20, 1877. Pennsylvania Coal Company's Coal in yard, ton of 2000 lb. Retail.

Lump, Egg and Stove, \$2 25. Chestnut, 2 00. Pea, 1 00. Delivered, fifty cents per ton additional.

San Francisco, Cal. From the Commercial Herald, Feb. 15, 1877. COAL—Imports from Jan. 1st to Feb. 1:

Table with columns for Tons, Mt. Diablo, Vancouver Island, Rocky Mountain, Seattle, English.

The market continues to be well supplied with California Mount Diablo from the Black Diamond mines. Bellingham Bay, Coos Bay, Seattle, Nanaimo, Wellington, etc. But little Australian is now arriving, while the receipts of Scotch and English steam are much less than for some time past. There is an improved demand for English steam cargoes to arrive, prices having risen from \$7.50 to \$8.50; Scotch, \$8.50; West Hartley, \$9; Wallsend, \$9; Australian steam, \$8.75 @ \$9. The shipments of Australian now en route to this port are very light, and the same may be said of all other foreign supplies as compared with last year's shipments, hence it is that consumers are more willing to enter into new engagements for forward supplies than for some time past.

Toledo, Ohio. Feb. 20, 1877. Specially reported by Messrs. GOSLINE & BARBOUR.

We quote as follows for retail delivery: Ton of 2,000 lb. Lackawanna lump, \$6 75. Lehigh lump, \$7 75. egg, 6 75. stove, 7 00. chestnut, 6 75. Soft Coal. Hocking lump, 4 00. Brier Hill, 5 75. nut, 4 00. Blossburg, 8 00. Willow Bank lump, 4 50. Cumberland, 8 00. nut, 4 00.

Rates of Transportation on Anthracite Coal to Tide Ports. PHILADELPHIA AND READING RAILROAD CO. General Office, 227 South Fourth Street. PHILADELPHIA, Dec. 18, 1876.

From and after this date, and until further notice, shipments of anthracite coal can be made through by rail to South Amboy, via Richmond Junction, at the following rates, per ton of 2,240 pounds, in company's car: From Schuylkill Haven, \$1 52. Tamaqua, 1 67. Pine Grove, 1 72. Port Richmond, 65. An additional charge of twenty-five cents per ton will be made on chestnut and pea coal, unless the shipper signs the usual release. The release now in force will apply to this trade. (By order of the Board of Managers), DAVID BROWN, Secretary.

Lehigh and Wyoming Coals. per ton of 2240 lb.

Table with columns for From Penn Haven, From Mauch Chunk, From Hazleton, From Upper Lehigh, From Ashley, and From Sugar Notch. Lists rates for various destinations like Newark, Mauch Chunk, Philadelphia, etc.

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

Table listing rates for various locations including East Waverly, N. Y., Ithaca, and Sayre, with prices ranging from \$1.75 to \$2.78.

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 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 Coxton to destination.

Freights

Representing the latest actual charters up to Feb. 23, 1877. Per Ton of 2,240 lb.

Table showing freight rates from Philadelphia, Baltimore, Georgetown, and other locations to various ports like Augusta, Albany, Alexandria, etc.

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

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Feb. 23, 1877.

American Pig.—We note sales of about 3,000 tons of the Thomas Iron Co.'s Nos. 1 and 2 X at quotations with this exception we learn of no business worthy of note. The weakness in the prices of certain brands of iron which we noted in our last, continues. We quote No. 1 foundry at \$20; No. 2 foundry \$19, and forge \$18.

Scotch Pig.—This article is very quiet. We note sales of 200 tons of Glengarnock and 100 tons of Coltness on private terms. We quote Coltness \$28; Glengarnock \$26.50; Eglinton \$25@25.50.

Rails.—During the last ten days there have been transactions aggregating over 40,000 tons of steel rails, mostly by eastern mills. We also note a sale of 800 tons of 35 lb. rails to go to Cuba. Iron rails are very quiet,

and but little inquired after. Since the large business in steel rails, noted above, makers are more firm in their quotations. We quote steel rails, at mills, at \$50, and iron at \$33@37.

Old Rails.—There is nothing doing in these. We quote nominally at \$19.50@20.

Scrap.—We note a sale of 200 tons of old car-wheels on private terms, and 150 tons of wrought scrap at \$27. We quote wrought scrap at \$26@27. The high price of wrought scrap as compared with pig iron is making it very quiet.

Baltimore, Md. Feb. 21, 1877.

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

We have no change to make in our quotations. Charcoal irons are firm, with decreasing stocks and fair sales. We quote:

Table listing prices for Baltimore Charcoal, Virginia Charcoal, Anthracite No. 1, etc.

Boston, Mass. Feb. 17, 1877.

Pig holds steady at \$20 for No. 1 at shipping ports. The demand is hardly so good as a week or fortnight ago. We quote \$24@24.50 for No. 1, \$23.50 for No. 2, and \$22.50@23.50 for grey forge. Scotch pig is quiet and unchanged, with a downward tendency, based on the decline abroad.

Bar is a little steadier than of late, quoting \$47@48 for refined and 38@39 for common.—Commercial Bulletin.

Chattanooga, Tenn. Feb. 19, 1877.

Specially reported by J. F. JAMES pig iron broker, etc., 233 Market Street.

No change to note in the condition of our market since last report. Demand limited to supply only immediate wants and equal to present production South. No change in prices.

Table listing prices for Tenn. Ala. and Ga. Charcoal, No. 1 foundry, etc.

Charcoal or Coke, White and Mottled \$15@17. Tennessee, Alabama and Georgia cold-blast car wheel. 22@28. Old Rails. 18@19. Old car wheels. 16@17. Wrought Scrap, No. 1. 17@19. Cast Scrap. 12@14. Muck Bar. 32@33.

Iron Ores.

Red Hematite (about 55 per cent. metallic iron), f.o.c. et mines. 1 25. Brown Hematite (about 25 per cent. metallic iron). 1 75.

Cincinnati, Ohio, Feb. 20, 1877.

Specially reported by Messrs. TRABER & AUBREY, commission merchants for the sale of pig iron, blooms, ore, etc.

The slight advance reported last week in C. C. foundry irons has been sustained with a moderately active demand for all grades. We quote:

Table listing prices for Hanging Rock, No. 1 Foundry, No. 2, Mill, Tennessee, No. 1, Foundry, etc.

STONE COAL.

Table listing prices for Ohio, No. 1, Foundry, No. 2, Soft Silver Grey, etc.

CAR-WHEEL.

Table listing prices for Hanging Rock, C. B., Tennessee, Missouri, Alabama.

BLOOMS.

Table listing prices for Charcoal, SOAP IRON.

Louisville, Ky. Feb. 20, 1877.

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

The market continues firm, and some grades of hot blast iron may be quoted at an advance. There are some outside lots that might be bought at old figures, but these are not important, and even a moderate demand will probably take these out of the market within a few days. The usual time, four months, allowed on quotations below.

HOT BLAST—CHARCOAL.

Table listing prices for No. 1 Foundry, from Hanging Rock Ores, No. 2, Mill, from, etc.

HOT BLAST—STONE COAL AND COKE.

Table listing prices for No. 1 Foundry, from Hanging Rock Ores, No. 2, Mill, from, etc.

Table listing prices for GOLD BLAST—CHARCOAL, Car Wheel from Hanging Rock Ores, Tennessee, Alabama and Georgia Ores, Kentucky Ores.

Pittsburg, Pa. Feb. 20, 1877.

Specially reported by A. H. CHILDS.

This market has developed no new features during the past week. The volume of trade is not very large, but prices are well sustained and the best brands are held firmly at full rates. Quotations unchanged.

Table listing prices for No. 1 Foundry, No. 2, Gray Forge, White and Mottled, Warm blast Charcoal, Cold blast Charcoal Western.

Philadelphia, Pa.

(Weekly report of the Philadelphia Iron Market, furnished by Messrs. JUSTICE, COX, JR., & Co., Iron Merchants, 333 Walnut Street, Philadelphia. Week ending Feb. 22, 1877.)

Pig Iron.—The market is decidedly weak, and some sales, at very low prices, are reported to clear up odd lots, whilst standard brands, sold on regular terms, are held firm at quotations. We report sales of about 5,000 tons, all brands and grades, some at exceeding low prices, and some at fully quoted prices. We quote No. 1 \$20 to \$21; No. 2, \$18.50 to \$19.50; Gray Forge, \$17.50 to \$20 as to brand.

MANUFACTURED IRON.—The demand for bars has been good this week, with a firmer feeling. Some orders have been refused this week that would have been accepted with alacrity two weeks ago. The orders for plate and tank iron continue good, while skelp orders are not coming as freely as the mill would like. But, upon the whole, this branch of the iron business has a good outlook, and is much more encouraging than pig iron. We quote bars 2 1/2 to 2 10 c. per lb.; Tank and Plate 2 1/2 to 7 c. per lb.; Skelp 2 1/2 to 2 1/2 c. per pound.

NEW RAILS.—We do not hear of any transactions in steel rails, and quote as at our last. There has been some inquiry and one or two small sales of light section of iron rails. We quote steel \$49 to \$50; Iron \$36 to \$40.

OLD RAILS.—There is some demand, but at low prices. We report sales 500 tons at \$21.

SCRAP.—is in light demand at quoted prices. We quote wrought \$22 to \$26; cast \$14 to \$19.

OLD CAR WHEELS.—Are quoted \$19.50 to \$20.50.

St. Louis, Mo. Feb. 20, 1877.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

Since last report our market has much improved, the demand is increasing and prices are stiffening up. Several good sales are noted during the past week, and prospects for the future are brightening. We quote same as last.

CHARCOAL.

Table listing prices for Missouri No. 1 Foundry, Gray Mill, H. Rock No. 1 Foundry, etc.

STONE COAL.

Missouri No. 1 Foundry. 25@24. Gray Mill. 23@23. White & M'd. 21@22.

COLD BLAST CHARCOAL FOR CAR WHEELS.

All Numbers. Hanging Rock. 35@46. Tennessee. 30@33. Kentucky. 30@33. Missouri. 28@30. Georgia. 29@30. Alabama. 28@30.

Assorted Bar Iron \$2 25, rates. No. 1 Wrought Scrap 95c. cwt. Heavy cast " 70 " Light " 40 "

Forge. 23 50. Chat., Tenn. No. 1 Foundry. 25 00.

" " " 25 50. " " " 22 50. " " " 21 00.

Montreal, Canada. Feb. 13, 1877.

The stock of pig iron in store is now very small and entirely in the hands of one or two merchants, and has been selling in small lots at the following quotations: Eglinton \$20@20.50; Summerlee \$21@22.00. Bar iron is moving quietly at \$1.97 1/2 @ 2.05. Tin plates have been very slow sale, and Canada plates are entirely neglected.—Monetary Times.

METALS.

NEW YORK, FRIDAY EVENING, Feb. 23 1877.

The metal market is not so active as it has been for two or three weeks past, and there are no positive indications of a better time to follow at an early day.

Gold Coin.—During the week under review the price of gold has ranged from 104 3/4 to 105 1/2 and closed at 105.

Bullion.—Silver continues nominal both abroad and here, with light transactions and without any new feature. It will probably decline, unless the shipments to the East Indies should increase. The quotations in this city range from 121 to 121 1/2 per oz.; in London, 56d.; and in San Francisco, 4 1/2 per cent. discount. Fine gold bars are quoted at 1/2 per cent. premium.

Copper.—The sales during the week have been very small, ranging from 19 1/4 c. @ 19 1/4 c. Manufacturers do not speak encouragingly of their business, and are only buying for immediate necessities. The announcement that the Wallaroo sale, in London, on the 21st inst., averaged but £77 6/8d., or a decline of nearly £6 as compared with the previous sale, has had a very depressing effect, making it impossible to sell our copper abroad at prices that would be profitable to most of the mining companies. The latest London quotations are dated

the 17th inst., and are: Chili Bars, £71 10/ and Best Selected, £79.

Tin.—There is no business of importance doing in pig tin. Straits in London is quoted at £72 10/. We quote here, in gold, per lb., as follows: Straits, 16 1/2c. @17c.; L. & F., 16 1/2c.; Refined, 16 1/2c.; and Banca, 19 1/2c. on spot, and 19c. to arrive.

Tin Plates.—A better business is reported from the West. Prices, however, are nominally unchanged. We quote, in gold, per box, as follows - Charcoal tins, \$6.75 @ \$7, and ternes, \$6 @ \$6.25; coke tins, \$6, and ternes, \$5.50 @ \$5.75.

Messrs. ROBT CROOKS & Co., of Liverpool, under date of February 8, say of tin plates: "Dullness still continues, and the hopes entertained by holders of an early reaction so far abandoned that many of them will now accept present prices for delivery in March-April. This is especially the case in charcoal tins, cokes being more firmly held. Terns, owing to the small difference in cost, are not procurable on as favorable comparative terms as tins."

Lead.—A sale of 200 tons at 6.40c. is reported. 6.50c. is now asked, although a less figure would probably be accepted.

Spelter and Zinc.—Domestic spelter is quiet at 6 1/2c. @ 6 3/4c. currency, according to brand. Sheet zinc is attracting no great amount of attention, and is quoted at 7 1/2c. currency.

Antimony continues to be quoted at 12 1/2c. @ 13c., gold.

Quicksilver.—The London market is quoted at £7 10/; San Francisco, 42 1/2c. @ 45c.; and this market only nominal.

The San Francisco Commercial Herald, of February 15, says of quicksilver: "The supply is free, and the market rather sluggish at 45c. with occasional sales a shade off. The Belgic for Hongkong, will carry several thousand flasks. The Newbern for Mexico has 150 flasks."

FINANCIAL.

New York Stocks.

NEW YORK, FRIDAY EVENING, Feb. 23, 1877.

The coal stocks continue to attract great attention and so persistently do the bears work that the Delaware & Hudson found it expedient to issue a special report explanatory of its financial condition. An application was made to place this company in the hands of a receiver, but this movement was at once defeated. No doubt, the position of all the companies is far from satisfactory, and since there is no prospect of any very great betterment in the coal trade for some time to come, it is difficult to understand the ground for the brave words of some of the managers. The mere assertion that everything is or will shortly be "lovely" goes for naught in these times, and the publication of a report that carefully conceals the items acts only as a bait to indiscriminate criticism, and invariably injures instead of benefitting those making it. If we mistake not, this will prove to be the result, especially in the case of the Delaware, Lackawanna & Western Railroad Company.

This stock has already declined nearly 6 per cent. since its annual report was made. The quotations during the week having reached 67 the highest point on Wednesday, and 60 1/2 as the lowest point which was reached to-day.

Delaware & Hudson stock has also declined to 46 from 57 1/2, the highest point attained during the week.

New Jersey Central has varied from 12 1/4 to 10 1/2, but its movement is now of little account since it has touched the bottom.

Pennsylvania Coal Company is also feeling the crush and has shrunk to 200, where a year ago it stood over 260.

Consolidation Coal Company.—At the annual meeting of this company, on the 20th inst., the following directors were elected to serve for the ensuing year: Mr. Charles F. Mayer, president, and Messrs. Robert Garrett, G. Cheston, W. F. Burges, Wm. Whitwright, Geo. B. Warren, Jr., D. W. Bishop, John Gregg, Wm. F. Frick, Wm. Donnell and Decatur H. Miller. 71,689 shares voted for this ticket. The offices are to be removed to Baltimore.

Pennsylvania Coal Company.—120 shares of this stock are sold at auction during the week at from \$200 1/4 to 200 1/2 per share.

Midas Petroleum and Improvement Company.—This company will hold its annual meeting on the 14th of March.

Glenwood Coal Company.—The annual meeting of this company will be held at Scranton, Pa. on the 7th day of March.

Miscellaneous Sales and Quotations.

Sales and quotations of the stocks and bonds dealt in here and at Philadelphia during the past week, are given in the following tables. The Philadelphia quotations will have a * affixed.

Table with columns: STOCKS, Quotations (Highest, Lowest), Sales. Includes entries for Cambria Iron Co., Pennsylvania Salt Manufact. Co., Westmoreland Coal Co., Buck Mountain Coal Co., Shafton Coal Co., Spring Mountain Coal Co., and St. Louis, I. M. & S.

Table with columns: BONDS, QUOTATIONS (High, Low, Closing), Sales Shares. Includes entries for D. & W. 78. Conv., N. J. C., L. & W. B. Coal Co., Am. Dock & Imp. 78., D. & H. C. Co., St. L. I. M. & S., Ches. & Ohio, L. V. R.R., P. R.R., P. & R. R.R., P. & R. C. & I. Co., L. C. & N. Co., and RR. loan.

Philadelphia Stocks.

PHILADELPHIA, Thursday Evening, Feb. 22, 1877.

A little better feeling is noticeable in the market for coal shares at Philadelphia, and we generally advance the quotations. The transactions aggregate about 167,000 shares.

Philadelphia and Reading is steady with an upward tendency. It has been quoted at from 11 1/4 to 12 1/4, or 22 1/2 to 25 1/2, on the basis of \$100 stock. This company is taking the only sure and certain road to success, viz, by increasing its business and exercising the strictest economy. The company possesses a magnificent coal estate, and it costs it less to mine coal and to put it in market than it does any of the other large companies. If it could relieve itself of its enormous interest charges it would make rapid strides towards prosperity. Whether it will be able to reduce these charges either by selling portions of its property or funding its interest coupons or in some other way are questions that will require all the ability and forbearance of those interested.

Leligh Coal and Navigation Company's stock has ranged at from 45 to 36 1/2 per cent., closing at 44. The sales amount to 38,000 shares. It is announced that the canal will be opened for navigation on the 20th of March.

Pennsylvania Railroad Company.—This stock closes at 84 1/2, an advance of 1/2 per cent. The sales amount to 107,000 shares. This company is now building 1,000 coal cars at its shops in Altoona.

The Delaware Water Gap State Company will hold its annual meeting on the 7th prox.

The Pennsylvania Railroad Company will hold its annual meeting on the 13th of March.

Gardner Oil Company.—This company has declared a dividend of 15c. per share.

Bareilly Coal Company.—This company will hold its annual meeting on April 12th.

The Preston Coal and Improvement Company will hold its annual meeting on the 7th of March.

AUCTION SALES OF STOCKS AND BONDS during the week have been as follows:

Pennsylvania Salt Manufacturing Company.—107 shares at from \$66 to \$68 per share.

Southern Colorado Coal and Iron Company.—15 shares at 50c. per share.

Philadelphia and Reading Coal and Iron Company.—\$17,000 7 per cent. bonds "Glenwood Tract" at from 45 to 47 per cent.

South Mountain Iron Company.—\$7,500 7 per cent. bonds at \$50 for the lot.

Coal Ridge Improvement and Coal Company.—500 shares par \$25 at 6c. per share.

Volcanic Oil and Coal Company.—600 shares par \$10, at from \$2.20 to \$2.25 per share.

Brady's Bend Iron Company.—366 shares par \$100 at 1c. per share.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, Feb. 23 1877.

Mining shares close rather below the quotations prevailing a week ago. The operations in the lower levels of the Comstock mines are seriously retarded by the intense heat encountered. In another part of this issue we give very recent information concerning the condition of these mines.

NEW YORK MINING STOCK EXCHANGE.

We are in receipt of the following quotations and sales for the week from the new board. It will be observed that this is separate and distinct from the American Mining and Stock Exchange, whose quotations appear elsewhere.

American Flag Gold Mining Company, Colorado, quotations, 7c. @ 10c. Bobtail Gold Mining Company, Colorado, 550 shares at from \$1.40 to \$1.50 per share. New York and Colorado Gold Mining Company, quotations, \$2.30 @ 25. Lacrosse Gold Mining Company, Colorado, 2,100 shares at from 27c. to 29c. Silver Islet Silver Mining Company, Michigan, 50c. per share bid. Bobtail Tunnel Company, Colorado, 25 shares at \$3.50 per share. Eureka Gold Mining Company, of Grass Valley, California, quotations, \$2.30 @ 3.40. Smith & Farmlee, G. M. Co., quotations, 8 @ 10c.

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & Co., Bankers and Brokers, Room 7 Traveller Building, 31 State Street, Boston.

BOSTON, WEDNESDAY EVENING Feb. 21, 1877.

The market winds up quiet to-night, as it generally does before a holiday. Prices, however, are firm in the main, but little disposition to trade. Calumet has receded to 183 1/2 bid, and is probably a purchase at about the present figures. There is better demand for Central at 32 1/2, and no stock offering. Duncan Silver is rather quiet but very firm at 6 3-10 bid. The company are in receipt of favorable news from the mine. International is quiet at 9-16 bid, and hardly a transaction for the week. 2,100 shares Mesnard was sold at auction to-day (collateral stock), and brought 57 1/2c. per share. The stock however, was offered in open market before and after the sale at 50c. Quincy is dull at about \$43. One of the leading brokers has a seller of Quincy for some time past, but it is believed by many that if there was any other way of forcing it down, he would adopt that method. In the small coppers nothing is doing.

Company Meetings of Lake Superior Copper and Silver Mining Companies.—We take the following from the Mining Gazette of the 15th inst., showing the date of the annual meeting of nearly all of the Lake Superior Copper and Silver Mining Companies:

Table with columns: Company, Date of Meeting, Office. Lists meetings for Adventure, Allouez, Amygdaloid, Atlantic, Atlas, Calumet & Hecla, Central, Copper Falls, Duncan, Dover, Duncan Silver, Eagle Harbor, Eagle River, Empire, Franklin, Fall River, Humboldt, Highland, Hungarian, International Silver, Island, Isle Royale, Kearsarge, Mesnard, Michigan, Minnesota, National, Osceola, Petherick, Pewabic, Phila. & Boston, Phoenix, Pontiac, Quincy, Rhode Island, Ridge, Rockland, St. Louis, St. Mary's, Seneca, Star, Superior, Washington, and Winthrop.

Gas Stocks.

NEW YORK, FRIDAY EVENING, Feb. 23, 1877.

We are reported no transactions in gas stocks, the market continuing very dull. We lower the quotations of the Manhattan \$10, and the New York \$3 per share, otherwise there is no change.

The Canadian Gas Question.—The Monetary Times of the 16th inst., with reference to the gas supply of cities, advocates the placing of this under the management of municipalities and says: "There ought to be inserted a general provision in the municipal law, giving town corporations, where there is now no gas, the exclusive right of supplying it; and in towns and cities where gas is now supplied by companies, the right to assume the works of these companies on equitable considerations, in which the rights of property would be scrupulously protected. The municipality, as trustee for the public, may safely be trusted with the monopoly of gas-making. The object should be less to make a profit than to serve the public well; but the supply of gas, in the hands of a municipality may, within reasonable limits, properly be made a source of revenue.

A bill has been introduced into the Toronto Legislature incorporating the People's Gas Company.

Nyack and Warren Gas-Light Company.—120 shares of this stock (hypoheated) were sold at auction during the week at \$500 for the lot.

Northern Liberties Gas Company.—23 shares of this stock were sold at auction in Philadelphia during the week at from \$41 to \$43 per share.

The Quincy, Ill., Gas Contract.—The City Council on the 14th inst. awarded the contract of supplying Quincy with gas for five years at \$2.25 per 1,000 feet to consumers, and \$30 per lamp. The unsuccessful bidders were the Capitol of Chicago and National of Boston—both at \$2 per 1,000 feet to consumers, and \$27 per lamp on a twenty-five years' contract.

The St. Louis Gas Question.—We note a statement that the Gas Consumers' Protective Association of St. Louis, which was recently formed, offers to lease the city gas works and property for a term of years, and to pledge itself to furnish gas to private consumers at \$1.50 per thousand feet, and to light the streets at a cost of \$5 per lamp annually.

The Brooklyn Gas Supply.—The Aldermen's Committee on the 21st inst. decided to establish the uniform rate to be paid the gas companies for lighting the street

COAL TRANSPORTATION AND MINING STOCKS.

Table with columns: Amount of Cap. Stock, Shares issued, Date, percentage and amount of last dividend, QUOTATIONS, and SHARES SOLD. Lists various coal and mining companies with their financial details and stock prices.

MINING STOCKS, New York.

Large table listing mining stocks in New York. Columns include: Name of Company, Location, Feet on Vein, Capital Stock, a No. of Shares, Total Assessments Levied, Date and Amount of Last Assessment, Total Dividends paid, Date and Amount of Last Dividend, and various daily quotations (Sat., Mon., Tues., Wed., Thurs., Fri.).

Boston.

Table listing mining stocks in Boston. Columns include: Name of Company, Location, Feet on Vein, Capital Stock, a No. of Shares, Total Assessments Levied, Date and Amount of Last Assessment, Total Dividends paid, Date and Amount of Last Dividend, and various daily quotations (Fri., Sat., Mon., Tues., Wed., Thurs.).

Par value \$100. g Quotations represent the latest prices bid. For readines of comparison the quotations of Philadelphia Stocks and the shares being \$50 each, are based upon a percentage value, or 100, equal to shares of \$100. Prices asked will have a * affixed. h Full paid. i On the four old companies. j This company declared a dividend of 3 1/2 per cent. on its preferred stock in July, 1876. k New York Stock Exchange quotations.

lamps at 22 cents for each lamp, to which price the presidents of the gas companies agreed. The latter refused to accept \$2 per 1,000 feet as the price of gas furnished, instead of \$2.25, as paid last year.

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.

Companies in New York and Vicinity.	Cap. Stk.	Par.	last Divid.	When Paid.	Bid.	Askd.
Mutual, N. Y.	\$5,000,000	\$ 100	2 1/2	Jan. '77	103 1/2	105
" " Bonds	90,000	1,000	13 1/2	Feb. '77	109	109
New York, "	4,000,000	100	5	Nov. '76	130	132
Metropol. "	2,500,000	100	5	Sep. '76	140	145
" " Certif.	1,000,000	100	3 1/2	" "	101	103
" " Bonds	500,000	1,000	3 1/2	Dec. "	102 1/2	102 1/2
Harlem "	1,850,000	50	4	Feb. '77	104	—
Manhattan "	4,000,000	50	10	Dec. "	220	227
Brooklyn, B'klyn..	2,000,000	25	5	Nov. '76	170	172 1/2
Nassau "	1,000,000	25	4	Jan. '76	80	—
" " Certif.	700,000	1,000	3 1/2	Nov. '76	95	—
People's "	1,000,000	10	3 1/2	Jan. '76	46	52 1/2
" " Certif.	300,000	1,000	3 1/2	July '76	84	90
" " Bds	325,000	100	3	Feb. '77	90	96
Metropol. "	1,000,000	10	3 1/2	Nov. '76	76	80
Wmsburgh "	1,000,000	50	3	Oct. '76	130	—
" " Certif.	1,000,000	100	3 1/2	July "	100	102 1/2
Citizen's "	1,200,000	20	2 1/2	Jan. '76	100	102 1/2
" " Certif.	320,000	1,000	3 1/2	Oct. "	98	102
J. C. N. J.	750,000	20	5	July '75	160	—
Centl. Westch. N.Y.	466,000	50	4	July "	90	—
Subur'n "	295,000	50	3 1/2	Oct. '76	90	100

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NEW YORK, Feb. 21st, 1877.

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100,000 TONS OF COAL,

from the Lackawanna Regions, of the usual sizes, deliverable at Hoboken, during the month of March, 1877.

The Sale will be positive; each lot put up will be sold to the highest bidder.

No Bids, in any form whatever, being made for account of, or on behalf of the Company.

The conditions will be fully made known at the time of sale.

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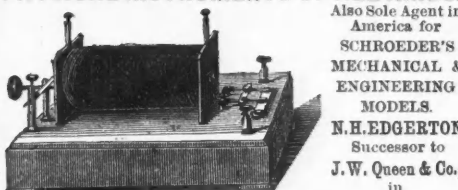
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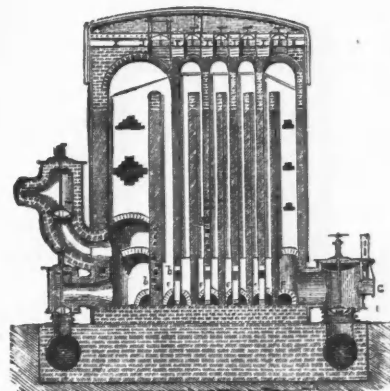
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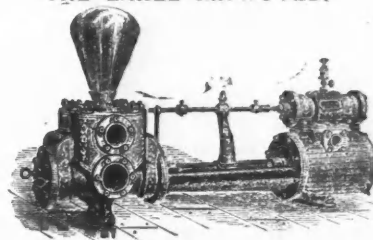
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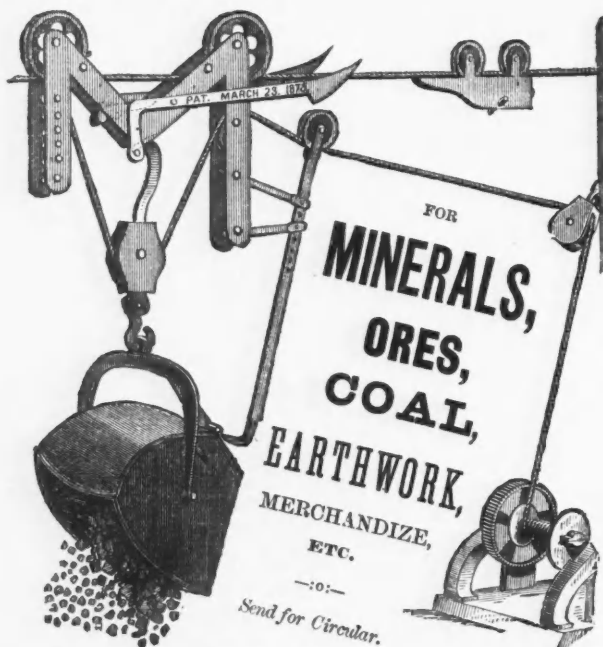
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