

books of the company at £6 7s. 6d., to which, on its being extracted, has merely to be added the cost of cementation." With a water supply assured by the completion of the great dam, the greatest obstacle to the increase of the output of copper by the company has been removed, and it will undoubtedly soon figure as the greatest producer of copper in the world.

The profits on sales of pyrites and of copper figure up to £752,039, including a balance brought forward of £22,184. After providing for interest and cost of administration, there remained a net profit available for dividends of £459,678. Out of this, two dividends, aggregating £450,000, or 28 shillings a share, of which there are 325,000, were declared, being 14 per cent per annum on a par value of £10. The market price of the shares is, however, £20, which seems rather high, in spite of the fact that the concern is so prosperous.

The San Domingos mine, now worked by the Mason & Barry Company, successors of the firm of Mason & Barry, is small, compared with its great rival, the Rio Tinto. Still, since its formation, in June, 1878, it has paid in dividends £1,095,177, the returns never being less than 10 per cent per annum, and reaching 25 per cent in 1880. On the other hand, the capital of the company has increased from £800,000 to £1,851,640. The mines in 1883 produced 382,555 tons, against 405,029 tons in 1882, the pyrites shipments being 123,450 and 129,437 tons respectively. The copper product, on the other hand, increased. The total net profit was £195,993, of which £92,582 were paid in the form of an interim dividend in October of last year. The sum of £20,000 is to be credited to good-will and leases and sinking fund; and to the unappropriated balance of £92,219, £50,000 are to be added from the rest account to pay a dividend of 15 shillings a share, or 12½ per cent in all.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

Zanesville No Great Shakes, After All.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The little paragraph in your issue of the 17th inst., stating that "three acres of land in the central portion of Zanesville had caved in—the ground settling 150 feet into the earth, and several houses totally destroyed," has been read with uncommon merriment here. Not a soul of us knew any thing about it—not one of the 20,000 people more immediately interested in the subsidence for 150 feet of their lots and houses below the established grades.

We are probably as wicked as our neighbors; but our earthquake hasn't come yet. What happened was a trifling let-down over some old coal workings, which in no place exceeded thirty inches, if so much, and which, so far as known, disturbed the serenity of not even a chicken-coop. Most of the inhabitants of the Fourth ward, where it occurred, learned of it several days later through the Cincinnati and New York newspapers. Our coal-veins here are nowhere over thirty inches thick, and for the rest of it, the Muskingum and Ohio valleys are among the solidest pieces of ground on the ball. Lord! how this world is given to lying!

C. E. R.

ZANESVILLE, OHIO, May 19.

NEW PUBLICATIONS.

L'INDUSTRIE MINIÈRE DE LA SUÈDE. By G. NORDENSTRÖM, Professor at the Stockholm School of Mines. Translated into French by J. H. KRAMER. Published for the International Exhibition at Madrid, 1883.

The work of Swedish writers in compiling for international exhibitions accounts of the magnitude of the mining industries of their country has always been exceptionally well done; and among the able documents of this kind, that of Professor Nordenström takes a high rank. It is a pamphlet of only 60 pages, accompanied with a map; but it gives a very good and at the same time a popular review of the mineral resources of Sweden, the production, the methods of working in its many branches, and the latest statistics. The greatest attention is of course paid to the boundless wealth of Sweden's iron ore-deposits, the magnitude of which may be appreciated when it is stated that the famous Kirunnavara iron mountain is estimated to contain two hundred and sixty millions of tons of iron ore, above the level of the plain from which it rises. A series of fully seventy-five complete analyses of the ores of the different producing mines furnishes ample evidence of the richness and purity of the ores.

DIE STOLLENANLAGEN. By G. HAUPT, Chief-Engineer, Gotha. Berlin: Julius Springer. 8vo, 250 pages. Price, 8 marks.

Text-books in mining do not generally keep pace with progress in actual practice, and usually their authors neglect to keep abreast with the times in allied branches of engineering. Thus many data valuable to a mining engineer are collected and put on record by those who conduct railroad tunneling operations. Herr Haupt has proposed to himself to deal with one branch of mining, tunnels and drifts, which has developed wonderfully during the past decade, and naturally the greater part of his work is devoted to a clear and full discussion of high explosives and machine drills. It deals, however, so far as the latter are concerned, almost exclusively with continental designs, which can not compete, in efficiency, durability, and adaptability to many circumstances, with the rock drills of our leading makers. His report on the Brandt drill is flattering, although it is hardly calculated to remove what may be the prejudice among American engineers against the use of hydraulic power at very high pressures. Earlier reports from friends who have used the Brandt drill were any

thing but encouraging, it being difficult to keep the pipe from leaking, and there being daily repairs. It is just to state, however, that the reports concerning its work at the Brandeite Tunnel are very favorable to it in these respects.

Herr Haupt's book, we notice with pleasure, contains a number of tables scattered throughout the text, giving practical results, duty, etc. It naturally goes over a good deal of ground cultivated *ad nauseam* by others—a fact which is calculated to give a less favorable impression of it at first; but a closer examination of it will convince an engineer of its real value. It is very handsomely printed, and contains a large number of well-executed illustrations. Although, of course, dealing exclusively with European practice, it may well be recommended to those of our engineers who have kept up their German.

THE CREATORS OF THE AGE OF STEEL. By W. T. JEANS. New York: Charles Scribner's Sons. 12mo, 349 pages. (Index.)

Mr. W. T. Jeans's avowed purpose in compiling the volume before us was the following, as he expresses it himself: "It has, therefore, appeared to us that the most striking facts in connection with this industry (iron and steel) could be presented in their most attractive form in short biographies of the creators of the age of steel. The career of men who, with no birthright but their talents, and no other secret of success than the 'magic of patience,' have attained positions of world-wide renown, should always have an intrinsic interest; and biographies of such men, while affording scope for a narrative sufficiently varied by incident to sustain attention, may become the means of disseminating some knowledge of the great industry they have created." Mr. Jeans's purpose is certainly one that deserves every encouragement and appreciation, and the manner in which he has sketched the history of our great inventors and manufacturers of iron and steel is undoubtedly so highly fascinating that even those well acquainted with the lives of these heroes of the "age of steel" will peruse it with growing interest. The book is very clearly written, and on the whole is accurate in its references to technical matters, which, of course, are treated in a popular way. The early struggles of such men as Sir Henry Bessemer, Sir William Siemens, Sir Joseph Whitworth, Sir John Brown, Sidney Gilchrist Thomas, and George J. Snelus, who are made the "creators of the age of steel," are well calculated to excite sympathy, while their successes are likely to incite to emulation. We are not disposed to quarrel with Mr. Jeans on the choice of those upon whom he has conferred the dignity of leaders in the march of progress. It is an extremely difficult and, at the same time, a very delicate task to decide who has and who has not contributed in so prominent a manner to the development of a great industry as to take rank among its greatest representatives. But we can not help expressing some surprise that such men as Krupp in Germany, Poulcel in France, and Holley in this country, and Richards, Martin, Mushet, and others in England, should not have been accorded greater prominence. Krupp may surely be deemed as much a "creator of the age of steel" as Sir Joseph Whitworth and Sir John Brown, and the other metallurgists named may jointly claim as good a title as Snelus. We can understand very well that Mr. Jeans was anxious to make each one of them the representative of a class of workers in this important field, but can not help feeling that some credit is due such men as Richards, Martin, Holley, Poulcel and others, who, working in different lines, have individually and collectively accomplished so much in making the Bessemer and open-hearth processes what they are to-day. Mr. Mushet has found ardent friends, and their efforts to secure to him the recognition he deserves have led to a controversy into which it is not now our purpose to enter. We do not believe that Mr. Jeans purposely neglected to make any mention of the great service that American engineers and mill managers have rendered in perfecting the mechanical details and general arrangement of plant that pushed the work of a pair of Bessemer converters to unheard-of results. His own work furnishes ample proof of the fact that it was not narrow, insular prejudice that led him to ignore these achievements, or those of German engineers, in developing the theory and practice of the basic process in a manner that has made their respective countries what they are to-day, the pioneers and acknowledged masters of the Thomas-Gilchrist Snelus-Riley process. Mr. Jeans shows in his work an ignorance of Americans and of American work that is appalling. On page 128 he says: "In the United States, where the Bessemer process is about as extensively worked as in the United Kingdom, titles, ribbons, and decorations are unknown; but in the State of Indiana, in a district rich in anthracite and pure iron ore, a new scene of industry is springing into existence. Furnaces are in full blast, houses and factories are being built, and the nucleus of a great town already exists, to be known in the future by the name of Bessemer." On page 331, Mr. Snelus "makes a special journey of 1000 miles from New York to Harrisburg." The only reference to Mr. Holley is in a quotation from an address by Mr. E. Windsor Richards, as President of the Cleveland Institute of Engineers. Not a word of the work of Jones, Hunt, Fritz, and other leaders in this country—an omission much to be regretted, and which might have been supplied had Mr. Jeans's book been submitted to a single American metallurgist before appearing with the imprint of an American publishing house.

FREIGHT RATES ON EAST-BOUND ORES AND FURNACE PRODUCTS.—Commissioner Fink has issued the following notice: "At a meeting of the standing committee, it was agreed that the rates on the articles named below will be the same as the rates on bullion and pig-lead in car-loads, namely, 20 cents per hundred pounds from Chicago to New York and from other points on the agreed percentage basis. Ore, silver, lead, antimony, or copper and calamine and copper matte, ingots, cakes, slabs, or pigs, and copper residue in car-loads, value not to exceed \$100 per net ton, to be limited by written release. The foregoing rates are not guaranteed for the calendar year, but may be advanced on ten days' notice."

FUEL CONTRACTS AWARDED.—The Committee on Supplies of the Board of Education of Philadelphia, Pa., awarded the contract, May 16th, for supplying the best hard Lehigh coal to the Lehigh Coal and Navigation Company for the ensuing year at \$4.64 a ton in the first five districts, \$6.50 in the Sixth, \$5.27 in the Seventh, \$5.04 in the Eighth, \$4.84 in the Ninth, and \$4.69 in the Tenth. The other bidders were Patrick & Lipsett, H. C. Cook, Johnston Jones, and the Lehigh Valley Coal Company. The charcoal was awarded to G. H. Higgins, at 40 cents a barrel.

THE PITTSBURG MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

The opening session of the American Society of Mechanical Engineers was held in the rooms of the Young Men's Christian Association, being in fact a joint session with the Engineers' Society of Western Pennsylvania. The proceedings were opened with a few hearty words of welcome by Mr. William Miller, President of the Western Society, to which Mr. J. E. Sweet, of Syracuse, New York, President of the Society of Mechanical Engineers, responded, contrasting the welcome extended to the Society at Pittsburgh, with the rude manner in which it had been treated at a recent meeting by government officers at West Point, New York. Mr. Alfred E. Hunt, of the Pittsburgh Testing Laboratory, was then called upon to read, in behalf of his associates, Col. T. P. Roberts, F. C. Philips, Professor of Chemistry at the Western University, N. M. McDowell, and W. F. Jarboe, the report of a special committee of the Engineers' Society of Western Pennsylvania on

NATURAL GAS.

Twenty-five years ago, the first wells drilled into the sand and rocks of Venango County, Pennsylvania, gave origin to the great petroleum industry; but it has only recently been realized that with the petroleum is associated an invisible fuel which, by reason of its calorific power and the variety of its possible applications, may yet assume a degree of commercial importance comparable to that of petroleum.

Natural gas from Western Pennsylvania is essentially composed of the most volatile of the hydrocarbons of the series known in chemistry as paraffines and of marsh-gas. The following table of analyses, some of which, we understand, were published in Report L of the Pennsylvania Geological Survey, while others, we believe, were made by Professor Philips, will give an idea of the composition of the gas from a number of wells:

	West Bloomfield, New York.	Olean, New York.	Burus Well, near St. Joe, Butler County, Pa.	Harvey Well, Clinton township, Butler County, Pa.	Cherry Tree, Indiana County, Pa.	Leechburg.	Creighton.	Fuel Gas Company.	Gases occluded in coal, Durham, England.
Hydrogen.....	82.41	96.50	8.10	13.50	22.50	4.79	.....	19.56	.....
Marsh-gas.....	.....	.....	75.44	80.11	60.27	89.65	86.34	78.24	85.8
Ethane.....	.....	.....	18.12	5.72	6.80	4.30	.....	.....	.....
Propane.....	.....	.....	trace	.....	.....	trace	.....	.....	.....
Butane.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Carbonic acid.....	10.11	.....	0.34	0.66	2.28	0.35	3.64	.....	0.34
Carbonic oxide.....	.....	0.50	trace	trace	trace	0.26	traces of higher hydrocarbons	2.20	trace
Oxygen.....	0.23	2.00	.....	.....	0.83	.....	.....	.....	.....
Nitrogen.....	4.31	.....	.....	.....	7.32	.....	.....	.....	.....
Illuminating hydrocarbons.....	2.94	1.00	.....	.....	.....	0.56	.....	.....	13.86
Total.....	100.00	100.00	100.00	99.99	100.00	100.00	100.00	100.00	100.00
Spec. gravity.....	0.693	0.692	0.6148	0.5119	.....	0.5580	0.5923	.....	.....

The gas from the Pennsylvania Fuel Company's well, at Murraysville, is pure marsh-gas; that from Petrolia, Canada, is marsh-gas with ethane and some carbonic acid; that from Pioneer Run, Venango County, Pa., is chiefly propane, with small quantities of carbonic acid and nitrogen; while the Rogers Gulch, West County, West Virginia, gas is chiefly marsh-gas, with small quantities of CO₂ and N.

Wells drilled for natural gas outside of the oil regions are of recent date, with few exceptions. The wells at New Cumberland, West Va., have supplied gas for more than twenty years for the manufacture of bricks. The East Liverpool, Ohio, wells have been burning twenty-five years, and are still productive. At Beaver Falls, natural gas has been used for six years in a cutlery works, but lately the gas has failed, presumably on account of the wells becoming filled up either with paraffine wax in the pores of the rock, or with an incrustation of salts of lime and magnesia, as it is said they have never been cleaned out since they were drilled. At Erie, so many wells have been drilled to the strata of gas rock that it has become partially exhausted. In the oil regions, a gas-well was looked on rather as a curse than a blessing, and as most of the wells produce gas as well as oil, and so many were drilled to the same sand or rock, it soon exhausted the supply.

Pittsburg has the advantage of being able to tap three or four very prolific gas belts or fields: the Butler County field, which supplies Spang, Chalfant & Co.; the Bull Creek, or Tarentum field, which struck gas at 1147 feet depth, and supplies the Pittsburg Plate-Glass Company, Pennsylvania Salt Manufacturing Company, and will supply Richards & Hartly's and Chalinor & Taylor's new glass-houses, and Godfrey & Clark's new paper-mill; the Murraysville or Trestle Creek and Lyons Run field, which tapped the gas at 1337 feet depth, and supplies the gas for the Acme Gas Company, used by the Edgar Thomson Steel-Works, the Fuel-Gas Company, which furnishes the Union Iron Mills, Park Brother & Co. (Limited), Wilson, Walker & Co., Hussey, Howe & Co., Shoenberger & Co., and many other works in the same neighborhood on the Alleghany River; the belt or field in Washington County in which is the celebrated McGuigan well, the gas from which is tapped to the South side.

If small wells are struck in the same belt as large ones, and are not sufficiently productive to be utilized, they should be plugged, as they drain the belt to no purpose. The more durable wells tap the gas-productive strata generally at greater depth than 1000 feet.

It is a common opinion among those versed in the management of gas-wells that the outflow is subject to a gradual diminution, tending ultimately to total extinction. Evidence of this is to be found in all parts of the gas territory where gas-wells have long been in use. In many localities, however, there is reason to think that the gradual falling off of the supply of a well is due to the choking up of the pipe by a deposit of salt

or paraffine, rather than the failure of the original source. This is notably the case with the Freeport gas-wells.

The following historical facts in regard to the wells drilled by Spang, Chalfant & Co. are of interest: No. 1 has been in use nine years, and is still a good well; No. 2, four years in use, still blowing though with diminished force; its location is three miles distant from any other gas belt; No. 3, yield insignificant; No. 4, pressure diminished from 1.5 pounds to 0 in one week; No. 5, failed after four years' use; No. 6, in use six years, gradually failing; No. 7, failed after five years' use; No. 8, good yet, drilled in 1883; No. 9, dry hole, in Anderson farm, struck quicksand at depth of over eleven hundred feet; No. 10 was a small well; No. 11, a good well, gas struck within the past few days. These wells being all in Butler County, their partial failure may be due to the close contiguity to the numerous oil-wells of that district, by which they have been drained. These wells have been supplying the mills of Spang, Chalfant & Co. some years with varying success, being able to supply the entire plant at times, and then, as wells failed, and before others could be drilled, the gas supply was sometimes insufficient, and it was therefore necessary either to stop part of the machinery or return to the use of coal.

The number of companies chartered to supply natural gas in Pennsylvania up to February 5th, 1884, was 150, representing a capital stock of \$2,160,580. Since that date, a large number of new charters have been granted.

Natural gas, next to hydrogen, is the most powerful of the gaseous fuels, and, if properly applied, one of the most economical, as very nearly its theoretical heating power can be utilized in evaporating water. Being so free from all deleterious elements, notably sulphur, it makes better iron, steel, and glass than coal fuel. It makes steam more regularly, as there is no opening of doors, and no blank spaces are left on the grate bars to let cold air in, and when properly arranged, regulates the steam pressure, leaving the man in charge nothing to do but to look after the water, and even that could be accomplished if one cared to trust to such a volatile water tender. Boilers will last longer, and there will be fewer explosions from unequal expansion and contraction, due to cold draughts of air being let in on hot plates.

For domestic purposes, a beautiful fire can be made, dust, ashes, and coal carriage avoided; smoke and the smoked ceilings and walls of Pittsburgh may become things of the past; yet, if sold at prices now charged, that is, 50 cents per 1000 cubic feet, it is much more costly than coal, especially if used in grates and stoves constructed for coal.

As the introduction of natural gas has been of such recent date in Pittsburgh, most of its users consume it in such a crude manner that they fail to get its best results, the difficulty being the expense of making the necessary changes in the furnaces. There is, however, one notable exception among the larger consumers, namely, the Union Iron Mills of Messrs. Carnegie, Brothers & Co., where it is used with economy in Siemens regenerative furnaces.

Natural gas is extensively used in heating boilers, in most cases by introducing a gas-pipe with a small row of holes in its side, the fire-space being closed up partly to check excessive draught.

An experiment was made to ascertain the value of gas as a fuel in comparison with coal in generating steam, using a retort or boiler of 42 inches diameter, ten feet long, with four-inch tubes. It was first fired with selected Youghiogheny coal, broken to about four-inch cubes, and the furnace was charged in a manner to obtain the best results possible with the stack that was attached to the boiler. Nine pounds of water evaporated to the pound of coal consumed was the best result obtained. The water was measured by two meters, one in the suction and the other in the discharge. The water was fed into a heater at a temperature of from 60 to 62 degrees; the heater was placed in the flue leading from the boiler to the stack in both gas and coal experiments. In making the calculations, the standard 76-pound bushel of the Pittsburgh District was used. Six hundred and eighty-four pounds of water were evaporated per bushel, which was 60.9 per cent of the theoretical value of the coal. Where gas was burned under the same boiler, but with a different furnace, and taking a pound of gas to be 23.5 cubic feet, the water evaporated was found to be 20.31 pounds, or 83.4 per cent of the theoretical heat units were utilized. The steam was under the atmospheric pressure, there being a large enough opening to prevent any back pressure; the combustion of both gas and coal was not hurried. It was found that the lower row of tubes could be plugged and the same amount of water could be evaporated with the coal; but with gas, by closing all the tubes (on end next to stack) except enough to get rid of the products of combustion, when the pressure on the walls of the furnace was three ounces and the fire forced to its best, it was found that very nearly the same results could be obtained. Hence, it was concluded that the most of the work was done on the shell of the boiler. Another experiment was made with the tubes plugged entirely, and a very small opening leading to the stack, and with an increased pressure on the furnace, and of course a different style, the results were nearly the same, but the rivets and seams began to suffer, although only the same amount of gas was burned, but not in the same time. The gas required much more air to accomplish complete combustion per pound of fuel than coal. One singular fact was noticed, that is, when the products of combustion showed the smallest amount of carbonic oxide, the best results were not obtained. This was probably due to the fact that the increased heat due to the burning of carbonic oxide to carbonic acid did not compensate for the loss occasioned by the amount of air that had to be let in to burn it, and which air had to be heated to about 1500 degrees. As the air, gas, and water were all accurately measured, the results were considered nearly correct; analyses of the gas in the escaping products of combustion were made quite often, only carbonic oxide and carbonic acid being determined. In most of the boilers in which gas is used, the method of heating is to be regarded as economical. A portion of the gas taken from the flue of a 42-inch by 24-foot two-flue boiler, consuming natural gas, was found to contain nitrogen gas, 85.88; carbonic acid, 6.16; and oxygen, 7.96, showing that a great excess of air was passing up the chimney, notwithstanding that in this instance more than usual care was taken in the regulation of the draught.

So long as meters are not employed measuring the volume of gas consumed in manufacturing establishments, it is scarcely probable that

owners will study economy in its use. But with an increased demand for natural gas, particularly when its superior heating qualities and low price, as compared with coal, are understood, the officials of the supplying companies will doubtless take such action as will prevent the reckless waste of this valuable natural product. If, however, as it might be shown by cheap contrivances, easily applied, a factory could be better supplied with only one third the present consumption of gas, the owners would certainly deem it no hardship if a meter was placed in their establishment, provided rates were not increased. In fact, it is most probable that a perfect system of supply will reach many more consumers, and with rates much lower than have heretofore been charged. At present, the want of method of the companies forbids as rapid a development of the gas supply as the public wants really require. Heretofore, it seems that contracts have been made to supply the gas at rates only a trifle less than the cost of coal; but in the haste to declare dividends, the companies seem to forget that, by permitting its reckless waste by a few consumers, they are crippling a resource that would yield better financial results through a more general distribution at more reasonable rates.

The committee reports then on different kinds of pipe and couplings used, and urges that light oil-well casing should not be used, and states that it is convinced that now the most scrupulous care is bestowed both in the construction of pipes and valves by the prominent manufacturers, and in the selection of material by some of the gas companies.

The varying requirements of a large iron-works will render it desirable to be able at all times to control an unlimited volume of gas supported by high pressure. In private dwellings, the danger from explosions due to leaks in pipes would be enormously increased by a pressure much exceeding that of ordinary coal-gas in the service mains. The committee states that, in its opinion, a pressure of over six inches of water in the pipes leading to dwellings should be forbidden by law.

The necessity for a reduction of the pressure, which is often from 75 to 100 pounds per square inch as the gas comes from the well, to an amount not exceeding 5 inches of water pressure in the street mains, renders the selection of regulating valves for accomplishing this purpose of great importance. The regulators proposed are of two classes. First, valves, of which the Lueher is the best known, but none of which the committee holds to be equal to the requirements; and second, tank governors, which are considered the best form of regulators. The committee described and showed a drawing of the apparatus used by the Clarion Light and Heat Company, of Clarion, Pennsylvania.

In order to investigate the question of explosibility of natural gas, the committee made a series of trials to ascertain the limits of its inflammability, taking the gas from Creighton Station as approximately representing the gas now used in Pittsburg. Different mixtures of measured quantities of natural gas were prepared, and also mixtures in the same proportion of coal-gas and air. The effect was noted when a coal-gas flame was plunged into each, the results being given in the following table:

TABLE SHOWING COMPARATIVE INFLAMMABILITY OF NATURAL GAS AND COAL-GAS.

Mixture of Natural gas. Air.		Effects.	Mixture of Alleghany City illuminating gas. Air.		Effects.
Volume.	Volumes.		Volume.	Volumes.	
1	4	Burns feebly.	1	4	Burns feebly.
1	6	" slowly.	1	6	Explodes.
1	7	" "	1	7	Burns explosively.
1	8	" rapidly.	1	8	" "
1	9	" explosively.	1	9	" "
1	10	Explodes.	1	10	" less rapidly.
1	12	Burns somewhat explosively.	1	12	Flashes.
1	13½	Burns quietly.	1	13½	No flash.
1	15	Flashes, but flame dies out.	1	15	"
1	16	Very feeble flash.	1	16	"

Natural gas brings with it from the well minute quantities of heavier liquid or solid hydrocarbons, which are carried away in the form of vapor or spray by the force and velocity of the gas under high pressure, and impart to it a strong and characteristic smell. The odor of the gas in the mains appears to be dependent on these traces of condensable hydrocarbon; for if kept in a closed vessel for a few days, the gas becomes absolutely odorless. The odor will therefore diminish more and more as it is carried away from the wells or from the high pressure mains, which may explain the contradictory statements upon this point that have found circulation. It has been found that air containing 10 per cent of Murrysville gas fresh from the high-pressure mains has a decided odor; this is also true of Freeport and Creighton gas; but the same gas, after standing in an air-tight glass for twenty-four hours, had lost every trace of odor.

The velocity of the gas depends largely on the amount of friction it has to overcome, as well as the initial pressure it has coming from the well. A well with its conducting pipes indicating pressure of 3.25 ounces of water at the mouth took just 4.25 minutes for the gas to traverse the 16,000 feet of pipe that it was then concentrated in, the pressure running up to 15 pounds at the well, due to the increased resistance in the friction of the pipe. The following experiment was also tried: Gas was carried into the pipe with an initial pressure of 90 pounds per square inch. It took just 2.25 minutes for it to traverse the 16,000 feet of pipe. Gas from a well having a pressure of 20 ounces had a velocity of 23,400 feet per minute. A rubber ball was driven through three miles of a 5½-inch casing pipe in 2½ minutes. When gas is blowing freely from the mouth of a well, the pressure has not been found in any case to reach two pounds per square inch. As it comes from the wells, it has a temperature of from 42 to 45 degrees Fahr. At the moment of release from the well, the volume no doubt undergoes a very considerable expansion, resulting in a lowering of the temperature, which may perhaps explain the fact that blocks of ice are often seen to be thrown from the stand-pipes while the gas is burning with a powerful flame.

At the time of the appointment of the committee, the prominent legal question of interest to natural gas companies was the definition of their right to lay their pipes in the streets and their responsibility for accidents. Recently a more important question has been brought forward

by the decision of a local court that but one natural gas company under the law of 1874 is authorized to supply gas to consumers in Pittsburg. The committee goes into this question, and suggests points as the basis of any future legislation that may supplant the present vague provisions of the law. In conclusion, the committee brings forward the following recommendations:

First. That the distributing mains for domestic consumption of natural gas be of a size amply sufficient to conduct gas to dwellings, with and at no time and place a pressure exceeding five and a half inches (water pressure). This pressure can be guaranteed to be uniform, certainly never in excess, by a properly constructed form of tank governor.

Second. Every domestic consumer of natural gas should see to it that an automatic cut-off valve be placed on his service-pipe, so arranged that, in case the supply from the tank governor should from any cause fail, his valve would immediately close the pipe connecting with his premises, and require a personal attention to restore the pressure when it again returns through the main. The committee believes that such automatic valves can be provided.

Third. No cast-iron fittings or parts of fittings of cast or any coarse-grained or inferior metal should be allowed in private houses, the object being to prevent the possibility of leaks.

Fourth. Special care should be taken to see that the street cut-off or valve is so boxed or tubed as to permit free outlet to the air of any gas escaping from a leaky main that may follow along the branch pipe from the street.

Fifth. In the case of fires under boilers, in ranges, fire-places, stoves, etc., consumers of natural gas have for the most part entirely disregarded its laws of combustion, in not using the proper appliances for the admixture of air to the gas-jets. In many instances, even among wholesale consumers of this fuel, it can be demonstrated that, with the use of improved mixers, the same quantity of heat can be produced from one third the volume of gas as is now developed.

Sixth. The feed-valves to fires, and all burners where natural gas is used in private houses, should be securely placed so far above the floors as to be out of the way of children, and where they could not be accidentally turned on; to this end, valve-stems with movable socket-handles are of advantage.

Seventh. All gas-pipes laid from service mains should be thoroughly tested for leakage before being accepted as in working order.

Eighth. Where natural gas is sold, either entirely or as a component part of illuminating gas, its candle power should be guaranteed to be of a satisfactory amount.

During the discussion, Mr. William Metcalf, of Pittsburg, called attention to the fact that to steel-makers a cessation of work at a critical time might entail a very serious loss. He quoted also some figures showing the quantity of coal used for puddling (0.505 pound per pound of muck-bar) and for melting crucible steel, and doubted whether the comparison of cost was as favorable to natural gas as many seemed to believe. Mr. Jarboe, in reply, stated that a calculation, based upon experiment, showed that with Pittsburg coal worth 5 cents a bushel, an equivalent of gas is worth 7.8 cents per 1000 cubic feet. Some remarks by Mr. Jacob Reese, of Pittsburg, brought out the point dwelt upon with emphasis by Mr. Jarboe, Capt. W. R. Jones, and others, that the greatest difficulty in using natural gas in metallic grate furnaces is to mix with it a sufficient quantity of air. Thus, it was found that in regenerative furnaces they did not work well until air was sent through both the air and gas checkerworks, while the gas was carried into the furnace direct and cold. It being asked whether the injector principle had not been applied to making the mixture of air and gas, Mr. Jarboe stated that a very extensive series of experiments with many forms of injectors had proved to him that they were not capable of doing the work, the necessary amount of air not being carried in. Blowers are the best appliance for providing the air. Mr. Painter dwelt upon the fact that the cost of obtaining furnaces was great, quoting the fact that at the Union mills of Mr. Carnegie the cost was \$470 per furnace. Captain Jones, of the Edgar Thomson Steel Company, emphasized the fact that the use of natural gas at his works had enabled him to dispense with the labor of 82 coal-heavers and firemen, who had always proved troublesome workmen. Mr. Durfee, of Bridgeport, and Mr. Towne, of Stamford, Conn., spoke on the utilization of the high-pressure natural gas for driving engines previous to burning it. It was pointed out that this has been done in the oil regions, but that the sand carried along by the gas destroyed the engine cylinders rapidly. Mr. Henning suggested that, if so used previously, the gas would not have sufficient pressure to be delivered into the combustion-chambers of the furnaces where it is to be burnt. This discussion was long continued, and touched a great variety of points, among them the risk of using so dangerous a gas as marsh-gas in dwellings, especially when there is a doubt whether the gas is odorless or not.

TABLE SHOWING THE COMPARATIVE EFFECTS OF DIFFERENT GAS-FUELS.

	Heat units yielded by one cubic foot.	Number of cubic feet needed to evaporate 100 lbs. of water at 212° F.
Hydrogen.....	183.1	203.0
Water-gas from coke.....	153.1	351.0
Blast-furnace gas.....	51.8	1,038.0
Carbonic oxide.....	178.3	313.0
Marsh-gas.....	571.0	93.8

THE SECOND SESSION.

On Wednesday morning, the members assembled in the rooms of the Western Iron Association, and after the disposal of some routine business, the reading of treasurer's and council reports and a report of the tellers, President Sweet called upon Mr. John W. Cloud, of Altoona, Pennsylvania, to read his paper on

HELICAL SPRINGS.

With the object of obtaining data upon which to base rules for the design of helical springs, and for the grade of steel to be used, Mr. Cloud had twenty samples, ten tempered and ten untempered, of sizes varying

from $\frac{3}{8}$ to $1\frac{5}{8}$ inch in diameter by 5 feet long, tested at Watertown, with the following results :

TABLE I.—CONDENSED STATEMENT OF TENSILE TESTS OF SPRING STEEL AT WATERTOWN ARSENAL.

Test number.	Diameter of Bar.	Tempered or untempered.	Elastic limit.	Tensile strength.	Elongation. Per cent.	Contraction of area. Per cent.	Modulus of elasticity.
3359	0 7/4	Untempered.	78,000	130,000	8.20	15.60	32,600,000
3360	0 7/4	"	77,000	152,090	6.40	10.50	33,000,000
3361	0 7/4	Tempered.	140,000	226,980	2.40	10.50	32,500,000
3362	0 7/4	"	140,000	232,790	3.30	7.90	31,300,000
3355	0 8/7	Untempered.	70,000	131,830	6.50	5.50	32,000,000
3356	0 8/7	"	73,000	146,330	5.60	7.70	31,000,000
3357	0 8/7	Tempered.	125,000	197,830	1.40	5.50	31,700,000
3358	0 8/7	"	125,000	160,000	0.55	5.55	31,600,000
3343	1 0/1	Untempered.	90,000	143,000	6.80	11.40	30,700,000
3345	1 0/1	"	82,000	134,750	3.00	5.70	31,300,000
3344	1 0/1	Tempered.	120,000	167,100	0.60	3.80	31,300,000
3346	1 0/1	"	120,000	189,375	1.30	3.80	31,900,000
3347	1 1/3	Untempered.	63,000	108,500	1.30	3.20	31,900,000
3349	1 1/3	"	66,000	94,500	0.55	1.50	30,700,000
3348	1 1/3	Tempered.	120,000	159,600	0.45	3.20	30,500,000
3350	1 1/3	"	125,000	164,200	0.55	3.20	32,500,000
3351	1 3/2	Untempered.	67,000	117,750	2.90	3.60	32,600,000
3352	1 3/2	"	64,000	104,850	2.40	3.60	30,800,000
3353	1 3/2	Tempered.	120,000	122,500	0.25	Hardly appreciable.	32,800,000
3354	1 3/2	"	115,000	141,000 applied. Test discontinued. Bar not fractured.	0.15	.....	31,400,000

Mr. Cloud develops the following formulæ for springs of circular and rectangular sections, V standing for the volume of steel in cubic inches, P the load on the spring, f the compression of the spring under the load P , G the modulus of elasticity for torsion, and S the maximum stress in normal section under the load P , or the stress at the distance from the axis of the bar to the most remote fiber :

$$\text{No. 1 (for circular bars)} \quad V = \frac{2 G \times P \times f}{S^2}$$

$$\text{No. 2 (for rectangular bars)} \quad V = \frac{3 G \times P \times f}{S^2}$$

Important general deductions may now be drawn from these formulæ, as follows :

1st. Formula No. 1 shows that in round steel of a given quality and of a given factor of safety, as determined by certain numerical values for G and S , the volume of steel, and therefore the weight of steel required, depend entirely upon the product Pf and are independent of any arbitrary dimensions chosen, such as the diameter and length of bar or diameter and length of helix, provided, of course, that if any of these are arbitrarily fixed, the others must be properly related to them as dictated by the foregoing formulæ.

Formula No. 2 shows the same to be true for rectangular bars with any relations between b and h . Formulæ Nos. 1 and 2, compared together, show that the volume and weight of steel required in the rectangular form, to do the same work, represented by Pf , is just fifty per cent greater than is required in the circular form, if the same maximum S is not to be exceeded, and this is independent of the ratio b to h .

Both formulæ show that for a given work represented by Pf , the volume and weight of steel required will vary inversely as the square of maximum S allowed, and directly as the modulus G , and that therefore a steel of high elastic limit and low modulus of elasticity is the most economical in weight required for helical springs.

In the foregoing discussion, the distortion of the bar during the process of coiling has been neglected. It is generally understood that a circular bar assumes a slightly elliptic section ; but this is probably too slight to make it an object to roll the bars elliptical to some extent, and to coil them so that they would be circular in the helix. The slight bending action to which the bar is subjected under load has also been disregarded, as too small an item to modify the compression materially, and the factor of safety should be sufficient to cover any increased stress from this cause, if there be any.

An examination of Table I. indicates that the bars of smaller size would be most economical in weight of steel required, because the elastic limit of such tempered bars is higher than for the larger sizes ; but this again necessitates helices of small diameter, besides a more elaborate case to contain them, and they are liable to bend under load if in compression. The same table shows that the modulus of elasticity is not materially altered by the process of oil tempering, which warrants the conclusion that a spring of given design can not have its rate of compression per 1000 pounds altered by this process of tempering, so that the rate calculated by these formulæ must prevail so long as the design and the temper together will not allow the stress to reach the elastic limit when the spring has its maximum load. It is possible, however, that the rate of compression may be largely interfered with, and the maximum stress that the steel may be called on to sustain may be seriously altered by improper workmanship in coiling, so as to make the angle of pitch variable when it should be constant. This is a departure from the design, and if care is not taken in this respect as in every other, the spring will not act under load as the formulæ indicate.

DISCUSSION OF HELICAL SPRINGS.

The most interesting points brought out during the discussion were raised by Mr. William Metcalf, of Pittsburg, who has had many years experience in the manufacture of springs. Mr. Metcalf dwelt upon the fact that, owing to the tendency of every railroad official to insist upon the delivery of springs of his own design, there was endless variety of forms, and manufacturers are forced to abandon all independent efforts, and go by the principle that the best spring is the one which the customer wants. Mr. Metcalf highly complimented Mr. Cloud and the Pennsylvania Railroad Company, and agreed with him that the strain is mainly torsional, but he insisted that springs are subject to flexion, and to the strain as a beam loaded at one end. He insisted also that the bar of a spring is subject to transverse strains. A class X spring increased $\frac{1}{8}$ inch in diameter.

To show how much material is wasted, Mr. Metcalf quoted the fact that he split a volute spring diagonally, then removed one half of the material, and found that it did as well as before. A spring made of a bar $1\frac{1}{4}$ by $\frac{1}{2}$ inch steel, 54 inches long, was coiled on edge and made a 6-inch spring. When loaded with 6000 pounds, the spring was $3\frac{1}{2}$ inches high, and at 8000 pounds $3\frac{5}{8}$ inches high, closing $3\frac{1}{4}$ inches high. The same bar coiled flat gave a spring $4\frac{1}{2}$ inches in diameter and 8 $\frac{1}{2}$ inches high. At 4000 pounds, it was $7\frac{1}{8}$ inches high ; at 6000 pounds, $7\frac{3}{8}$ inches high, thus showing a motion of 660 pounds per $\frac{1}{8}$ inch, while between 6000 and 8000 pounds it was 200 pounds per $\frac{1}{8}$ of an inch. A spring made of one-inch round bar, $5\frac{1}{2}$ inches in diameter and 6 inches high, at 4000 pounds, the spring was $5\frac{1}{2}$ inches high ; at 6000 pounds, $5\frac{3}{8}$ inches, showing an average of 285.7 pounds per $\frac{1}{8}$ inch. At 8000 pounds the spring was $4\frac{1}{2}$ inches high, an average of 333 pounds ; at 10,000 pounds $4\frac{7}{8}$ inches, a resistance of 400 pounds per $\frac{1}{8}$ inch. The spring closed at $4\frac{5}{8}$ inch. These, and other examples quoted by Mr. Metcalf, showed that the motion of springs was not even. Mr. Metcalf urged, also that the duty of springs should be considered, and that the railroads generally insist that the spring should be so tempered that it will rather break than set.

Professor Rogers, of Cambridge, then presented a paper on the Practical Solution of the Perfect Screw Problem, which elicited a long discussion, in which many members took part, among them Messrs. Towne, Oberlin, Smith, Sweet, Bond, Reese, Woodbury, and Robinson.

THE EVENING SESSION

was opened by a paper by Mr. William Kent, of New York, on RULES FOR CONDUCTING BOILER TESTS,

which was brought forward by him with the object of creating an exchange of opinion concerning the advisability of adopting standard rules for conducting boiler tests. With this end in view, he has proposed the following rules :

PRELIMINARIES TO A TEST.

I. Establish the good condition of the Boiler.—Have heating surface clean inside and out, grate-bars and sides of furnace free from clinkers, dust and ashes removed from back connections, leaks in masonry stopped, and all obstructions to draught removed. See that the damper will open to full extent, and that it may be closed when desired. Test for leaks in masonry by firing a little smoky fuel and immediately closing damper. The smoke will then escape through the leaks.

II. See that the blow-off valve is perfectly tight, and that there are no leaks of water from the boiler. During the test, the blow-off pipe should remain exposed, and any water that escapes from it should be measured, or preferably it should be closed by a cap.

III. See that there is no other feed-pipe connected with the boiler than the one which delivers the measured water ; also that all connections with other boilers, either in water or steam spaces, are stopped with blind flanges. If an injector is used, it must receive steam directly from the boiler tested, and not from a steam-pipe or from any other boiler.

All connections to or from the boiler should be broken except those in use during the test. Then, if both pump and injector are attached to the boiler, the one or the other should be disconnected.

IV. See that the steam-pipe is so arranged that water of condensation can not run back into the boiler. If the steam-pipe has such an inclination that the water of condensation from any portion of the steam-pipe system may run back into the boiler, it must be trapped so as to prevent this water getting into the boiler without being measured.

V. Have an understanding with the parties in whose interest the test is to be made as to the character of the coal to be used. The coal must be dry, or if wet, a sample must be dried carefully and a determination of the amount of moisture in the coal made, and the calculation of the results of the test corrected accordingly.

Wherever possible, the test should be made with standard coal of a known quality. For that portion of the country east of the Alleghany Mountains, anthracite egg coal, or Cumberland semi-bituminous coal should be taken as the standard for making tests. West of the Alleghany Mountains and east of the Missouri River, Pittsburg lump coal should be used.*

VI. In all important tests, a sample of coal should be selected for chemical analysis.

VII. Establish the correctness of all apparatus used in the test for weighing and measuring. These are :

1. Scales for weighing coal, ashes, and water.
2. Tanks, or water-meters for measuring water.
3. Thermometers and pyrometers for taking temperatures of air, steam, feed-water, waste gases, etc.
4. Pressure-gauges, draught-gauges, etc.

VIII. Measure and record the dimensions, position, etc., of grate and heating surfaces, flues, chimneys, etc.

IX. Before beginning a test, the boiler and chimney should be thoroughly heated to their usual working temperature. If the boiler is new, it should be in continuous use at least a week before testing, so as to dry the mortar thoroughly and heat the walls.

STARTING AND STOPPING A TEST.

A test should last at least ten hours of continuous running, and twenty-four hours whenever practicable. The conditions of the boiler and furnace in all respects should be, as nearly as possible, the same at the end as at the beginning of the test. The steam pressure should be the same, the water level the same, the fire upon the grates should be the same in quantity and condition, and the walls, flues, etc., should be of the same temperature. To secure as near an approximation to exact uniformity as possible in conditions of the fire and in temperatures of the walls and flues, the following method of starting and stopping a test should be adopted :

At the regular time for slicing and cleaning fires, have them burnt rather low, as is usual before cleaning, and then thoroughly cleaned ; note the amount of coal left on the grate as nearly as it can be estimated ;

* These coals are selected because they are about the only coals which contain the essentials of excellence of quality, adaptability to various kinds of furnaces, grates, boilers, and methods of firing, and wide distribution and general accessibility in the markets.

note the pressure of steam and the height of the water-level (which should be at the medium height to be carried throughout the test) at the same time; and note this time as the time of starting the test; and fresh coal which has been weighed should now be fired. The ash-pits should be thoroughly cleaned at once after starting. Before the end of the test, the fires should be burned low, just as before the start, and the fires cleaned in such a manner as to leave the same amount of fire, and in the same condition, on the grates as at the start. The water-level and steam pressure should be brought to the same point as at the start, and the time of the ending of the test should be noted before fresh coal is fired.

DURING THE TEST.

1. *Keep the conditions uniform.*—The boiler should be run continuously without stopping for meal times or for rise of pressure of steam due to increased demand for steam. The draught being adjusted by means of the damper to the rate of coal combustion desired before the test is begun, it should not be changed during the test.

If the boiler is not connected to the same steam-pipe with other boilers, an extra outlet for steam should be provided, in case the pressure should rise to that at which the safety-valve is set; and in case of such rise of pressure, it should be reduced to the desired point by opening the extra outlet, without checking the fires.

If the boiler is connected to a main steam-pipe with other boilers, the safety-valve on the boiler tested should be set a few pounds higher than those of the other boilers, so that in case of a rise in pressure, the other boilers may blow off, and the pressure be reduced by closing their dampers, allowing the damper of the boiler tested to remain open, and firing as usual.

All the conditions should be kept as nearly uniform as possible, such as force of draught, pressure of steam, and height of water. The time of cleaning the fires will depend upon the character of the fuel, the rapidity of combustion, and the kind of grates. When very good coal is used, and the combustion not too rapid, a ten-hour test may be run without any cleaning of the grates, other than just before the beginning and just before the end of the test. But in case the grates have to be cleaned during the test, the intervals between one cleaning and another should be uniform.

2. *Keeping the records.*—The coal should be weighed and delivered to the firemen in equal portions, each sufficient for about one hour's run, and a fresh portion should not be delivered until the previous one has all been fired. The time required to consume each portion should be noted, the time being recorded at the instant of firing the first of each new portion. At the same time, the amount of water fed into the boiler should be accurately noted and recorded, including the height of the water in the boiler, and the average temperature of feed and pressure of steam during the time. By thus recording the amount of water evaporated by successive portions of coal, the record of the test may be divided into several divisions, if desired, at the end of the test, to discover the degrees of uniformity of combustion, evaporation, and economy, at different stages of the test.

When the pressure of steam and temperature of feed are nearly constant, half-hourly observations of each will be sufficient; but when there is considerable variation, observations should be made more frequently, and the figures recorded should be the averages for each interval of time rather than the figures which are observed at the end of the interval.

3. *Priming tests.*—In all tests in which accuracy of results is important, calorimeter tests should be made of the percentage of moisture in the steam, or of the degree of superheating. At least ten such tests should be made during the trial of the boiler, and the final records of the boiler test corrected according to the average results of the calorimeter tests.

On account of the difficulty of securing accuracy in these tests, the greatest care should be taken in the measurements of weights and temperatures. The thermometers should be accurate to within a tenth of a degree, the scales on which the condensed steam is weighed to within one hundredth of a pound.

REPORTING THE TEST.

The final results should be recorded upon a properly prepared blank, and should contain the following items:

1. Heating surface	square feet.
2. Grate surface (feet inches long by feet inches wide)	" "
3. Ratio of heating to grate surface	" "
4. Kind of fuel used	" "
5. Duration of test	" "
6. Average steam pressure	pounds.
7. Average temperature of feed	degrees.
8. Pounds of coal burned	pounds.
9. Pounds of refuse	" "
10. Pounds of combustible	" "
11. Per cent of refuse	per cent.
12. Coal burned per square foot grate per hour	pounds.
13. Total water evaporated	" "
14. Water evaporated per hour	" "
15. Water evaporated per square foot heating surface per hour	" "
16. Water evaporated per pound coal—Actual conditions	" "
17. Water evaporated per pound combustible—Actual conditions	" "
18. Water evaporated per pound coal—From and at 212 degrees	" "
19. Water evaporated per pound combustible—From and at 212 degrees	" "
20. Quality of steam. (Moisture or superheating)	" "
21. Rated horse-power. (Builder's rating)	H. P.
22. Horse-power developed at 30 pounds of water evaporated per hour from and at 212 degrees	" "
23. Per cent above (or below) rated capacity	per cent.
24. Temperature of boiler-room	degrees.
25. Temperature of flue gases	" "
26. Force of draught in inches of water	inches.

* The customary method of rating horse-power is 30 pounds of water per horse-power per hour from a feed-water temperature of 212 degrees into steam at 70 pounds pressure above the atmosphere, which is equal to 30-985 pounds from feed at 212 degrees into steam of the same temperature. The writer prefers the calculations both of economy and horse-power to be made on the basis of evaporation from and at 212 degrees, for the sake of both uniformity and of convenience in calculation.

The paper was discussed by Messrs. Le Van, N. W. Pratt, Emery, Woodbury, Nagle, Porter, Leavitt, and others. On the motion of Mr. Kent, it was decided to appoint a committee to determine upon a method of conducting boiler tests.

THE WORLD'S COPPER PRODUCT.

Messrs. Henry R. Merton & Co., of London, have compiled the following valuable table. Those figures marked with a star are estimated:

	1883.	1882.	1881.	1880.	1879.
	Tons.	Tons.	Tons.	Tons.	Tons.
Algiers.....	600*	600*	600*	500*	500*
Argentine Republic.....	293	800	307	300*	300*
Australia.....	12,000*	8,950*	10,000	9,700	9,500
Austria.....	500*	455*	455	470	245
Bolivia—					
Corocoro.....	3,250	3,250	2,655	2,000*	2,000*
Chili.....	41,099	42,909	37,889	42,916	49,318
Cape of Good Hope—					
Cape Copper Company.....	5,000	5,000	5,087	5,038	4,328
Canada.....	329	221	50	50*	50*
England.....	3,000*	3,464	3,875	3,662	3,462
Germany—					
Mansfeld.....	12,643	11,516	10,999	9,800	8,400
Other German.....	1,220*	1,743*	1,743	1,000	600*
Hungary.....	1,000*	976*	976	976	976
Italy.....	1,600*	1,400*	1,480*	1,380*	1,140*
Japan.....	2,800*	2,800*	1,900*	1,900*	1,900*
Mexico.....	489	401	333	400*	400*
Newfoundland—					
Betts Cove.....	1,053	1,500	1,718	1,500*	1,500*
Norway—					
Vigsnæs.....	2,340	2,300	2,350	2,040	2,000
Other Norwegian.....	290*	290*	290	386	412
Peru.....	395	440	615	600*	600*
Russia.....	3,000*	3,000*	3,000*	3,081*	3,081
Spain and Portugal—					
Rio Tinto.....	20,472	17,389	16,066	16,215	13,751
Tharsis.....	9,800*	9,000*	10,203*	9,151*	11,324*
Mason & Barry.....	8,600*	8,000*	8,170*	6,603	4,692
Sevilla.....	2,026	1,885	1,340	1,705	1,360
Portuguesa.....	2,357	1,700	1,410	1,000	770
Poderosa.....	1,000*	800*	800*	800*	800*
United States.....	52,080	39,300	30,882	25,010	23,350
Venezuela—					
New Quebrada.....	4,018	3,700	2,823	1,800	1,597
Total.....	193,454	174,596	159,711	151,057	149,156

PUMPING HOT WATER.—The proceedings of the Institution of Civil Engineers contain a paper on Pumping Hot Water, by Mr. Henry James Cole. The donkey-pump employed was single-acting, having a ram 3 inches in diameter, with a length of stroke of 7 inches. The pump was elevated to various heights; but the results being so nearly alike, allowing for difference in height and temperature, the table given below for 15 feet may be taken as typical of all. The supply-tank stood on the ground, the water in it being heated by a jet of steam. The suction-pipe was led directly to the valve-box with only one bend, and the delivery-tank was elevated to about the same level as the pump, the water being discharged through a valve loaded to 60 pounds per square inch. The following table gives the results of experiment No. 3 with the pump 15 feet above the water-level. It will be observed that at the speed of the pump had to be reduced for the higher temperatures:

Revolutions. Per minute.	Temperature Fahr. Degrees.	Hot water pumped per minute. Cubic inches.	Revolutions. Per minute.	Temperature Fahr. Degrees.	Hot water pumped per minute. Cubic inches.
70	70	3430	70	160	3286
70	100	3430	60	170	2682
70	120	3430	50	180	2180
70	140	3430			

Each quantity stated is the mean of several trials. Above 180 degrees Fahrenheit, scarcely any water could be pumped. According to Regnault, 185 degrees would be about the limiting temperature at 15 feet.

THE EXPANSION OF VOLUME OF METALS AT THE MELTING-POINT.—Herr E. Wiedemann has made a series of experiments on the expansion of volume at melting-point, and the relative rates of cooling of tin and certain alloys of bismuth and lead. The metal or alloy was inclosed in a closely-fitting glass cylinder, at the upper end of which was fixed a capillary tube. For filling the apparatus, oil was used, as it has the advantage of not evolving air when heated to 200 degrees C.; moreover, it does not possess an appreciable vapor-tension at that temperature. When heated above that point, the oil attacks the metal. The rate of cooling was determined by heating the metal at 260 degrees in an iron vessel. A thermometer protected by a glass cap filled with oil was inclosed within the molten mass. The whole apparatus was then immersed in a double-walled metallic vessel, the intermediate space between the walls being filled with water. In three experiments, it was found that tin on melting expanded in volume 1-76, 1-69, 2-20 per cent. Experiments also proved that soft solder expands almost two per cent of its volume in melting. An alloy of bismuth and lead, corresponding to Pb₂Bi of sp. gr. 11-4 begins to show an increase of expansion at about 120-136 degrees, which reaches its maximum at 180 degrees. When heated to 240 degrees, and allowed to cool, the temperature remained constant for long intervals of time at 180 degrees and 125 degrees, the two melting-points of the alloy. BiPb, sp. gr. 11-03, expands abnormally between 127 degrees and 132 degrees, melts at 146 degrees and 125 degrees. PbBi₂, sp. gr. 10-96, expands abnormally between 126 degrees and 132 degrees, melts at 140 degrees and 124 degrees. PbBi₃, sp. gr. 9-73, expands most markedly between 120 degrees and 136 degrees, melts at 125 degrees and 200 degrees. PbBi₄, sp. gr. 8-6, melts partially between 125 degrees and 130 degrees, contracts between 172 degrees and 204 degrees; its melting-points are 170 degrees and 120 degrees. The result of these experiments show that these alloys form a definite compound between PbBi and PbBi₂, whose melting-point is about 125 degrees, and in which the excess of one metal, lead or bismuth, as the case may be, dissolves. For equal increments of temperature, the proportion of the metal dissolved rapidly increases.

RUSSELL'S IMPROVED PROCESS FOR THE LIXIVIATION OF SILVER ORES.—IV.*

With Critical Remarks on other Methods of Copper, Silver, and Gold Extraction.

By C. A. Stetefeldt, New York City.

The following five experiments were made with Ontario ore that carried an unusually large percentage of zinc-blende. As in the previous case, a fraction of one per cent of salt (from three tenths to six tenths) remained in the ore. If we call the amount of fire generally used in chloridizing-roasting at the Ontario mill "normal," this condition was only maintained in experiment No. 4. In all other cases, extra fire was used, especially in Nos. 1, 2, and 3. The final results, that is, after the ore has remained on the cooling-floor, indicate that this extra fire is beneficial. In experiment No. 3, the admission of air was materially reduced, and the temperature was highest. The initial result in this case is the lowest of all, but the increase in per cent of silver extracted, after the ore has remained on the cooling-floor, is by far the highest, and the final result the best. When the ore in experiment No. 4 was discharged, it was not red-hot. Although the initial result is much better than in No. 3, the gain by remaining on the cooling-floor is less than one half of No. 3. Outside of the lixiviation tests recorded below, Mr. Russell also treated the roasted ore with caustic ammonia and concentrated brine. But without first going into an investigation of the solubility of silver compounds in these reagents, the results have little interest.

TABLE OF EXPERIMENTS.

Samples taken from inside of shaft and flue.	Experiment.				
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Value of raw ore, oz. per ton	74.8	83.2	82.4	102.8	79.5
Value of roasted ore, shaft, oz.	66.0	68.0	62.0	92.0	72.0
Value of roasted ore, flue, oz.	94.0	84.0	84.0	108.0	91.0
Per cent of salts soluble in shaft.	6.5	3.0	3.5	3.2	4.2
Per cent of salts soluble in flue.	2.0	1.5	1.5	5.0	2.1
Per cent of sodium hyposulph. in shaft.	14.0	7.5	9.5	10.7	9.3
Per cent of sodium hyposulph. in flue.	9.0	5.0	6.5	7.0	6.0
Per cent of silver extracted by shaft.	5.2	5.3	5.8	4.8	5.6
Per cent of silver extracted by flue.	12.0	...	...	4.0	...
Per cent of silver extracted by ordinary solution.	30.9	20.9	31.5	23.0	27.5
Per cent of silver extracted by extra-solution.	29.0	26.9	15.0	25.2	18.8
Per cent of silver extracted by extra-solution.	66.5	60.6	50.0	59.6	66.7
Per cent of silver extracted by extra-solution.	61.6	70.9	45.5	66.3	67.8

Samples taken after the ore has remained 16 hrs. on cooling-floor.	Composition of charge, about, parts.				
	3 shaft, 2 flue.	3 shaft, 2 flue.	Shaft only.	4 shaft, 1 flue.	Shaft only.
Per cent of salts soluble in water	8.5	5.0	6.7	5.5	5.5
Per cent of salts sol. in sod. hypos.	13.2	9.5	12.7	11.0	10.0
Per cent of silver extracted by water	2.0	...	12.6	6.8	10.0
Per cent of silver, ordinary solution	74.2	64.8	83.4	35.3	73.7
Per cent of silver, extra-solution	84.0	80.0	85.8	77.6	81.9
Increase of per cent in silver extracted by extra-solution, as compared with the samples taken from inside of shaft and flue, considering the composition of charge.	19.5	15.3	35.8	16.7	15.2
Per cent of silver extracted by lixiviating 2 tons	85.0	72.1	85.7	74.4	80.6

The first question which presents itself in reviewing this interesting table is: In what condition does the silver exist in the roasted ore? The silver soluble in water is undoubtedly present as silver sulphate. From the fact that a large percentage of silver is extracted by ordinary solution, especially considering the final results, it follows that the principal part of the silver must be in a combination equally soluble in ordinary and extra-solution. As such, we have found the arsenates and antimonates of silver. Nearly all the silver in Ontario ore occurs as fahl-ore, and from it these combinations are derived. Some silver, it is fair to presume, is present in metallic form, and this is easily soluble in extra-solution. Silver sulphide as such does not occur in the ore, and, supposing it to be present, is so easily oxidized that it can hardly exist after roasting.

The solubility tests of roasted ore in water show a marked difference between shaft and flue. In chloridizing-roasting, the formation of sulphates takes place principally in the flue. The salt converts the sulphates of copper and zinc completely into chlorides in the shaft, but not in the flue. The larger percentage of sulphates formed in oxidizing-roasting in the shaft of the Stetefeldt furnace must be due to the greater coarseness of the ore which is here deposited. It will be seen, from the difference in value of the roasted ore in the shaft and flue, that the latter contains much more silver-bearing mineral, and that in consequence more sulphates might be expected in this portion of the ore. After the roasted ore has remained red-hot for a considerable time on the cooling-floor, the quantity of salts soluble in water and sodium hyposulphite has materially increased. The sulphates of copper, zinc, and manganese react most energetically on the silver, increasing the quantity of silver sulphate, antimonate, and arsenate, and thus converting it into combinations soluble in hyposulphite solutions.

I can not end this discussion without pointing out the practical importance of these experiments. If it is possible to extract silver by lixiviation without using salt in roasting, we not only save the expense of the salt, but also the cost of drying and crushing it, and of the plant needed for these purposes. For localities where salt is very costly and the ores are of low grade, a decrease in the yield of silver of several per cent would still leave a balance in favor of oxidizing-roasting.

* Read at the Cincinnati Meeting of the American Institute of Mining Engineers.

From the facts recorded about the influence of time in muffle-roasting, it appears that a momentary roasting is an essential condition to the success of the process. It seems difficult to convince the majority of metallurgists of the advantages, and even of the possibility, of this method.

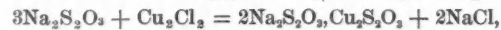
I will state here, that it is a common practice in silver mills to be penurious in the use of salt in chloridizing-roasting, and the ordinary so-called "mill-man" rarely takes pains to experiment on this important subject.

No general rules can be given, and only actual tests fully decide the question. The following series of tests, made with Ontario ore, plainly show the effect of an increase in the percentage of salt:

Ontario ore roasted with	Silver chloridized.
2 per cent salt.	44.5 per cent.
4 " "	52.0 " "
6 " "	60.4 " "
8 " "	76.0 " "
10 " "	82.8 " "
12 " "	88.4 " "
14 " "	90.9 " "
16 " "	93.0 " "

§ 20. Extra-Solution with Cuprous Chloride.

In § 7 we have seen that cuprous chloride is dissolved by sodium hyposulphite. In the reaction taking place, expressed by the equation,



the same double salt is formed as the one we discussed in the preparation of the extra-solution with copper sulphate in equation No. 3. In comparing the above formula with that of equation No. 3, it is easily seen that with Cu_2Cl_2 much less sodium hyposulphite is required with copper sulphate, to produce standard extra-solution of equal strength. Hence, it might be considered economy to use cuprous chloride in the preparation of the extra-solution. But the difficulty and expense of first preparing cuprous chloride make this impracticable. The question has, however, an important bearing in another respect. If a silver ore which contains copper is subjected to a chloridizing-roasting, more or less copper sulphate and cuprous chloride will be formed. In former publications, I have pointed out a curious fact that was observed in analyzing samples of Ontario ore roasted in the Stetefeldt furnace. The ore from the shaft contained 0.16 per cent copper in the form of cuprous chloride, and only a trace of sulphate; the ore roasted by the auxiliary fire in the flue and dust-chambers contained only a trace of cuprous chloride, but 0.30 per cent copper in the form of sulphate. In the lixiviation process, a leaching with water being imperative before the hyposulphite solution can be applied, it is the insoluble cuprous chloride only which remains in the ore, and even a part of this is dissolved by the wash-water, especially if the roasted ore contains undecomposed salt. From this, it follows that the extra-solution formed by the cuprous chloride in contact with ordinary solution can only be very weak, and that its effect can not be very pronounced.

§ 21. The Extraction of Silver from Copper Matte.

The Ziervogel process is, theoretically, the most simple and advantageous for the extraction of silver from copper matte. But in practice we find its application rather limited. It is adopted in its greatest perfection at the works of the "Mansfelder Kupferschieferbauende Gewerkschaft," in Germany. But even here, many charges have to be returned for a second roasting, whenever they contain above 0.023 per cent of silver. In England, the Ziervogel process has been used to extract the largest portion of the silver from copper matte, followed by a roasting of the residues with salt, and lixiviation of the silver chloride by Augustin's method. In the United States, the Ziervogel process is in operation in Colorado; but with rich mattes, desilverization of the residues is by no means so perfect as is desirable. If we inquire into the conditions essential for a successful working of this process, we find the following requirements must be fulfilled:

- 1st. Absence in the copper matte of such sulphides as in roasting change to sulphates, and are liable to sinter: PbSO_4 .
- 2d. Absence of such sulphides as, after oxidation, and in contact with Ag_2S and Ag_2SO_4 , are liable to form silver salts insoluble in water: Ag_3AsO_4 and AgSbO_3 .
- 3d. Absence in the matte of metallic copper, the silver contents of which would be lost.
- 4th. Roasting-furnaces of such construction must be used that a complete combustion of the gases takes place, and the possibility of the formation of cuprous oxide is excluded.
- 5th. Complete control of the temperature, so that the CuSO_4 can be decomposed without affecting the Ag_2SO_4 .
- 6th. A very careful roasting is essential, commencing at a low temperature, which is gradually raised and increased, so as to decompose the CuSO_4 only. This requires skilled laborers who are trained especially for the work.

When Mr. Russell had discovered the peculiar reactions of his extra-solution, it became at once evident to me that the Ziervogel process could be used to advantage in many cases where it is inapplicable now and also that a less delicate management of the roasting process might still lead to satisfactory results. To effect this, it would only be necessary, first, to lixiviate with hot water, and then, without removing the charge from the tanks, to apply the extra-solution. Any metallic silver, Ag_2S , Ag_3AsO_4 , and AgSbO_3 must then go into solution, and only such silver combinations would be lost as are inclosed in sintered and melted particles of the charge.

The experiments so far made are only few, but indicate the probability of success. Mr. Russell experimented principally on roasted matte from Colorado, with the following results:

The roasted copper matte contained 511.5 ounces of silver per ton.

There were extracted of the silver:	
By lixiviation with hot water	87.5 per cent.
" " made acid with H_2SO_4	89.0 " "
" " and subsequently with ordinary hyposol.	90.3 " "
" " and subsequently with extra-solution as per § 17	95.4 " "
	95.7 " "

Consequently in this case, 6.55 per cent, or 33.5 ounces more silver per

THE SMITH EXHAUST-FAN.

The Huyett & Smith Manufacturing Company, of Detroit, Mich., has, in the Smith fan, brought out an appliance that contains some novel features, calculated, we believe, to largely increase its efficiency. Our large engraving merely gives a general notion of its design, the details of the construction being more clearly brought out in Figures 2 and 3. It is a characteristic of fans as generally designed that their blades work in a case just enough larger than the blades to give them free working space.

As the section in Fig. 2 will show, the fan has two air-delivery cham-

DEAD CALIFORNIA MINING TOWNS.

All of the old California mining towns, says the San Francisco *Chronicle*, are in a decayed or decaying condition. Some of them, most flourishing from 1849 to 1854 or 1856, are blotted from existence and lost to memory save in the immediate neighborhood where they once stood. Nearly every one of the placer mining counties has some such melancholy unwritten histories of its own. Perhaps El Dorado, where the first placer was discovered, has the most. In 1850, there stood an exceedingly lively town on a stream known as Mathenas Creek, a tributary of the Cosumnes, which "forty-niners" christened by the preten-

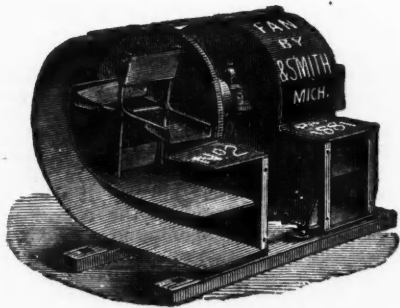


Fig. 2.

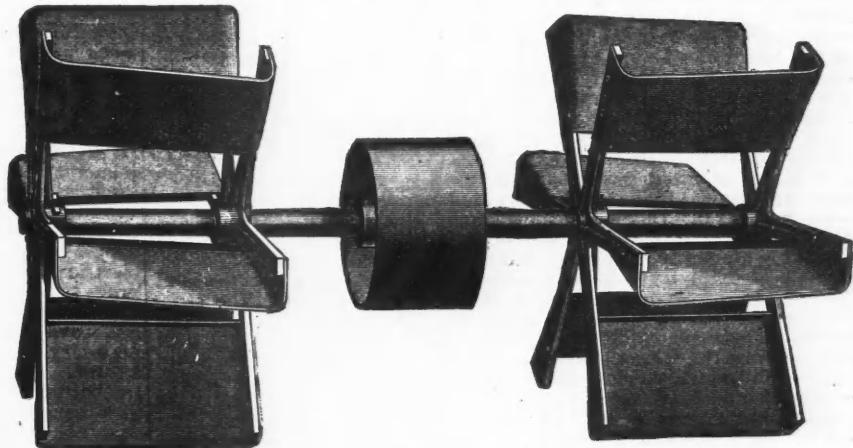


Fig. 3.

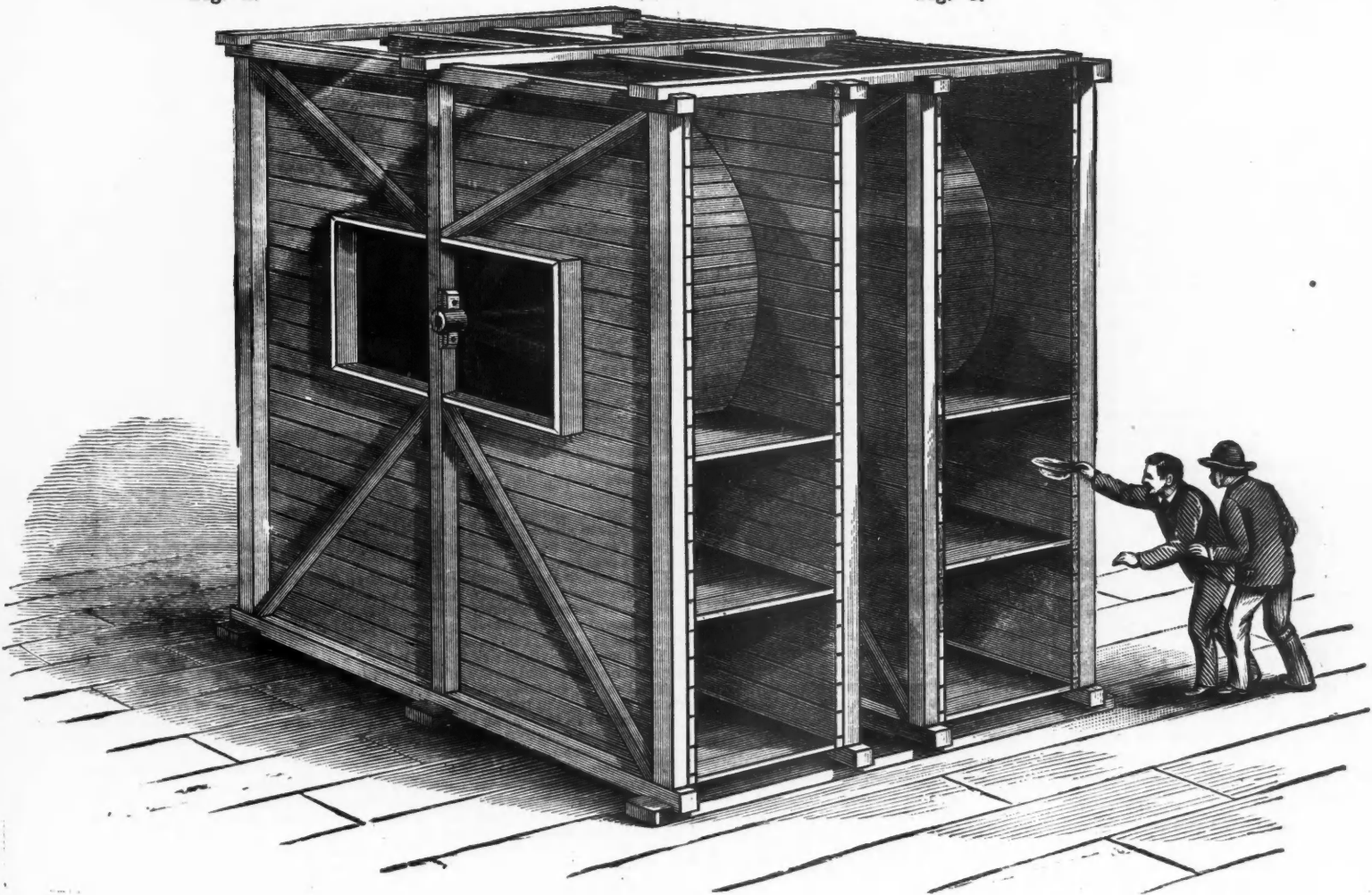


Fig. 1.

THE SMITH EXHAUST-FAN.

bers instead of one, the air being drawn into the fan through the opening in the side, shown in Fig. 1. Each blade, during its revolution, therefore discharges air, during one half of its course toward the rear of the fan-case into the lower chamber. After it has passed the cut-off, it delivers the air before it through the upper chamber. This arrangement, simple as it is, must naturally largely increase the efficiency of the fan, since it theoretically nearly doubles its capacity, or, with the same volume discharged, approximately reduces the power required to one half. The form of the blades, which we may mention incidentally are of steel, is such that by their screw-like twist they draw the air into the fan-case and from the inlet opening, taking it where the blade can most effectually crowd it forward without any back-lash.

tious name of Aurum City. The country was full of cities in those early days. Besides Sacramento City, the county of Sacramento had a place toward its eastern line called Prairie City, which lasted till about 1865, and then vanished out of sight, since then out of memory. Folsom was originally called Granite City, and then Granite, so named by Dr. L. Bradley, a gentleman whose enterprise created the first considerable mining canal in the State, drawing water from the north fork of the Cosumnes to the dry diggings around Diamond and Mud Springs and old Weavertown, on Weaver Creek. Bradley bought up some old type, cases, and a press that had passed through two or three fires at Colonia and Diamond Springs, and with this shabby material started a weekly paper in the early spring of

1856, at Folsom, naming it the *Granite Journal*, from which the town took and held the name of Granite till the paper sold out to the Republicans as a Fremont organ. In 1855, the place known as Mormon Island, three miles east of Granite, was as large a town as Folsom now is. At present, it is a mere shadow of what it was. In 1851, Aurum City contained a population of 1200, and that in those days implied at least 1150 active workers in the mines, on an average earning from \$10 to an ounce a day to the worker. In 1856, Aurum was in the list of decayed towns, and ten years later it had "gone glimmering amid the dreams of things that were." Even the name of Mathenas Creek is now extinct, save in El Dorado County, where it constitutes an election precinct, or did a few years ago, and the Cosumnes is now the modern substitute for the ancient "Macosuma" River. Nobody from 1849 to 1854 called Placerville by any other name than "Hangtown," which it earned at the hands of a mob, and by and by exchanged for its present more euphonious name. As early as the fall of 1848, prospecting had extended from Coloma, on the south fork of the American, over to Weaver Creek and northward to the middle and north forks, and eastward to Weaver town, and the following winter upward to Placerville and Kelsey's. Within a radius of fifteen miles from Coloma, there were, in the summer of 1850, not less than twenty towns, "cities," and camps, the largest being Hangtown, Diamond Springs, Mud Springs, Georgetown, Uniontown, Spanish Dry Diggings, Ringgold, and Weaver town. All of these, save three or four, have gone out of existence, and the three or four remaining are now chiefly supported by orchards and vineyards.

The largest and best vineyard anywhere in the mining counties is at Coloma, and its beginnings are a quarter of a century old. The same town produced the first saw-mill and peach orchard in the mines, and its peaches have become famous throughout the State. The saw-mill went early, because the talcose slate rock on which it was built contained diggings rich enough to yield \$50 a day to the man. There was a marked poverty of nomenclature among the early miners, and "bars," and "Indian Creeks," "Dry Creeks," and "Cañon Creeks" were numerous. The forks of the American, Cosumnes, Mokelumne, Yuba, and Feather rivers had their "bar," towns, and camps at every hand, some of them containing as many as 300 or 400 workers. All these have vanished. Michigan Bar, Red Dog, Dry Creek, in El Dorado; Doton's Bar, Poverty Bar, Rich Bar, are now either as houseless and lonely as they were before gold was discovered, or turned into orchards or vineyards.

Contemporary with the movement of prospectors in the fall of 1848 upon the streams and gulches around Coloma, there was a like one in the direction of the Mokelumne and Tuolumne rivers. Soldiers of Stephenson's Regiment on furlough broke ground at Mokelumne Hill and thereabouts in the winter of 1848, and in the summer of 1849 Chilians and Mexicans settled places known by the sacred or saintly names of Jesus Maria, San Antonio, San Andreas, and San Domingo. The last-named town in 1853 contained 1000 thrifty miners; but as early as twenty years ago it had so completely disappeared that not even a chimney was left, and the coyotes had repossessed the ruins of many of the most flourishing mining camps of Calaveras and Tuolumne before the outbreak of the civil war. In 1859, Columbia was a little city, as well built and as populous as Santa Rosa, the present county-seat of Sonoma County. Ten or fifteen years later, it was entirely deserted by the white miners, and brick houses, constructed at a cost of \$10,000 each, were sold to the Chinese, who removed them to get at the diggings they were built upon, and the Columbia of to-day is the picture of the saddest desolation. Big Oak Flat, Volcano, Indian Diggings, Sebastopol, Alta-ville, Angels, Vallecito, Jamestown, Chinese Camp, Campo Seco, Cook's Bar, in the southern mines, and Parks's, Rose's, Rich and Independence bars and Howland's Flat, Gibsonville, Port Wine, Rabbit Creek, Nelson's Creek, in the north, all of them famous and rich placers thirty years ago, are now mere memories.

In the far north, the desertion of the mining towns was so complete that the political existence of one of the famous counties of early times has ceased. Klamath is no longer a county. In its place, we have Modoc, Lassen, and Del Norte, supported by lumbering and live stock industries. Among the mining towns that have survived to the present from the earliest years of placer mining most reputedly with regard to wealth and population are Auburn, Nevada, Shasta, Grass Valley, Sonora, Murphy's, and Oroville. But all around them, places that were once as rich and as prosperous have perished. Rough and Ready, Cherokee Diggings, and Ophir were, in their day, as much sought after as the lost cities of the Euphrates and Tigris; alas! now invisible for evermore. Such as remain have been saved from ruin by railroad communication—notably Auburn, Nevada, and Shasta—and by the turn of labor from the mines into the cultivation of orchards, vineyards, and the manufacture of lumber or the rearing of sheep and Angora goats. Of the 5,000,000 sheep in this State, probably one half are subsisted in the old mining counties, grazing in the spring among the ruins of ancient and forgotten "camps" and "cities," "bars," "gulches," and "cañons," out of which hundreds of millions were taken for the enrichment of every part of the earth more than California, and to the extreme impoverishment of the particular regions known as the placer mines. There is no sadder sight in the world than one of these deserted towns, with the scorched remains of its hotels, cabins, stores, and saloons, and the ground all around it torn into cuts or heaped in piles, so that no plow can ever make it useful for agriculture, even if it contained the elements essential to that purpose. Something like an idea of the wreck and ruin that have been wrought may be conceived when the reader is informed that within the present generation there were three or four towns in these now desolated districts that contained each a greater number of laboring men in constant and profitable employment than San José or Los Angeles or Stockton or Sacramento now, and that for the first years of its existence as a county El Dorado had as many senators in the Legislature as San Francisco, and eight assemblymen to our nine; while now we have a larger representation in the Legislature than all the old mining counties together.

In fact, these decayed and still decaying counties are a serious discount on the State's resources, financially and politically, and will remain such until railroads and woolen and other manufactures resuscitate them. It is not at all a scandal to say that it is upon the representatives from these impoverished counties that corporation evil influences have in

the recent past been brought to bear in the greatest potentiality, and yet with the minimum of cost to the purchasers of votes. The reason lies right on the surface. It is found in the general poverty of the people and the instability of that part of the population which can get away, and is always on the alert for a "raise" to enable it to move into regions where something more of life, society, and wealth may be found.

THE CONDUCTIVITY OF COPPER.—The true nature of electrical resistance, says *Engineering*, is by no means well known, and the only light which the induction balance of Professor Hughes has as yet shed upon it has not revealed its true nature. An interesting observation recently made by Mr. W. Groves deserves to be more widely known. Mr. Groves took thin disks of brass and coated them by electro-deposition with a thick layer of pure crystalline copper. He then cut similar disks of copper from the deposit and tested them in the induction balance. The scale gave 200 as their induction value. The same disks, after being melted in a founder's furnace, only gave 100 on the scale; and after a second melting, their induction value had fallen to nearly that of ordinary sheet-copper, namely, from 50 to 80 degrees. If, as many believe, the induction value represents the conductivity of the copper, there is here a great falling off, and it might be valuable, not only in a theoretical but in a practical sense, to find out the true cause. Dr. Mathiessen found that copper lost in conductivity by absorption of oxygen, and the pure copper being fused in an ordinary founder's furnace may have lost its electric conducting power by absorption of this impurity. Should that prove to be the case, there is much to be gained by fusing copper in presence of hydrogen, which, uniting with the oxygen, would form water and leave the copper in its pure condition. To ascertain this, it will be necessary to call in the aid of chemistry and analyze the copper so treated. Mr. Grove's experiment is interesting as opening up a field for further investigation. Should the effect in question not be traceable to the absorption of oxygen, it may be due to the molecular structure of the copper in the three cases mentioned, the crystalline structure of the first case being more conductive than the molten structure in the other two cases.

FURNACE, MILL, AND FACTORY.

Messrs. Heald & Morris, of Baldwinsville, Onondaga County, New York, manufacturers of steam-engines and centrifugal pumps, have issued a new catalogue containing illustrations and descriptions of their various styles of engines and of their centrifugal pumps.

Thomas Binns, metallurgist, assayer, and gold and silver refiner, has removed his works and office to No. 40 Ann street, this city.

The steel rail mill at the Bessemer works, Pueblo, Colorado, closed May 12th, for an indefinite period. All the other departments of the works will continue in full blast.

Sir Titus Salt, Charles Stead, of Saltaire, England, and William Donaldson, of Glasgow, the owners of 28,000 acres of mineral lands near Chattanooga, Tenn., are at present in that city, and have decided to erect on their tract two large blast-furnaces, with a capacity of 250 tons per day. The investment will reach \$500,000, and will be expended within the next fifteen months.

At Pittsburg, there are still five furnaces out of blast, but one of these, the Soho, will soon be ready to be blown in. Lucy No. 1 will require the labor of a month before it is ready. The outlook is not favorable to an increase of production. The American Iron-Works consume the product of the Eliza as rapidly as it is made, and both the Isabellas ship daily, so that not a pig is kept in stock in the yard. The supply of pig at the mills is very small, some not having more than enough to run three days.

The Western Nail Association will meet at Pittsburg on the 28th inst., to further consider the pool project.

The Dickson Manufacturing Company, of Wilkes-Barre, Pa., will furnish the hoisting-engines for the Tripp shaft at Scranton, Pa., which is operated by the Delaware, Lackawanna & Western Coal Company. It has also shipped to the Delaware & Hudson Coal Company, at Whitehall, New York, two hoisting-engines.

The McKeesport, Pennsylvania, mills of W. D. Wood & Co. have resumed operations in all departments but the Russia sheet-iron.

The foundry at Frostburg, Maryland, owned by Thomas H. Paul, was sold at sheriff's sale May 10th.

The Lechner Manufacturing Company, Columbus, Ohio, has recently made large shipments of its roller detachable chain elevators, conveyers, and driving-belts to Wisconsin, Pennsylvania, and New York. Its chains are rapidly coming into general use throughout the country. Owing to its peculiar construction, it has great strength, and is very durable.

The forge department of the Kelly Nail and Iron Company, at Ironton, Ohio, was burned May 22d; loss, \$50,000, fully insured.

The Pratt & Whitney Company, of Hartford, Conn., have, after years of experiment, succeeded in making taps for stay-bolt holes in boilers very perfect in pitch and straight in length, an achievement worthy of note. These taps can be furnished of any length from 12 inches to 54 inches, and of any desired diameter, form, and pitch of thread.

The Marinette Iron-Works Company, of Florence, Wis., is building two 17-inch Cornish pumps for the Chapin mine, Iron Mountain, Mich.

The sheet-mill of the Reading Iron-Works has resumed operations.

The Hartman Steel Company, of Beaver Falls, Pa., is building an addition to its recently completed wire nail works.

The production of the rail mill of the Pennsylvania Steel Company, at Steelton, Pa., for April was 11,168 tons of steel rails, an increase of 2029 tons over the corresponding month of last year. The total tonnage in the Bessemer mill was 15,074 tons, being an increase of 994 tons over the corresponding month last year.

The Pennsylvania Steel Company is furnishing the 70-pound rails with which the Philadelphia & Atlantic City Railroad is replacing its old 40-pound rails. The angle splice bars for the work are being made by the Philadelphia & Reading Coal and Iron Company's rolling-mill at Reading.

The firm of Witherow & Gordon, engineers and contractors, and agents for the Whitwell hot-blast stoves, was dissolved by mutual consent on April 18th, Mr. Gordon retiring and Mr. J. P. Witherow succeeding to the business of the firm.

The Wheeler Iron Company, at Middlesex, Pa., has shut down.

The failure of the Colorado Machinery and Manufacturing Company, of Pueblo, Colorado, is announced, and attachments to the amount of \$68,000 have already been levied on the company's property. The entire indebtedness will aggregate from \$100,000 to \$150,000, and the assets are placed at about \$100,000. The amount due the National Tube-Works Company is \$47,000, for all but \$2000 of which the company has a chattel mortgage.

Messrs. Eimer & Amend, of Nos. 205, 207, 209, and 211 Third avenue, this city, the well-known importers and manufacturers of chemical apparatus and assay materials, have issued a catalogue giving a very complete list of current prices of chemicals.

The mill of the Kelley Nail and Iron Company, at Ironton, Ohio, was partially destroyed by fire May 21st. The damage is estimated at \$25,000, which is covered by insurance.

The stockholders of the Reading Iron-Works, May 21st, agreed to increase the capital stock by an issue of \$550,000, making the total capital \$1,050,000. The object of the increase, all of which is preferred stock, is to wipe out the floating debt of the company, which is extinguished thereby. The holders of the extension notes of the company have agreed to take the new stock.

The Fuel-Gas Company, of Pittsburg, Pa., has let the contract for the double line of pipe between Pittsburg and Murraysville, to the Pennsylvania Tube-Works. About forty miles of pipe will be required, and the contract calls for its delivery within sixty days. The cost will be nearly \$275,000. Bids were received from eleven firms.

The Cambria Iron-Works Company, Pennsylvania, has filed a bill in equity in the Supreme Court, at Boston, Mass., against the Cincinnati & St. Louis Railroad Company. The plaintiff alleges that the defendant road is indebted to it in the sum of \$22,949 for steel rails.

The workmen at the Glendower Iron-Works, of Danville, Pa., left work on May 17th, not receiving their pay, and the mill has been idle since. It is thought that the company will ask for an extension from its creditors.

The Black Diamond Steel-Works, of Pittsburg, Pa., is to make plates for the boilers of two ocean steamers, to be built at Cramp's Philadelphia yard, and two tow-boats. The latter require 12-ton ingots.

The Hydraulic Power Company has just completed an immense plant of air-compressing machinery at Little Quinnesec Falls, on the Menominee River, Michigan. The object of the plant is to utilize the force furnished by the stream for the work heretofore done by steam at the mines near Iron Mountain, three miles distant. Two pairs of Rand compressors, 32-inch cylinders 60-inch stroke, run by a water-wheel, give 1000 horse-power, all that is necessary. A line of 24-inch pipe conducts the air two and seven eighths miles. Cost, \$325,000. Only one sixth of the water capacity is used.

LABOR AND WAGES.

In the Senate, May 14th, the bill to establish a bureau of labor statistics was taken up and discussed, but no action taken.

The Coal Creek, Tennessee, miners have been out since the 1st of April, against a reduction of 12½ cents a ton.

The miners of Braidwood, Eureka, Diamond and Coal City, Illinois, have agreed to accept the terms offered by the coal companies for another year. The contract for the next year is the same as last year in the general prices and all other conditions except the sliding-scale, and that is left out for the present year.

The miners in the different works at Warrior, Alabama, are all out on a strike against a reduction of ten per cent. They get at present 82½ cents a net ton. The coal ranges from two feet four inches to one yard, and at the present price the miners have to labor hard to make reasonable wages. The probabilities are that, unless the operators make some concessions, the strike will be one of the longest on record.

The miners of the Brazil, Indiana, coal district met in mass convention in Brazil on the 7th inst. and decided to prolong the strike. They reaffirmed their former declaration that they would not go to work at 75 cents, and continued their arbitration and other committees for an indefinite period.

Serious trouble is reported at the Rising Fawn furnace, at Cartersville, Georgia, owned largely by Senator Brown, who is discharging his free white laborers and filling their places with negro convicts.

At a meeting of the Executive Association of Engineers, held in this city May 18th, resolutions were passed censuring the Roosevelt Investigating Committee for not taking action on the complaint made by the association in regard to the abuses in the office of the Inspector of Steam Boilers.

The stove mounters in three of the foundries at Troy, New York, have withdrawn from the Union; and in the other establishments work is resuming with apprentices and other non-union employes in the mounting departments. The stove manufacturers do not intend in future to submit to trades-union dictations, and the labor organizations will hardly ever be as strong again in Troy as they have been in the past. The Stove Mounters' Union ordered members working in non-union shops to strike. The order was ignored by the mounters.

Sheldon & Co., of Auburn, New York, closed their rolling-mill May 21st, throwing out about 100 men. The low price of manufactured iron and a heavy verdict recently obtained by an employe for damages for an injury are the cause.

The salaried employes of the Edgar Thomson Steel-Works, at Braddock, Pa., have been notified that a 10 per cent reduction in their wages will be made on the first of June.

Ex-President Gowen of the Philadelphia & Reading Railroad has stated, respecting the rumors of the issuing of scrip by that company for wages and materials, that no scrip has yet been issued to any of the employes. The company had made its payment for material and supplies in ordinary four-months' notes instead of cash. It was contemplated to issue scrip bearing interest for the wages payable in May and June; and when this issue was made, it would be for the railroad hands, at three months with interest, and for those of the Coal and Iron Company, at thirty days with interest; the reason for the difference being that a recent act of the Assembly made it illegal for mining and manufacturing companies to issue scrip for the payment of wages extending over a greater period than thirty days, and that by the time the announcement of the issue of this scrip was made public, it would be accompanied by an announcement that the workmen could get cash for the scrip for its full face value at once. The company has to pay out in June and July for rentals and interest about \$3,700,000. If it could have had full work in May and June, it could have earned, over and above the fixed charges in those two months, more than enough to meet these large payments for interest and rentals. Although the company has good collaterals, and in ordinary times could have borrowed the money to tide over, at present it would be folly to pay out the money in hand and rely on the ability to borrow; and hence it is considered wiser to issue scrip for the wages, which is a fixed lien upon the property of the company. The relief afforded by the issues of scrip will amount to \$1,000,000 more in cash than is required by the company to pay the entire rental and interest accounts for June and July. Dispatches from Wilkes-Barre state that this report has caused great excitement at Ashley, Pa., where the company has nearly one thousand men employed.

RAILROAD NEWS.

In compliance with the order to reduce expenses wherever possible, 350 men were discharged May 16th, from the shops of the Philadelphia & Reading Railroad at Reading. This makes over 500 hands discharged since May 10th. It is calculated that the suspension of unnecessary work along the main line and the Jersey Central road will save about \$150,000 a month.

The long-deferred case of Peter Cullen against the Reading Railroad Company was amicably settled on private terms, May 16th. The suit was brought in 1878, and was for the recovery of the \$10,000 reward offered for the arrest and conviction of the burners of the Lebanon Valley bridge in the railroad riots of 1877.

The railroads running into St. Louis through the coal mining region of Illinois have for five years maintained a coal pool. The rate was fixed at 2½ cents a bushel. The clause of the agreement provided that the Wabash could haul coal intended

exclusively for the shops and operating departments of the Gould system at 1½ cents. Several large contracts were recently secured by the Wabash, which the other lines said were obtained by putting the 1½ cent coal on the market in violation of the agreement. The Wabash denied this, but the other roads refused to believe the denial, broke up the pool, and reduced the rates to half a cent per bushel, which is less than the cost of hauling. The Gould lines control all the tracks and it is impossible for other roads to deliver coal in St. Louis without using the Gould tracks. The latter has hitherto charged \$2 a car for switching. May 15th, in retaliation for the cut in coal rates, switching charges were advanced \$2 a car. This will, if continued, compensate the Wabash for its loss by the cut in coal rates.

The Rochester & Pittsburg Company reports a very good coal business. The work is done on contracts made some time since at good rates.

A traffic agreement has been reached by the Union Pacific and Northern Pacific roads for an interchange of freight and passenger business at non-competitive points, beginning June 1st.

The survey for the proposed extension of the Kansas City, Fort Scott & Gulf Railroad eastward from La Cygne has begun. It will extend to Clinton, Mo., by the way of Butler. The route runs through several miles of very valuable coal land. It is surmised that the eastern terminus of the road will be St. Louis.

During April, the Denver & Rio Grande Railroad carried sixty-one cars of ore, aggregating 1,230,000 pounds, from Utah to Colorado, to be smelted. In the same time, the road brought sixty-five car-loads of Colorado ore, 1,270,000 pounds, for reduction at the Utah smelters.

COAL TRADE NOTES.

CANADA.

PROVINCE OF NOVA SCOTIA.

Judgment was given in the Supreme Court at Halifax, May 15th, in the case of D. C. Fraser vs. The Halifax & Cape Breton Coal and Railroad Company, an action for lawyers' fees. Plaintiff was awarded the amount of his claim, \$6034.

COLORADO.

The Colorado Coal Company has filed articles of incorporation. The capital stock is \$1,000,000. The directors are James H. Caldwell, L. M. McDonald, and George C. Norris. The company will operate in Fremont County.

A large force of men is at work on the coke-ovens at Durango, and it is expected the ovens will be ready for use by the first of June. They will have a capacity of about twenty-five tons of coke per day. The most of this coke will be used in the smelter at Durango, but some will be shipped to the smelters in the mountains.

The coke-ovens of the Colorado Coal and Iron Company at Crested Butte are gradually firing up. An order for two hundred tons has been received from the Mingo Furnace Company, of Utah.

MARYLAND.

Jackson, Detmold, Old and New Coney, and Koontz mines, at Lonaconing, are working full-time, with an occasional half-day. Pekin mine is working full-time. Big Vein has suspended operations. New Detmold mine worked 11½ days during the first two weeks in May, with an average output of 45 tons per man. The Jackson mine for the same period worked 11 days, with an average output of 65 tons per man.

NEW MEXICO.

The Gallup and Defiance coal mines, near Albuquerque, have been purchased by Denver capitalists. A company will be formed, which will be called the Denver & Gallup Coal Company, with a capital stock of \$300,000.

OHIO.

The Washington mines, at Washingtonville, are doing reasonably well. The Fairview mine is running steadily, as is also Waiters & Co.'s mine, but the men do not get as much work as they can do. Cars are scarce.

By the passage of the new mining law in Ohio, the State was divided into three districts. Inspectors were appointed as follows: First District, William Dalrymple, of Nelsonville; Second District, William A. Davis, of Cambridge; Third District, Austin King, of Salineville. Thomas Bancroft is the Chief Inspector.

The Youghiogheny and Ashtabula coal mines, at Robbins's station, have caved in, and it is thought the mines will be ruined. Men are at work trying to prop up portions of them that have not yet fallen down, but they have to work with extreme caution, as the pit is filled with dangerous gases. Fears are entertained of an explosion.

The large coal-works at East Palestine are both in full operation, with apparent good prospects for a steady summer's run, says the correspondent of the *Pittsburg Telegraph*. The State Line Coal Company some years ago purchased 700 acres of coal property at the upper end of town, and opened up the State Line Bank, the opening being in Ohio and a portion of the underground workings extending over into Beaver County, Pennsylvania, therefore bringing it under the jurisdiction of mine inspectors and mining laws of two States. This mine has been opened about ten years, and a large amount of coal has been taken from it. Some ingenious machinery has been introduced for getting the coal forward and loading it rapidly and economically. The opening is a drift into the four-foot seam, the main entry being driven back over a mile and a quarter through the first hill. About all the coal in this hill has been mined out, and the principal work is now going on back in the second hill. The company has recently purchased 130 acres of additional coal property on the left of the old workings, and is now driving the old fourth left entry to meet one coming from the back hill. When this is accomplished, all the coal will be brought forward through the fourth entry, making the haul much shorter than now. The coal is all brought forward with an endless wire rope running back over a mile in the main entry, to which point the coal is brought from the back hill with mules. About 500 tons of coal are produced daily. The miners receive 75 cents a ton for coal run over an inch and an eighth screen. About 350 men are employed in and about the works. The Fort Wayne Railroad Company has recently made this a coaling station for all freight-engines passing both east and west, and proposes in a short time to coal all passenger engines here. For this purpose, large coaling-chutes have been built, with facilities for stocking a large amount of coal. About 130 tons of coal are required for this purpose, which will be increased by coaling the passenger engines.

The Prospect Hill Coal-Works have been reasonably well supplied with orders the past six months, and have shipped quite a large amount of coal. There are two openings, one into the lower or four-foot seam, entered by a slope, and a drift opening into the three-foot seam. About 75 men are employed, receiving 75 cents a ton in the lower seam, and 80 cents a ton in the small coal. Both of these mines are operated with a rope, ingeniously arranged, and the coal is brought forward rapidly by a small stationary engine at the mouth of the mines. The mines are to be worked more extensively. All coal from these mines is shipped by the Fort Wayne road, and the prospects bid fair for a steady summer's work.

PENNSYLVANIA.

ANTHRACITE.

The mine inspectors of the different districts report as follows for April: Pottsville District—Samuel Gay, inspector: Accidents, 3; injured, 3. Total number of employes, 6805; average number of days employed, 17; number of tons of coal shipped, 160,472.06.

Shenandoah District—Robert Mauchline, inspector: Accidents, 13; killed, 3; injured, 16. Total number of employes, 13,069; average number of days employed, 18½; number of tons of coal mined, 391,972.10.

Shamokin District—James Ryan, inspector: Accidents, 24; killed, 4; injured, 20. Total number of employes, 13,345; average number of days employed, 19½; number of tons coal mined, 403,992.02.

May 10th, \$25,750 of the capital stock of \$200,000 of the Thomas Coal Company, operating the Kehley Run colliery, at Shenandoah, was sold to George F. Baer. The stock was sold subject to an indebtedness of \$24,168.43 of Daniel B. Fisher, of Leesport, to the Thomas Coal Company.

Complaint has been made by citizens of Scranton because of the culm which is dumped into the Lackawanna River by mine corporations.

The abandoned Wolf Creek colliery, near Minersville, is to be reopened and worked by the Philadelphia & Reading Coal Company.

BITUMINOUS.

The W. H. Brown coal mine, at Saltsburg, has been worked out and abandoned.

Some of the mines in the vicinity of Ramsey are not doing much, while others are full. Harper, Spees & Co.'s mine at Tom's Run, employing about fifty men, is doing well and is likely soon to put on more men. Steen's mine has just started up, having been idle a couple of months, but the prospect is for a good summer's work. Smith's mine has not been running for some months. Kernell, Powers & Smith have opened a new slope about a quarter of a mile below here, and are busy night and day driving entries and putting up buildings preparatory to opening up big works. They have at present about twenty-eight men employed on the day turn in the slope, and may, before the end of the year, have upward of a hundred. This will probably be the most extensive works on the run. Hazeltine, Jacobs & Co. have also got their mine to running again. They have received a contract which will give them steady work for a year with double the force now employed. Seventy-five cents a ton, over an inch and a half screen, are paid for mining on all the mines on this run.

The Saltsburg Coal Company is running both its large mines better than for some months past, although not more than to half their capacity. The Fairbanks mine, two miles from Saltsburg, has about 100 men, and loads from ten to twelve cars daily. The coal averages six feet. The company owns 900 acres in this tract. The first hill has been worked out and the force is all working in the second hill. An opening has already been made back in the third hill, where a large force will be put to work when trade revives. The miners receive 50 cents a ton for run of mine. During the past year, this company opened and put in operation at Coalport, three miles below Saltsburg, on the new line of the West Penn Road, another large mine, known as the Foster mine, under the same management. The mine has a fine tippie, fitted up with patent dumping machinery. There is also a fine seam of coal running from six feet to six feet eight inches. In the present workings, they are somewhat bothered with slates, but hope to get away from them as they get farther in the hill. About 70 men are employed, receiving 65 cents a ton for coal over an inch and a half screen. There are 1300 acres in this tract.

The works at Mansfield are doing a very good business. The Mansfield Coal and Coke Company's two mines employ upward of 400 men, and are running steadily, with the prospect of plenty of work during the summer. The Grant mine has also started up recently, with a good prospect. The price of mining is three cents a bushel over an inch and a half screen.

At Leechburg, the two mines of Leechburg Coal Company are running along steadily, but not to their full capacity. The Tunnel and Bagdad mines are also running fairly, with prospects of continuing to do so.

COKE.

The Connellsville *Courier* says that the condition of the coke trade was never so even in its entire history as now. For the past month, it has not varied to any appreciable degree. The production is uniform, the quality is uniform, the price is uniform. For this desirable condition of affairs, the coke pool must be awarded the credit. Of the 6879 ovens in the pool, fifteen per cent, or 1030, are idle under the pool order. The remainder lie idle every Thursday. Of the 2872 ovens out of the pool, 1648 are furnace ovens, and 432 are idle, 113 from lack of orders, and 319 tied up in litigation.

Orders continue about as usual. There is no material change for the better or worse noticed. Eastern shipments, it is true, are falling off slightly, but Western shipments are more than keeping up. Prices remain firm, but there is no advance, the iron market not being in condition to warrant coke manufacturers in making any further demands at present for higher prices.

The Port Royal Coal and Coke Company will begin shipping coal over the Peemickey about the 1st of June.

The H. C. Frick Coke Company has purchased the Schoonmaker interest in Morewood plant for \$150,000.

The Pennsville works will be started up soon, so announces A. H. Sherrick, the owner. It is also understood that Judge Ewing, purchaser of the Mahoning works, will soon put them in operation.

It is reported that J. M. Schoonmaker has disposed of his interest in the Redstone works to J. W. Moore & Co.

The Isabella Coke Works and mines at Cokeville have been idle since the burning of the large crusher and washer several months ago. The crusher is rebuilding.

TENNESSEE.

The Main Jellico Mountain Company has been organized with a capital of \$500,000. The coal mines are on the Tennessee and Kentucky State line, and will be connected with both the Louisville & Nashville and the Knoxville & Ohio railroads. Work is progressing rapidly, and the company expects to be turning out six hundred tons of coal a day by next September. A broad-gauge railroad is building from Jellico up to the mines, a distance of a mile and a half.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—COCHISE MINING DISTRICT.

PEABODY.—Orders have been received from headquarters to close the mine and pay all the men off. The smelter will continue to run until the ore on the dump is exhausted, when it too will shut down. The reason assigned for this action is the rise in the price of coke and the fall in that of copper.

TOMBSTONE DISTRICT.

Efforts to effect a compromise between the mine-owners and miners are now making, and it is thought will be successful. If so, the mines will resume operations.

PROMPTER.—The secretary's and treasurer's reports presented at the annual meeting, showed the finances of the company in good condition. The superintendent reported the ore-bodies looking well in the drifts, stopes, and winzes on the 1st, 2d, and 3d levels. The first shipment of twenty tons of ore was made May 10th to the reductor-works at Socorro.

GILA COUNTY.

OLD DOMINION.—The shipments for the week ended May 18th amounted to 11½ tons of copper.

GRAHAM COUNTY.

CLIFTON.—This hydraulic company has made arrangements with a gang of

Chinamen to begin work at Oro on shares. They will wash for gold with rockers, and will receive 80 per cent of whatever gold is taken out.

MARICOPA COUNTY.

The First National Bank of Phoenix, located at Phoenix, is closing up its affairs. All note-holders and others creditors of said association are notified to present all notes and other claims against the association for payment.

CALIFORNIA.

EUREKA COUNTY.

PLUMAS EUREKA.—The suit of Mr. Lankin against the Plumas Eureka Mining Company, which has been pending several years, will be tried in the United States Circuit Court, San Francisco, before Judge Sawyer. Mr. Lankin claims 2000 feet of the Plumas Eureka ledge, with its proportion of surface ground, on which there are many valuable improvements, including the company's mill. The Lankin claim is said to cover the most valuable portion of the ledge, and involves a property valuation of several millions of dollars, exclusive of accrued dividends from date of purchase, which he claims he is entitled to.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—At the Bodie Consolidated mill, there were crushed 140 tons of ore during the week ended May 12th. The average assay of the pulp was \$49.52, and of the tailings \$5.89. The most of this ore has been taken from the Vulcan vein, which is not looking so well. The ore is rather low grade. The shipments hereafter will be lighter than heretofore. It is stated that the company has an actual balance on hand above all indebtedness of \$126,000.

CHAMPION.—The usual amount of work is done underground.

STANDARD CONSOLIDATED.—Twelve miners were employed in the mine during the week ended May 10th. The flow of surface water has decreased considerably.

SYNDICATE.—The mill is running steadily on a good grade of ore.

PLUMAS COUNTY—GREENVILLE DISTRICT.

LUKY S.—A mill is to be erected at once. The prospects at the mine are good, and it is thought that the ore will mill \$15 a ton.

SIERRA COUNTY.

MARGUERITE.—As soon as the water has been pumped out, the work of sinking a new three-compartment shaft 400 feet west of the present one is to begin. As drifts have been run directly under where the new shaft is to be sunk, the latter work will be greatly facilitated by putting through a rise from the fourth to the third level, which will form the shaft for that distance. Buildings will be erected at the new shaft, and the hoisting and pumping gear run by water-power. The company is determined to put things in shape this summer to work the mine on the most economical basis.

PIONEER.—A receiver for this gold mining company has been appointed by the court.

CANADA.

The staff of the Geological Survey is making active preparations for the season's work, and the several parties will shortly be en route for their fields of exploration. Dr. Dawson and Mr. White will investigate the geological formation of a portion of the Rocky Mountains in the vicinity of the Canadian Pacific Railroad. Dr. Bell and Messrs. Tyrell, A. C. Lawson, and A. Ferrier will summer in the vicinity of the Lake of the Woods, Messrs. R. W. Ellis, A. E. Barlow, and W. A. Giroux will work in Cumberland, N. S. Messrs. H. Fletcher, J. McMillan, and E. Farrebat will operate in Antigonish and Guysboro' counties, N. S. Mr. Bowman will explore a portion of British Columbia. Messrs. R. J. McConnell and D. B. Dowling will pitch their tents at Cypress Hills, N. W. T. Mr. J. B. Tyrell will investigate the resources of the Edmonton District. Mr. A. P. Low will join a Quebec surveying party starting from the Saguenay and working in the direction of James Bay. Messrs. T. Westen and J. M. Macoun will collect specimens in the Northwest territories. Professor Macoun will follow the line of the Canadian Pacific Railroad from Ottawa west, and Professor Buley and Messrs. McGinnis and Chalmers will go to New Brunswick.

PROVINCE OF NOVA SCOTIA.

SALMON RIVER GOLD MINING COMPANY.—Eight stamps have been added to the mill, increasing the number now running to forty-three. This company started about three years ago with five stamps, and has been steadily increasing its crushing power as the mine has developed. The main vein is from 2½ to 9 feet in width, and mills from \$10 to \$100 per ton; the cost of mining and milling is \$2.50 per ton. All machinery is driven by water-power.

PROVINCE OF ONTARIO.

The mica mining industry is opening up in Loughboro'. Mr. Case, who for years was engaged in phosphate mining in the township, has begun to work systematically in extricating mica from an excellent bed upon a lot back of Sydenham on Goad Lake, which he not long since purchased.

Mr. Coste, of the Geological Survey of Canada, has been inspecting some of the mining locations in the county of Hastings. He visited the Canada Consolidated Mining Company's property, the Seymour iron mine, the Sexsmith mine, and other properties. He has expressed the opinion that there is gold in paying quantities at the Consolidated, and that the Seymour mine shows every indication of yet supplying a large quantity of ore. The time allotted (one month) for examining the mines in this county is too short, and Mr. Coste has returned to Ottawa to make arrangements for a thorough survey of the mines and minerals in the county of Hastings, which will take at least the whole summer to complete, so numerous have been the deposits found of the precious and economic metals and minerals.

COLORADO.

CHAFFEE COUNTY.

LAKE VIEW.—This tunnel company has assessed the stock one dollar a share, and will expend the money in procuring patents on its eight lodes, and in pushing development-work. The tunnel is in about eight hundred feet, and it is expected to cut the Quincy and several other veins.

CLEAR CREEK COUNTY.

It is reported that John M. Dumont has purchased all the interests of David Ball at Empire, including mines, mill, and residence property. The amount paid it is estimated was between \$25,000 and \$30,000.

COLORADO CENTRAL.—A strike is reported.

DIAMOND TUNNEL.—The Tunnel Company will soon begin working the several lodes cut by the tunnel. A number of lodes that have been lying idle will also be worked.

PAY ROCK.—In the main level, a four-inch streak of rich ore was encountered, besides a large body of concentrating ore. The tramway from this mine to the concentrator in Silver Plume was put in operation May 16th.

GILPIN COUNTY.

An influential company to work a big group of mines on Central Hill has recently been organized. The company is operating the German, Bates, Hunter, Morsell, Kitty, and several other good properties. One hundred and ten men are constantly employed, and there are daily shipments of ore.

LA PLATA COUNTY.

SAN JUAN & NEW YORK.—The smelter is running to its fullest capacity. It is receiving from fifty to seventy-five tons of ore a day. The company is building a

large addition to the smelter, to be used as an ore-house and for crushing and mixing ores.

LAKE COUNTY.

The Leadville Herald report the following: The amount of ore extracted from the Leadville mines, under the lease system, is continually increasing. At the present time, from one fourth to one third of all the ore shipped to the Leadville smelters is mined by leasers. Parties working under this system, if they are so fortunate as to find ore, will take it out and sell it, regardless of the market value of the metals contained in it, so long as their operations leave them a profit. Consequently there is only a slight decrease in the production of this class of mines during the existing depressed condition of the lead market.

Among the mines now worked by leasers, in whole or part, may be mentioned the following prominent properties: The Morning Star, the Evening Star, Catalpa, Crescent, Robert E. Lee, Little Sliver, Climax, Amie, Little Chief, Little Pittsburg, New Pittsburg, Iron Silver, Argentine, Adelaide, Brian Boru, Florence, Smuggler, Consolidated, Long & Derry, Robert Emmet, Eliza, Tenderfoot, and a score of less note.

The success of leasers has been varied. Quite a number of miners have made fortunes at the business. The leasers in the Amie last year made over \$50,000 profit in a few months. Mr. Esty made over \$10,000 working the Catalpa on a royalty, and again, in company with Mr. Hill, took several thousand dollars' profit out of the Moyamensing, and then sold his privilege back to the company for \$12,000. Another very profitable lease has been the one held by Mr. Slockett, on the Smuggler mine, on Iron Hill, whose profits must have run up into the tens of thousands.

The agent of the Morgan Smelter, of Utah, is shipping four car-loads of iron ore daily to Salt Lake City. The ore is secured from the Deer Lodge mine, on Fryer Hill, and the Evening Star mine, on Carbonate Hill.

BOREEL.—The Gonebrod mine, owned by this company, on the north side of Carbonate Hill, is disclosing some ore. The ore-bins of the mine contain about sixty tons of mineral, ranging in value from twenty-five to thirty ounces in silver to the ton. Mr. Kerns, the president, is expected at the mines.

CHRYSOLITE.—The experimental run of 1000 tons has been completed, and a clean-up at the Leadville gold and silver mill is in progress.

EVENING STAR.—The sinking of the upper shaft has been suspended for some time past, owing to the uncontrollable flow of water. The total depth of the shaft is about 470 feet. With the subsidence of the water, it is possible that drifting on the contact may be taken up; but it appears that hopes of finding ore at still greater depths are no longer entertained.

IOWA GULCH.—The company has been incorporated with a capital of \$6,000,000. It will be remembered that the property was recently sold in Philadelphia for \$300.

MAID OF ERIN.—A shipment of two loads of select ore from this mine on Carbonate Hill was recently made. The lot returned 292½ ounces in silver to the ton, and contained forty per cent of lead.

MORNING STAR.—The properties, during April, shipped 348 tons, averaging \$65.34 a ton, smelters' returns. The assays on this ore ran from 16 to 203 ounces in silver to the ton, and from 13 to 35 per cent in lead. The mines are looking well, and those portions worked by the company are yielding considerable high-grade ore. The operations of the leasers in the main are successful, and considerable ore and iron are shipped from which the company is receiving good royalties. Mr. W. S. Ward has resigned as manager of the Morning and Evening Star mines, and Mr. Robert E. Beoraem has been appointed to succeed him.

NEW PITTSBURG.—The Ida Nyce shaft is worked under a lease. The Ponsardine shaft has attained a depth of 240 feet. The bottom of the shaft is in quartzite, showing some iron. Considerable water has lately been encountered, to handle which the company is providing an additional boiler and large steam-pumps.

OURAY COUNTY.

ALEXANDRIA.—The discovery of an eight-foot ore-streak in this lode has caused a great rush to Red Mountain.

PARK COUNTY.

CRYSTAL LAKE.—The company will begin the erection of a large mill for the treatment of its ores, produced by the mines on North Star Mountain.

MAGNOLIA.—Another stamp-mill is to be erected at Montgomery for the treatment of the ores produced by this mine.

RIO GRANDE COUNTY.

It is rumored that the Colorado Loan and Trust Company will soon begin a railroad from its new town, Henry, on the Rio Grande, to the mining camps on the Alamosa and Conejos Rivers, thence across the range to Pagosa Springs and Amargo, to connect with the San Juan extension of the Denver & Rio Grande.

SAGUACHE COUNTY.

EMPRESS JOSEPHINE.—Large quantities of high-grade ore are produced. The mineral in the third level is composed of brittle silver and gray copper, and the pay-streak is 28 inches wide, and is growing larger. The second level, where the rich strike of petzite was made one week ago, still holds its own, with a pay-streak forty inches wide.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—The Leadville Herald reports that about fifteen tons of from 30 to 50-ounce ore are shipped daily. The property has lately made quite an important disclosure, consisting of a fair body of ore, located in the tunnel midway between its mouth and old ore-chute. Being at least 400 feet distant from the former bonanza, it is more than likely that this is an entirely new and independent ore-chute. The mineral was uncovered in driving a drift from the tunnel to the right, at a point where a small pocket of ore had been uncovered years ago. After advancing the drift about fifteen feet, the bottom of an ore-chute dipping to the eastward was encountered. The opening has since been continued for twenty-five feet in ore, and at present shows a breast from three to six feet in height and fifteen feet in width. No back-stoping has yet been done on the vein, although the extraction of ore and opening of the chute downward continues. Some work is also done in the old stopes above the eighth level. Below this level, the mine is flooded with water. All the work in progress in the Robinson mine is done on tribute, under the management of Mr. Moore, and will continue in this way until the first of next month. With the beginning of June, Mr. Moore expects to have accumulated from royalties sufficient funds to enable the company to work the mine without granting any further leases, and also sufficient ore resources to insure a profit on the operations of the company.

SPIRIT.—Operations have commenced. A tramway is to be built from the mouth of the tunnel to the railroad, a distance of 1050 feet.

DAKOTA.

The developments growing out of the recent tin discoveries have caused great excitement at Custer. The assays on tin-stone taken from several developed mica mines show an unprecedented percentage of tin. Numbers of Eastern and English capitalists and experts are here looking over the field.

CARTER.—Recent developments in this mine, on Elk Creek, have proved to be of a very flattering character. The ore is free milling.

DAKOTA MAID.—This mine has recently attracted a little attention. A shaft

has been sunk to the depth of 60 feet, and a cross-cut of 38 feet extended on each side, showing richness of the vein in gold and silver. One of the owners has gone East to make arrangements for the erection of a stamp-mill and other facilities for the profitable operation of the mine.

FATHER DE SMET.—The superintendent writes, under date of May 5th, as follows: Inclosed please find express company's receipt for bar No. 183, containing 1520-10 ounces gold, result of clean-up of the mill for last half of April, making a total of 2479-20 ounces for the month, a very good showing every way. There is no change to report in the general outlook of ore-faces on first and second levels. South header, third level, shows a breast 20 feet in width, all milling ore and apparently increasing in size as we advance. The mine is in good condition, showing up well everywhere and will continue to give good results for a long time. The mill is running as usual, without any delays whatever. The report for week ended May 15th shows ore extracted from the first, second, and third levels, 2070 tons; ore milled, 2070 tons. A southwest drift, third level, has been started from a point near the present face of the tramway tunnel, to be called tramway header, and has advanced 7 feet.

MINERVA.—The company is mining and milling an average of about 100 tons of ore a day.

ORO FINO.—The mill is constantly running with good results. At the mine, the hoisting-works are working well, and no difficulty is now encountered from water.

PIERCE.—The rumor that this mine had passed into the hands of the Homestake Company has been denied. Parties interested have stated that the Pierce mine is exclusively the property of the Pierce Gold Mining Company, of New York, and that no negotiations are pending for the purpose of disposing of it. In all probability, operations on the property will begin this year.

IDAHO.

The failure of Howell & Co.'s Bank at Spokane Falls is reported. General C. C. Howell and his partner have disappeared, it is said. The former was the prime mover in the boom which caused such a rush to the Cœur d'Alène mines.

The Kansas City Smelting-Works have established an agency at Hailey. They are prepared to buy every pound of ore offered, and pay spot cash at the highest ruling rates.

BRIGGS.—This placer mining claim on Snake River has been sold to New York parties for \$2000 cash and \$25,000 in stock.

JUNIPER.—The offices have been removed from the Astor House to the Williamsburg City Fire Insurance Company's building, Broadway, corner of Liberty street. The superintendent at the mines reports active progress in development-work and in constructing the canal and flume.

MAY FLOWER.—In the lower tunnel, ore has been found, and there is every probability that this is a continuation of the upper ore-body that has been yielding for three or four years, and which still shows large quantities of ore.

MARYLAND.

The Union Mining Company, which recently gave the grounds for a park in the center of Mount Savage for the benefit of the workmen, will also construct several buildings on the lot. It also gives \$300 toward fitting out the band, with the understanding that it is to have music at least once a week in the park, when the weather is favorable.

MICHIGAN.

COPPER MINES.

CENTRAL.—At the annual meeting, a resolution directing the continuance of the corporate existence of the company for a period of thirty years from the 13th day of September, 1884, was passed by a vote of 17,688 shares. The new articles of association and proofs of this action have been filed and recorded, as required by the laws of Michigan.

LAKE SUPERIOR NATIVE COPPER-WORKS.—It is the intention to erect three new reverberatory furnaces, and the Calumet News says that the company has been promised the Peninsula's mineral if it is smelted at the rate of \$4 a ton less than now done by the Detroit & Lake Superior Copper Company.

PEWABIC.—According to the Hancock Mining Journal, the drafts of this company, issued on last pay-day, have been allowed to go to protest.

IRON MINES.

Lake shipments of iron ore from the ports of the Marquette District up to and including the 14th of May have been:

	Tons.
Escanaba, Marquette District.....	57,287
" Menominee District.....	84,585
Marquette, Marquette ".....	17,418
L'Anse, ".....	134
Total.....	159,424

AURORA.—This property has been incorporated for the purpose of developing an iron ore property in the Agogetic District, Ontonagon County.

MOUNTAIN.—After two years' exploratory work on the Iron Mountain town-site, operations have been suspended, no developments having been made that warrant a further continuation of operations. The work was done with the view of securing the presumed continuation of the Hewitt lens to the west.

NEW YORK.—The mine has been closed, the reason not being given. The mine has been worked for twenty years, and has produced about 1,066,000 tons of ore.

MONTANA.

LEWIS & CLARKE COUNTY.

MONTANA COMPANY (LIMITED).—The first clean-up from the new twenty-stamp mill at the Drum Lummon mine has been received at Helena. The bullion produced is worth \$20,000. The company is putting up thirty more stamps.

SILVER BOW COUNTY.

ALICE.—Recent developments are said to be of considerable importance. A south cross-cut from the 200-foot south level has tapped what appears to be a second south vein that seems to be well defined, regular, and of excellent grade, though it has not yet been fully opened. It may be an extension of the Belle of Butte, which was very rich and productive at that depth, or it may be an independent vein not before discovered. A cross-cut has been extended south from the 700-foot level of the main shaft, and the first south vein has been intersected with very gratifying results, one streak of ore being literally filled with native and wire silver and black with sulphurets.

MOULTON.—High-grade ore has been struck on the 300-foot level. On the 500-foot level, work continues actively in the face of the west drift, where, at a distance of 650 feet from the main cross-cut, the winze from the 400-foot level is expected to connect. Over \$50,000 were produced during April, the battery assays for the month averaging \$60. The company employs 100 men, and is said to have over \$100,000 in the treasury.

NEVADA.

ESMERALDA COUNTY.

KENTUCK.—The mine is yielding very fine ore. The mill, which has not been running for some time, on account of the depth of snow, which rendered transportation impossible, will resume work very soon.

HUMBOLDT COUNTY.

The recent developments in the Nickel mine, at Lovelock, and the body of high-grade ore that is showing up, will, it is thought, justify the erection of reduction-works at once. The tunnel started to intersect the vein cuts the foot-wall about 500 feet deep, and it is estimated that it will have to run 100 feet farther to reach the hanging-wall. This cross-cut establishes the fact that the ore continues down, as the vein is richer than at the surface. Several small veins from 10 inches to two feet thick, carrying ore that assays 65 per cent of metal, have been cut in the tunnel.

STOREY COUNTY—COMSTOCK LODE.

The southeast drift on the 2700 level of the Gould & Curry will be pushed as soon as the hot water tapped in it has sufficiently drained out. The diamond drill has shown that there is a large body of quartz a short distance in advance of this drift.

Work has been temporarily stopped in the west cross-cut of the 1200 level of the Best & Belcher, in order to give J. P. Jones an opportunity of putting men into the ground leased in the old Bonanza mines.

Men are cutting out a tank station on the 2900 level of the Combination shaft for the water that will be taken up at that level by the Cornish pump. On the completion of this, a drift will be started west on the 2900 level. This drift will drain the water on the levels above, and will facilitate prospecting on the 2800 level of the Chollar and Hale & Norcross.

A number of men have been put to work on the upper levels of the Consolidated Virginia, under the Jones contract. A station is chambering out on the 1200 level and a drift into Consolidated Virginia ground will be started.

NORTH CAROLINA.

COPPER WORLD.—Pittsburg capitalists who recently purchased the Harris Gray copper mine, Person County, have organized a company under the above name, with a capital of \$40,000. The principal office is in Pittsburg. The mine is now worked.

SAUNDERS.—Work has been suspended at this gold mine in Montgomery County.

UTAH.

BEAVER COUNTY.

FRISCO MINING AND SMELTING COMPANY.—A force of fifteen men is employed in the Rattler mine, and a 75-foot contract has been let. The outlook is a very favorable one.

JUAB COUNTY.

MAMMOTH.—By consent, the two cases of William Fuller vs. the Mammoth Mining Company, pending in the District Court at Salt Lake City, were dismissed May 15th.

SUMMIT COUNTY.

ONTARIO.—The mill has been shut down for cleaning up and repairs for a week. Great interest is taken in the opening of the new 900 level.

WYOMING.

Prof. George E. Bailey has been reappointed geologist of this territory.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED APRIL 1ST, 1884.

- 295,898. Machine for Cold-Drawing Rods, etc. Charles C. Billings, Boston, Mass.
 295,920. Miter-Gauge. Espridon Hippolito, San José, Assignor of one half to James D. Campbell, Los Angeles, Cal.
 295,942. Caster-Wheel and Die for Making the same. Walter S. Ravenscroft, Parkersburg, West Va.
 295,965. Coining of Steels. John J. Williamson, Boston, Mass.
 295,978. Pressure-Regulator. William Burnett, New York City, Assignor of one half to James Reilly, Brooklyn, N. Y.
 295,988. Metallurgical Gas-Furnace. William F. Durfee, Bridgeport, Conn., and Thomas Ecleston, New York City.
 295,992. Ore-Separator. Hadley P. Fairfield, West Medford, Mass., and Louis A. Shead, Alameda, Cal., Assignors to Gordon McKay, Trustee.
 295,993. Ore-Separator. Hadley P. Fairfield, West Medford, Mass., and Louis A. Shead, Alameda, Cal., Assignors to Gordon McKay, Trustee.
 295,998. Gate or Valve. Philip Giovannini, San Francisco, Cal.
 296,008. Elevator-Bucket. Joseph A. Holmes, Greenland, N. H.
 296,009. Combined Feed-Pump and Condensing Apparatus for Engines. John Houpt, Springtown, Pa.
 296,011. Miner's Squib. George A. Ingram, Plymouth, Pa.
 296,033. Reverberatory Gas-Furnace. William L. McNair, Golden, Colo.
 296,052. Rock-Drill. William E. Peyton, San Francisco, Cal., Assignor of part to James M. Thompson, same place, and Conrad Shenfield, Albuquerque, New Mexico.
 296,053. Boring-Machine. Zachariah C. Phillips, Alleghany, Pa.
 296,068. Magnetic Ore-Separator. Felix Victorien Rouleau, Isle Verte, Quebec, Can.
 296,072. Evaporator-Furnace. Thomas Scantlin and James M. Scantlin, Evansville, Ind.
 296,075. Ore-Separator. Louis A. Shead, Alameda, Cal., and Hadley P. Fairfield, West Medford, Mass., Assignors to Gordon McKay, Trustee.
 296,081. Bearing for Rolling-Mills. Walter Steel, West Bergen, N. J., Assignor to Spaulding, Jennings & Co., same place.
 296,089. Coal-Dumper. Thomas Wallwork, Litchfield, Ill.
 296,094. Apparatus for Coating Wire with Metal. Lewis Williams, Johnstown, Pa., Assignor to the Cambria Iron Company, of Pennsylvania.
 296,096. Ore-Crusher. Jacob Charles Wiswell, Medford, Mass.
 296,101. Hot-Blast Stove. Joseph J. Airey, Pittsburg, Pa.
 296,116. Process of Roasting and Disintegrating Gold, Silver, and Copper Ores. David Walton Birmingham, Clifton, N. Y.
 296,123. Rotary Engine. Squire Broadbent and Squire Broadbent the Younger, Tonguear Bradford, County of York, England.
 296,174. Regenerator-Furnace. Gower Jones, Washington, D. C., Assignor to the Standard Vapor Fuel Iron and Steel Company of New York City.
 296,175. Superheater. Gower Jones, Washington, D. C., Assignor to the Standard Vapor Fuel Iron and Steel Company of New York City.
 296,176. Superheater-Furnace. Gower Jones, Washington, D. C., Assignor to the Standard Vapor Fuel Iron and Steel Company of New York City.
 296,225. Blast-Furnace. Hermann Schulze-Berge, Rochester, Pa.
 296,251. Apparatus for Treating Ores and for other Purposes. Theodore Ruggles Timby, Nyack, N. Y.
 296,254. Manufacture of Drills. Claus Van Haagen, Philadelphia, Pa.
 296,262. Manufacture of Spongy Lead. Frank Tamblin Williams and John Charles Howell, Llanelli, County of Carmarthen, England.
 296,263. Detachable Lever for Forges. James F. Winchell, Springfield, Ohio.
 296,269. Machine for Bending Wire. Charles F. Beaman, Chicago, Ill., Assignor to the Wellsville Plate and Sheet-Iron Company, Wellsville, Ohio.
 296,270. Attachment for Metal-Planers. Edwin R. Bryant, Rochester, New York, Assignor to the Rochester Machine Tool-Works, Limited, same place.
 296,279. Straightening, Bending, and Punching Machine. James Cosgrove, Pittsburg, Pa.
 296,285. Process Apparatus. Nathan G. Gurney, Baltimore, Md., Assignor of one half to Francis Clark, same place.
 296,301. Apparatus for Feeding Fuel to and in Furnaces. Thomas Vicars the Elder, John Vicars the Elder, Thomas Vicars the Younger, and John Vicars the Younger, Liverpool, County of Lancaster, England.

GRANTED APRIL 8TH.

- 296,322. Incinerating-Furnace. Henry F. Firman, New York City, Assignor to the Universal Concentrating Company, Camden, N. J.
 296,343. Apparatus for Hoisting and Conveying Ground, Minerals, etc. Patrick H. McCauley, Des Moines, Iowa.

- 296,357. Process of and Apparatus for Reducing Metals by Electrolysis. Augustus J. Rogers, Milwaukee, Wis., Assignor of two thirds to Henry Mann and Julius Koebig, both of same place.
 296,369. Mold for Repairing Broken Rolls, Shafts, etc. John J. Vinton, Youngstown, Ohio.
 296,373. Corrugated Metal Rolling Shutter. James G. Wilson, New York City, Assignor to Francis Forbes, same place.
 296,399. Heating-Furnace. John Evans, Etna, Pa., Assignor of one half to George A. Chalfant, same place.
 296,433. Hoisting Apparatus. James H. Montgomery, Denver, Colo.
 296,462. Packing, Lubricating, and Cooling the Pistons of Air-Compressors. Charles F. Ruff, Phoenixville, Pa.
 296,543. Valve and Gear for Steam-Engines. August C. Dumke and August F. Dumke, Manitowoc, Wis.
 296,569. Ore-Elevator. William Allen Hartt, Rochester, N. Y.
 296,586. Attachment for Smelting-Furnaces. Gilbert M. Levette, Indianapolis, Ind.
 296,610. Metallic Roofing-Plate. George Patten, Washington, D. C.
 296,616. Roofing-Tile. Benjamin F. Powers, George E. Needham, and James Hayes, Cleveland, Ohio; said Hayes Assignor to said Powers and Needham.
 296,660. Rock-Drill. De Volsen Wood, Boonton, N. J.
 296,681. Rock-Drill. George McDerby, Astoria, N. Y.
 296,709. Process of Separating Precious Metals from Ores, etc. Edward Hubbard Russell, Park City, Utah.
 296,710. Process of Separating Metals from Ores and Metallurgical Products and from Each Other. Edward Hubbard Russell, Park City, Utah.

GRANTED APRIL 15TH.

- 296,752. Middlings Purifier. Andrew Hunter, Chicago, Ill.
 296,765. Manufacture of White Lead. John Cowdery Martin, Richmond, County of Surrey, England.
 296,768. Steam-Boiler and Furnace Lining. Charles McMillan, Chicago, Ill.
 296,789. Steam-Power Stamp. William S. Sharpneck, Denver, Colo., Assignor to the Nichols Manufacturing Company, same place.
 296,791. Smoke-Consuming Device. John W. Smith and James D. Smith, Washington, D. C., Assignors of fourteen twenty-fourths to Simpson P. Moses, William B. Moore, and I. Heylin McDonald, same place.
 296,795. Stone-Crusher. Henning Sundquist, Chicago, Ill., Assignor of one half to John Sontag, same place.
 296,804. Rock-Drill and Well-Boring Machine. Willet C. Wells, Ogden, Iowa.
 296,858. Process of Making Zinc Sulphide Anhydrous. Thomas MacFarlane, Montreal, Quebec, Can., Assignor of one half to A. Ramsay, same place.
 296,884. Method of Manufacturing Metal Alloys. Gustav Selve, Altena, Westphalia, Prussia, Germany.
 296,914. Stone-Crusher. Theodore A. Blake, New Haven, Conn.
 296,924. Self-Feeding Ratchet-Drill. Robert N. Cherry, Jersey City, N. J.
 296,951. Metal-Planing Machine. George A. Gray, Jr., Covington, Ky.
 297,064. Mining Apparatus. Thomas W. Campbell, Valley Falls, Kan.
 297,076. Pump. Robert Hardie, Hoboken, N. J., Assignor of one half to John A. Walsh, New York City.
 297,083. Crushing-Mill. George W. Morrow, Toronto, Ohio.
 297,097. Manufacture of Sheet-Iron. W. Dewees Wood, Pittsburg, Pa.

GRANTED APRIL 22D.

- 297,105. Process of, and Apparatus for, Separating Metals from their Ores. Abel H. Bliss, Chicago, Ill.
 297,122. Smoke-Consumer. William L. Fitch, Chicago, Ill.
 297,171. Ratchet-Drill. Caspar Schumacher, Kalk, Germany.
 297,210. Ratchet-Drill. Pardon A. Whitney, Cleveland, O.
 297,244. Method of and Apparatus for Corrugating Tubes. Charles E. Emery, Brooklyn, and A. Henry Gettner, New York City.
 297,254. Rotary Engine. George L. Griffin, William Aurelius Shoup, and James Robert Cade, Harrisburg, Texas.
 297,312. Shaft-Bearing. Harris Tabor, Alleghany, Assignor to the Westinghouse Machine Company, Pittsburg, Pa.
 297,330. Mechanism for Checking or Stopping the Action of Machinery. Jacob D. Wright, Worcester, Mass., Assignor to the Wright Machine Company, same place.
 297,350. Coal-Chute. Joseph E. Clifton, Geneseo, Ill.
 297,372. Apparatus for Corrugating Tubes. Samson Fox, Harrogate, County of York, England.
 297,376. Pump. Robert P. Garsed, Morristown, Pa.
 297,383. Suspended Drilling-Machine. Edward F. Gordon and Horatio Hobbs, Concord, N. H.
 297,392. Rotary Blower. Ralph E. Harris, Macomb, Ill.
 297,400. Double-Acting Pump. William H. Holcombe and Clifford A. Holcombe, Beloit, Wis., Assignors to the Holcombe Brothers and Stone Manufacturing Corporation (Limited), same place.
 297,403. Molding-Machine. John W. Hudson, Wellington, Ill.
 297,456. Chuck for Rock-Drills. Henry C. Sergeant, Denver, Colo.
 297,478. Rotary Pump. Albin Warth, Stapleton, N. Y.
 297,480. Process of Separating Metals from Franklinitic Ores. Arthur F. Wendt, New York City.
 297,483. Oil-Cup Feeder. James S. Worswick, Montgomery, Ala., Assignor of one half to Arthur T. Hannon, same place.
 297,504. Trap for Steam-Pressure Gauges. George Hannibal Crosby, Somerville, Mass.
 297,529. Metallic Roofing-Shingle. John Mott, New York City, Assignor to the Anglo-American Roofing Company, same place.
 297,530. Metallic Shingle. John Mott, New York City.
 297,539. Dumping Coal-Cart. William S. Shoemaker, Baltimore, Md.
 297,546. Machine for Rolling Axl s. Silas H. Wilson, Brooklyn, N. Y., Assignor, by direct and mesne assignments, to Robert H. Thompson and Elizabeth Wilson, same place, and Henry D. Norris, New York City.

GRANTED APRIL 29TH.

- 297,550. Machine for Straightening Metal Rods. John Agnew, Cummings, Assignor to the Agnew Shafting Company, Chicago, Ill.
 297,551. Die for Drawing Metal Rods. John Agnew, Cummings, Assignor to the Agnew Shafting Company, Chicago, Ill.
 297,552. Steam Rock-Drill. John F. Allen, Brooklyn, N. Y.
 297,572. Boiler-Feeder. William Cunningham, Watsontown, Pa.
 297,575. Rotary Engine. Adolf Decher, Munich, Germany.
 297,589. Rotary Engine. Carl Enke, Nuremberg, Bavaria, Assignor to Victor Henry von Swaine, Wiesbaden, Germany.
 297,591. Machine for Separating Coal from Ashes, etc. Lucius O. Frazier, Pittsburg, Pa.
 297,609. Self-Dumping Tub. Charles P. Lattemoor, Somerville, Mass.
 297,630. Smoke-Preventing Furnace. George Playford and George Richard Swaine, Cleveland, Ohio; said Swaine Assignor to Charles F. Alexander, same place.
 297,631. Mode of Weaving Metallic Bars. Henry Davidson Plimsoil, New York City.
 297,646. Molder's Flask. Eleazer Thomas, Pawtucket, R. I.
 297,659. Forge-Hammer. James H. Baker, Westville, Ohio.
 297,663. Blast-Furnace Apparatus. John Francis Bennett, Pittsburg, Pa.
 297,679. Barb-Fence Machine. John D. Curtis, Worcester, Mass., Assignor to Washburn & Moen Manufacturing Company, same place.
 297,680. Construction of Continuous Rolling-Mills. Frederick H. Daniels, Worcester, Mass.
 297,681. Nut-Lock. Lewis H. Davis, West Chester, Pa., Assignor to the Wilmington Malleable Iron Company, Wilmington, Del.
 297,766. Process of Preparing Ozokerite and other Solid Hydrocarbons. Jean Charles Octave Chemin, Paris, France.
 297,808. Furnace-Door. Lyman F. Johnson, Cleveland, Ohio.
 297,845. Smoke-Burning Attachment for Furnaces. William A. Porter, Alliance, and William Heston, Mount Union, Ohio.
 297,862. Fastening for Corrugated Metal Sheets. John Smith, Kansas City, Mo.
 297,888. Furnace for Smelting Ores. John W. Webb, Denver, Colo., Assignor of one half to Charles F. Burrell, same place.
 297,890. Roller-Mill. Rosia W. Welch, Baltimore, Md., Assignor of one half to William Cammack, Washington, D. C.
 297,901. Hood for Forges. James F. Winchell, Springfield, Ohio.
 297,934. Elevator-Bucket. Charles W. Hunt, New York City.
 297,951. Blasting-Cartridge. Robert Punshon and Robert R. Vizer, London, England.

FINANCIAL.

Gold and Silver Stocks.

New York, Friday Evening, May 23.

The mining market continues very dull; but business was of a little better nature and character than last week. There was not much change in prices either way, and as a general rule, the market was steady. The exceptions were the Comstocks, which seemed to be unsettled, with a tendency toward weakness. The Tuscarora stocks, on the other hand, were inclined to be strong, although but moderately dealt in. A full summary of the market is given below. The total number of shares sold aggregates 63,025, as against 41,085 last week.

The Comstock shares were quiet and sold at weak prices. California sold from 18@7c., with a small business. Consolidated Virginia was actively dealt in, and was a little weak; it sold from 20@17c. Sierra Nevada records a small business at irregular prices, selling from \$1.75@1.25@1.50. Union Consolidated was also irregular, but was fairly dealt in; it sold from \$2.25@1.60@2.05. Mexican was strong under a small business, selling from \$1.65@2.05. Sutro Tunnel sold at 12c. throughout, and was moderately dealt in.

The Leadville stocks were quiet and steady. Amie sold from 7@6c., and was very quiet. Chrysolite sold as low as 77c. at one time yesterday, but rallied and closed at 88c.; it was quiet. Dunkin was weak, selling from 18@10c., under a small business. Breece sold at 26c. Iron Silver was a little weak; it sold from 96@90c., under a small business. Little Chief sold at 42c., and was quiet. Climax records but one transaction, and that at 2c.

The Bodie stocks were quiet and ruled at weak prices. Bodie Consolidated sold at irregular prices under a small business; it was quoted from \$3.50@3.30@3.40. Standard was very weak, selling from 98@75c. under a small business. Bulwer sold at 50c., and Bechtel at 27c.

The Tuscarora stocks were moderately dealt in at strong prices. Grand Prize sold at 20c. Belle Isle was strong, and was fairly dealt in; it sold from 45@55c. Navajo was moderately dealt in at irregular prices; it sold as high as \$3.20 at one time, but fell back to \$3, at which figure it has ruled for some time past. Independence sold at 30c.

In the miscellaneous list, Alice sold at strong prices under a small business; it was quoted from \$2.60@2.95. Eureka Consolidated suffered a decline, but was dealt in mostly under time sales; it sold from \$3.85@3.10@3.25. Green Mountain was quiet and steady at \$2.05. Homestake sold at \$9 under a small business. Horn-Silver was fairly dealt in at steady prices; it sold from \$6.38@6. Robinson was quiet at 20c.

Caledonia records one small transaction at 65c. Central Arizona declined from last week's strong prices under a small business; it sold from 16@19@18c. Lacrosse was quiet and steady at 14@13c. Rappahannock was fairly dealt in at steady prices, selling from 18@16c. Sonora sold from 7@5c., with a small business.

The Eureka Consolidated Mining Company has reopened the stock transfer-books at the office of Laidlaw & Co., No. 14 Wall street.

MEETINGS.

The following companies will hold their annual meetings for the election of trustees and the transaction of other business, at the times mentioned:

Quincy Mining Company, No. 2 Exchange Court, Room 22, New York City, June 4th, at twelve o'clock M.

Rappahannock Gold Mining Company, No 60 Broadway, Room 15, New York City, May 28th, at half-past three o'clock P.M.

Robert E. Lee Mining Company, office of James V. Dexter, Leadville, Colo., June 7th.

Rio Grande Copper Company, No. 207 Vine street, Camden, N. J., June 12th, at twelve o'clock M.

Steward Iron Mining Company, No. 52 Wall street, New York City, June 2d, at eleven o'clock A.M.

Union Mining Company, of Alleghany County, Maryland, No. 115 Broadway, Room 46, New York City, June 2d, at twelve o'clock M.

DIVIDENDS.

Alice Gold and Silver Mining Company, of Montana, has declared a dividend (No. 11) of twelve and a half per cent a share, or \$50,000, payable at the Farmers' Loan and Trust Company, June 2d.

Bodie Consolidated Mining Company, of California, has declared a dividend of fifty cents a share, payable to Eastern stockholders at the office of Laidlaw & Co., No. 14 Wall street, New York, June 5th.

Catalpa Mining Company, of Colorado, has declared a dividend (No. 6) of ten cents a share, or \$30,000, payable at No. 66 Broad street, New York City, May 31st.

Jocustita Mining Company, of Mexico, has declared a quarterly dividend (No. 12) of fifty cents a share, or \$50,000, payable at Messrs. Lounsbury & Haggin's, No. 15 Broad street, New York City, May 31st.

Kentuck Mining Company, of Nevada, has declared a dividend (No. 46) of ten cents a share, payable at San Francisco, May 19th.

Little Chief Mining Company, of Colorado, has declared a dividend of ten cents a share, or \$20,000, payable at No. 139 Broadway, New York City, May 30th.

Ontario Silver Mining Company, of Utah, has declared a dividend (No. 95) of \$75,000, payable at Messrs. Lounsbury & Haggin's, No. 15 Broad street, New York City, May 31st. Total of dividends to date, \$5,525,000.

PIPE LINE CERTIFICATES.

The amount of business transacted does not reach the high figures of last week, but this is mostly owing to the closing of the Exchange at three o'clock instead of at four o'clock as formerly. Oil opened last Saturday at 77½c., weakened to 72c., and then rallied to 81c. closing at 80c. On Monday, the market opened at 80½c., and since that time it has gradually declined, with occasional rallies. Wednesday, it sold as low as 70c., but rallied and closed that day at 73½c. Yesterday, the market was firm, and closed with a good feeling. To-day's market opened at 75½c., and gradually weakened to 73½c. It rallied a trifle, and close unsettled at 73½c.

There was another reduction in the price of Refined petroleum of ½ of a cent per gallon. It is now quoted at 8½c. in New York and 7½c. in Philadelphia and Baltimore.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
May 17	\$.077½	\$0.81	\$0.72	\$0.80	4,711,000
19	.80½	.80½	.74½	.77½	4,442,000
20	.77½	.78½	.75½	.76½	2,366,000
21	.75½	.75½	.70	.73½	6,679,000
22	.73	.75½	.73	.75½	5,918,000
23	.75½	.75½	.73½	.73½	5,398,000
Total sales					29,514,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	May 16.	May 17.	May 19.	May 20.	May 21.	May 22.
Albion						
Alpha						
Alta	1¾	1¾	2½	2½	2	1¾
Argenta						
Bechtel			1½		1	1
Belcher						
Belle Isle	2½		2½	2½	2	2½
Best & Belcher	3¾	3¾	3	3¾	3¾	3
Bodie						
Bullion						
Bulwer						
California	20			20	10	10
Chollar	1¾	1¾	1¾	1¾	1¾	1¾
Con. Pacific						
Con. Virginia	20		20		20	20
Crown Point	1¾	1¾	1¾	1¾	1¾	
Day	2½		2½			
Elko Cons						
Eureka Cons	4				3¼	3¼
Exchequer						
Gould & Curry	1¾	1¾	1¾	1¾	1¾	1¾
Grand Prize						
Hale & Norcross	2¼	2¼	2¼	2¼	2¼	2¼
Independence						
Martin White						
Mexican	1¾	1¾	1¾	2	1¾	1¾
Mono						
Mount Diablo						2¼
Navajo	3	3	3	3	3¼	3¾
North Belle						
North Belle Isle	1¾	1¾	1¾	1¾	1¾	1¾
Ophir						
Overman						
Potosi	.65	.60	.60	.60	.55	.60
Savage	.80	.85	.80	.80	.75	.85
Scorpion						
Sierra Nevada	1¾	1¾	1¾	1¾	1¾	1¾
Silver King						
Tip Top						
Union Cons.	2	2	2	2	1¾	1¾
Utah			1¾			90
Wales Cons.						
Yellow Jacket	2½	2		2	2	2

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

Boston, May 22.

There is but little doing in copper stocks outside of Calumet & Hecla and Quincy, and even in these the transactions are extremely limited, and consist chiefly of small lots thrown upon the market by tired holders or by those whose necessities compel them to sell. There is no speculative activity, although we believe that those who buy Franklin, for instance, at the present price, and hold it, will surely get a good advance on it whenever the upward turn comes. Calumet & Hecla, which closed last week with sales at \$168, advanced to \$170, reacted to \$167.50 and again sold at \$170. The sales for the week were but a little over one hundred shares. In Quincy, sales were made at \$36.25, \$36.50, and \$36, the lowest price being made to-day, but the stock closed firm at \$36 bid, \$36.50 asked. Franklin sold at \$7-400 shares, same as last week. Osceola declined from \$14 (May 7th) to \$12.50, on small sales. The above comprises all the dealings in this class of stocks for the week at the regular Stock Exchange, and reflects the extreme dullness for this class of stocks.

In silver stocks, there is no change in the situation, and it is almost impossible to make any transactions. Orders to buy or sell, especially the former, are very limited. Catalpa sold at 35c., but the announcement of a dividend of 10 cents a share next month has caused a little demand for the stock, and 37½c. is now bid. Bonanza sold at \$1, the same as last sale.

At the Mining Exchange, business does not improve, and the outlook is not very promising for the next few months. Bowman Silver continues to rule steady at 14@15c., while Empire and Sullivan, both of which were at one time very active stocks, seem to be entirely neglected.

3 P.M.—At the afternoon Board, the only sale was a small lot of Pewabic at \$1. Closing prices: Al. louez, ½ bid. Atlantic, 7 bid. Bonanza, \$1 bid, \$1½ asked. Calumet & Hecla, \$170 bid. Franklin, \$7½ bid. Osceola, \$12 bid, \$13 asked. Pewabic, \$1 bid. Quincy, \$36 bid, \$36½ asked.

BULLION MARKET.

New York, Friday Evening, May 23.

The decline in sterling exchange has weakened our silver market, and leaves it, at present posting, in a nominal condition.

DATE.	LONDON.		DATE.	N. Y.	
	Pence.	Cents.		Pence.	Cents.
May 17	50 13-16	111	May 21	50½	111
19	50½	111	22	50 15-16	111½
20	50½	111	23	50 15-16	111½

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of April.	Year from 1st. 1884.	
			\$	lb.
*Alice, g. s.	Mont.		298,761	
*Belmont	Mont.		8,081	
Bodie, g.	Cal.	120,499	209,475	
*Bonanza King, s.	Cal.	56,730	191,891	
*Boston & Montana, g.	Mont.	37,483	170,296	
*Chrysolite, s. L.	Colo.	20,095	52,373	
*Consolidated Bobtail, g.	Colo.		24,326	
*Contention, s. g.	Ariz.	65,010	269,174	
*Deadwood-Terra, g.	Dak.		128,763	
*Derbec Blue Gravel, g. s.	Colo.	12,732	42,028	
*Father de Smet, g.	Dak.	40,986	137,061	
Grand Prize, s.	Nev.		25,000	
*Hecla Cons., g. s. L.	Mont.		162,178	
*Homestake, g.	Dak.		301,053	
*Hope, s.	Mont.		17,980	
Horn-Silver, s. L.	Utah.	168,000	750,087	
*Iron Silver, s. L.	Colo.		184,169	
*Kentuck, g. s.	Nev.	3,508	15,147	
*Lexington, g. s.	Mont.	98,477	398,373	
*Little Pittsburg, s.	Colo.	12,000	37,134	
Moulton, s.	Mont.		122,000	
*Mount Diablo, s.	Nev.		24,820	
*Navajo, g. s.	Nev.	29,268	115,018	
*Ontario, s. L.	Utah.		536,205	
*Original, s. c.	Mont.		11,135	
*Oxford, g.	N. S.	4,090	14,352	
*Paradise Valley, s. g.	Nev.		45,164	
*Plymouth Consolidated, g.	Cal.	88,399	364,177	
*South Yuba, g.	Cal.	3,637	8,450	
*Syndicate, g. s.	Cal.	12,419	48,280	
*Tombstone, s. L.	Ariz.	88,094	302,692	
United Gregory, g.	Colo.		7,174	
Total amount of shipments to date			\$5,013,743	

* Official. † Assay value. ‡ Not including value of lead. G. Gold; S. Silver; L. Lead; C. Copper.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2½ per cent. During the week, the bank lost £920,000 bullion, but the proportion of its reserve to its liabilities was raised from 48 per cent to 48½, against 35½ per cent at this date last year.

METALS.

NEW YORK, Friday Evening, May 23.

Copper.—There were no new features during the week under review, some 200,000 pounds selling in a small way at 14¼c. Lake Superior, and 13¼@13½c. other brands. Manufacturers being stocked, they are out of the market for the present. Cablegrams from London this morning quote Chili Bars £55 15s. 1d., and Best Selected £64 10s. In their price current, dated 8th inst., Messrs. Vivian, Younger & Bond, London, remark: The market still presents some features of strength. Statistics, aided by the smelters' purchases, show a reduced visible supply, at the same time consumers generally have replenished their stocks, and the extraordinary increase in shipments to the East raises some doubt as to whether that market has not been over-bought. The importance of consumption keeping up can not be overestimated, in view of the increasing production available for the European markets. Some recent estimates put last year's increase at upward of 20,000 tons, of which America contributed 12,500 tons, and Spain 5000 tons. Spanish exportation, first two months, 97,569 tons of ore, against 101,061 last year, and 103,091 in 1882: of ingot copper, 2409 tons, against 4263 and 4973.

The following are the Board of Trade returns for the first four months:

		January 1 to April 30.		
		1884.	1883.	1882.
Imports.	Pure in pyrites.....	5,314	5,951	5,650
	precipitate.....	6,206	7,261	5,253
	ore.....	8,217	4,036	3,862
	regulus.....	3,865	2,830	2,910
	Bars, cakes, etc.....	13,041	11,697	10,136
		36,643	31,745	27,811
Exports.	Raw (English).....	6,597	5,954	3,398
	Sheets.....	8,056	5,472	4,730
	Yellow metal at 60 per cent.....	3,475	3,070	3,343
	Brass metal at 70 per cent.....	1,418	1,096	999
	Foreign.....	19,546	16,162	12,470
		3,833	3,072	3,915
		23,379	19,234	16,385

Tin.—The market has been demoralized by a sudden drop in London since yesterday, to £83 17s. 6d. Straits, the market here declining to 18¾c., with little doing. Messrs. W. T. Sargent & Son, London, May 3d, dwell on the decreased shipments from the Straits and Australia during the first four months, a decrease of 1200 tons, whereas consumption showed an increase of 1000 tons. On the other hand, Messrs. Gillfillan, Wood & Co., Singapore, write under date of March 31st: A considerable stock is held by first hands, which, with large arrivals next month, should tend to depress the value. A short time prior to this, they observed that a great deal of English capital has recently gone into tin mining in the Peninsula of Malacca, and that an unusually large output is likely to be the result during what remains of 1884.

Lead.—The Chicago Refiners' meeting of yesterday led to nothing positive, the telegraph tells us, and the debates are going on while we write. Meanwhile, the market here, though inactive, has gone on strengthening, not because any great results are expected to be obtained at the meeting just alluded to, but because, from all accounts, production at the West is curtailed for the present, and the metal is looked upon as being soundly situated for the time being. The present price of Common Domestic is 3¼c. on the spot, and of Refined, 3-80c.

Messrs. John Wahl & Co., of St. Louis, wire us as follows to-day:

The market is very steady, at some advance over last week's quotations. Sales for the week sum up 80 tons at 3-50c.; 80 tons at 3-55c.; 50 tons at 3-60c. of Chemical Lead. Refined Lead selling in small lots at 3-60c., large lots not offering. Receipts during the week foot up 1000 tons, against 1200 last week.

Messrs. Everett & Post, of Chicago, telegraph us as follows to-day:

The market is very steady at some advance on last

week's quotations, and with a fair demand. Our market is nominally 3-55c., though some sales have been made at 3-50c. Refiners as a rule refuse to sell futures, and several are out of the market entirely. The meeting of refiners is still in session.

Spanish exportation during the first two months has been 3549 tons of ore, against 1987 tons last year, and 2783 in 1882; of pig-lead, 21,126 tons, against 20,426 and 19,205. London quotes per cable soft Spanish £11 12s. 6d., against £11 2s. 6d. a fortnight ago.

Spelter.—A moderate trade is reported at 4-60c., Common Domestic, at which figure the market remains well supported, while in London Ordinary continues to bring £14 2s. 6d. at shipping ports. Spanish calamine export, first two months 4402 tons, against last year, same time, 1800, and 2792 in 1882.

Quicksilver.—Messrs. W. T. Sargent & Son, London, May 3d, print the valuable statistics below:

IMPORTATIONS INTO LONDON FOR THE FIVE MONTHS OF EACH SEASON, ENDING APRIL 30TH.

	1884.	1883.	1882.	1881.
Government Spanish.....	31,996	13,670	32,998	27,800
Other Spanish.....	372	362	250	.....
Italian.....	2,966	2,200	1,894	1,581
Austrian.....	2,245	62	300	.....
Californian and Borneo.....	.....	.....	.....	1,116

Total bottles.....37,579 16,294 35,442 30,497

EXPORTS FROM LONDON FOR THE FIVE MONTHS OF EACH SEASON, ENDING APRIL 30TH.

Bottles.....19,500* 21,150 14,071 9,305

* Estimating April at 3,500 bottles.

The receipts of Californian at San Francisco during April were 2734 bottles, making from January 1st to April 30th, as follows:

1884.	1883.	1882.	1881.	1880.	1879.
Bottles.	Bottles.	Bottles.	Bottles.	Bottles.	Bottles.
9794	15,472	13,529	16,146	18,252	21,305

IRON MARKET REVIEW.

NEW YORK, Friday Evening, May 23.

American Pig.—The market remains in about the same condition that it has been for weeks past. Prices remain firm for the best brands, notably of No. 1 and Gray Forge, while No. 2 Foundry is in more ample supply. Business, of course, has been exceedingly dull.

We quote No. 1 Foundry at \$20@21; No. 2, \$19 @19.50; and Gray Forge, \$17.50@18.50. There have been no sales of domestic Bessemer pig. Foreign remains quiet at \$20 ex ship. Twenty per cent Spiegel is quoted in round lots at \$28@28.50 ex ship, some sales having been made at the lower figure. Ferro-manganese, 45 per cent, is worth \$45.

Scotch Pig.—There is no change whatever to note. There is an occasional sale of small lots, but the trade is very dull, and almost stagnant.

We quote ex ship and to arrive: Coltness, \$21.50 @22; Langloan, \$22@22.50; Summerlee, \$21; Dalmellington, \$20; Gartsherrie, \$21.25@21.50; Eglinton, \$19.50@20; and Glengarnock, \$21.50@22.

At the Metal Exchange, the following cable quotations have been received: Coltness, 56s. 6d.; Langloan, 52s. 6d.; Summerlee, 51s.; Gartsherrie, 51s.; Glengarnock, at Ardrossan, 50s. 6d.; Dalmellington, 47s. 6d.; and Eglinton, 44s. 3d. Warrants, 41s. 4d.

Steel Rails.—There has been no business of any importance. We quote \$32.50@33 at mill.

Old Rails.—We quote \$19@20.

Philadelphia. May 23.

[From our Special Correspondent.]

Pig Iron.—Most of the pig-iron that has been sold this week has been under \$20. There is more complaint as to quality now than there used to be, owing to the efforts of some makers to make a little margin; but the complaint as to impurities has made the sale of really reliable brands rather more active, and some companies whose brands are guaranteed can sell their iron readily at \$21. No. 2 iron is cheap and plenty, and few good orders are heard of. Prices will very likely decline still further. In Forge iron, no changes have taken place. Moderate sales are made at about \$18, although there is plenty of iron to be bought above and below this figure.

Blooms.—Quotations are \$55@56 for Charcoal, and \$45@46 for Anthracite. Very little business is done, and that mostly at the inside figures quoted.

Foreign Irons.—A few sales of 20 per cent Spiegel-eisen have been made at \$27.75. Nothing is done in Bessemer. Quotations, \$19.75. Ten per cent Spiegel

is worth a little under \$24. There are a few inquiries, but no large business.

Muck-Bars.—Muck-Bars can be had at \$31, although \$32 is the nominal figure.

Merchant Iron.—There is less certainty in the minds of manufacturers and consumers this week, as to the suspension in the West. It has been privately ascertained that there are some parties who, for business reasons, will sign the scale, and if some do, all will have to, and the result will be the crowding of Western iron into Eastern markets, and a further depression of price here. At present writing, a conference is in session at Pittsburg, and in two hours the result will be known here. Laying aside Western competition, there is a fair demand for Eastern iron. Quotations are nominally \$1.90@2, but business has been done as low as \$1.70. Two or three mills report a good deal of business on hand, but complaints are general.

Nails.—Nails are quoted nominally at \$2.50, but only small lots are selling at that. The building demand is quite heavy.

Plate and Tank Iron.—No heavy sales are reported. Quotations are 2-15@2-25c. for Boat Plate and Tank, 2-75c. for Shell, 3-75c. for Flange, and 4-75c. for Fire-Box.

Structural Iron.—A small business is doing, but there is nothing deserving of special notice. Quotations are 2-20c. for Angles, 2-25c. for Bridge Plates, 2-75c. for Tees, and 3-50c. for Beams and Channels.

Wrought Pipes and Tubes.—Quotations are firmly maintained at from 27½ to 30 per cent discount for Butt-Welded Black Pipe, 17½ to 20 for Galvanized, 47½ to 50 per cent for Lap-Welded Black, and 32 to 25 per cent for Galvanized; Boiler Tubes, 47½ per cent.

Sheet Iron.—This week has not brought out any very heavy orders, but a number of small lots of galvanized have been ordered for early delivery. A number of inquiries for good-sized lots are now on the market, and buyers will soon place their orders; prices unchanged.

Steel Rails.—There are rumors of large transactions heard on the street, but nothing definite can be ascertained as to any important business. It is probable that some large orders would be placed at \$33.50.

Old Rails.—Quotations are nominally \$21@22.50 for Tees, according to location and size of order. Bridge Rails, \$23.50. Double-Heads, \$23@23.50. Crop-Ends, \$21 for Domestic, and 50c.@\$1 more for Foreign, but no sales of consequence have been made.

Scrap.—Stocks of scrap iron are accumulating, and No. 1 is selling this week at \$23. Cargo lots are nominally \$21, but none is selling.

Pittsburg. May 22.

[From our Special Correspondent.]

Pig Iron.—The dullness as regards sales of this commodity, according to the sales reported this week, was something more than usual even in these dull times. Three weeks ago, the sales of pig reported were over 2200 tons, two weeks ago they were about 1800 tons, and last week were but 550 tons. This is very small; but then there are private transactions that are never reported, and there may have been some last week and this. It was rumored that 1200 tons were picked up last week late, and 800 tons on Tuesday, but prices or quality are not learned. The movement will be heavier this week, I should judge, from present sales. There is no improvement in prices, the quotations of last week standing for this. Lower grades have been offered at \$16.50 cash, without buyers, because other sales have been made at \$16@16.25 cash. The iron business had two "depressors" this week, the uncertainty about the scales of wages and the financial flurry. There is little question but the New York failures and the one in our city have made business men nervous, be their nervousness well founded or not. Concerning the scales, there are rumors in the air that make the pig-iron men feel happier. It is considered pretty certain that Carnegie's Union Mills and one mill here, as well as two mills in Wheeling, find business so profitable at present that they are disposed to accede to the demands of the men. If such is the case, it will act as a damper upon the manufacturers who desire a 10 per cent reduction, as they will not have a strike on themselves. Yesterday, the Committee of Manufacturers, taking these facts into consideration, called a conference with the Amalgamated Association Committee, and they met to

ailed. Nothing will be done by the heavy buyers until after July 1st. The expectation that a good deal of business would be done in June has been entertained by some of the companies, but is doomed to disappointment. Inferior coals are very heavily shaded, and even the best coals can be had on very easy terms. The line trade is in bad shape, vessels are still scarce, and there is no very urgent demand.

The Eastern iron interests expected to have a better demand this summer, and would in that case have been better buyers of coal, but that hope seems to be lost. With all the dullness, an occasional good sale is heard of. Last week's output in the Clearfield region was the largest yet reported, being 79,175 tons. Output for the year, 1,127,593 tons. Nearly all the yearly contracts are placed, and the operators are well fixed for work, although profits are very light.

Pittsburg. May 22.

[From our Special Correspondent.]

In brief, the coal trade about Pittsburg is, on the railroads, busy; on the river, resuming work and fair. Coke is unchanged in all respects.

I find for the week ending with to day but very few changes in the railroad coal trade. The cause for this is, that prices are now as low as they can well get—to hard pan, in fact—and the prospects for any improvement or depression cloudy. The trade will probably continue as it is for another month or more, barring a shut-down of the iron mills, which would make it worse. The miners are generally working what is called full-time, and there are no strikes, all receiving 3 cents alike for mining, except at the New York & Cleveland Company's mines, where part of the force is getting $2\frac{1}{2}$ cents a bushel for digging coal that enters into competition with natural gas. Operators are satisfied with trade as it is, although there is little if any profit. Contracts made too close, is the usual cry, and it is a fact. The margins are such that it pays to continue work in preference to idleness. The shipments are fair, but have been considerably delayed the past week owing to a scarcity of cars on the roads leading to the lakes. For some reason, lake craft is moving slowly, and the loaded cars remain at Ashtabula and Cleveland. This delay is becoming serious, and should be remedied. It might also be said that, while the trade is as stated, there are more miners than are required for the work. The prospect of peace and fair work through the summer has tempted hundreds to come this way, but I hear of no one underbidding in wages. The Coal Trade Tribunal rate will prevent this, and consequently strangers must run the chance of securing jobs. To-day, the railroad coal operators met to elect the members of the tribunal to serve during the ensuing year. The use of natural gas is becoming more extensive daily, as I have already told your readers, and it threatens to utterly destroy the local mill market for nut coal. More mills are talking of using it in their works, and the experiments with it have demonstrated that it can be used successfully under furnaces. I can not say as yet that it has caused a falling off in production of coal, but when it will so act is only a question of time.

The river coal operators of the first and second pools have taken time by the forelock and made it optional with the miners whether they would resume work at a reduction of wages or remain idle. They gave them the choice of digging for 3 cents a bushel through the summer or nothing, and quite a number of pits have accepted and gone to work. The men were generally getting $3\frac{1}{4}$ cents before the spring run ended; but as I told you some weeks ago, lower prices would have to rule in the future, and the cut may not end with the present proffered price. Last Saturday, the notices were extensively posted, and at some pits in the second pool it was accepted without much growling. Others, in the first pool especially, do not seem so anxious to accept, but they probably will when they get their empties before the tippie, which will be this week or next. Walton, Pine Run, Stone, Wilson Bailey & Co., O'Neil, and Lysle were the operators first to move. The miners of Brown, Munnhall & Fassett in the second pool have been working for that price for some time, and it is said they will be reduced to $2\frac{1}{2}$ cents, as those operators have an arrangement with their men to work at $\frac{1}{4}$ cent under the price generally paid, the consideration being steady

work. These operators fought their miners into accepting these low rates, and propose evidently to keep them where they have them. It is a question whether these men do not make as much in the end as the others, by reason of regular work. The new basis of wages in the first and second pools of 3 cents will result in $2\frac{1}{4}$ cents in the third pool, as those operators insist on a $\frac{1}{4}$ cent lower rate, and has resulted in $2\frac{1}{2}$ cents in the fourth pool, for which price the miners who have been on strike returned to work. A recapitulation of prices for digging on the river would show:

	1st pool.	2d pool.	3d pool.	4th pool.
Price six months ago...	3 $\frac{1}{4}$ c.	3 $\frac{1}{4}$ c.	3 $\frac{1}{4}$ c.	3c.
Price one month ago...	3 $\frac{1}{4}$ c.	3 $\frac{1}{4}$ c.	3c.	2 $\frac{3}{4}$ c.
Price at present.....	3c.	3c.	2 $\frac{3}{4}$ c.	2 $\frac{1}{4}$ c.
Price at present on railroad.....	5c.			
Selling price river coal, wholesale, on board.....			5@6c.	
Selling price railroad coal, on the wall.....				5 $\frac{1}{4}$ c.

It may thus be seen that prices both for digging and selling on both the river and railroad are about the same. River coal is selling at Cincinnati now at $7\frac{1}{2}$ cents, a drop of $\frac{1}{4}$ cent consequent on receiving the fleet-mentioned in my last. At Louisville, the price is $7\frac{1}{4}$ cents, a drop of a quarter-cent. No coal went down this week except about 800,000 bushels on the swell of last Friday. The stock in the pools, in boats, aggregates 3,500,000 bushels. It may be noticed that a meeting of the Coal Exchange is likely, shortly, to draw up a memorial to Congress to buy the Monongahela Lockage Company, and thus secure free tolls equal to those on the Kanawha. I have just learned that O'Neil's mines in the second pool have accepted the reduction and gone to work.

The coke producers also had a meeting on Tuesday, and feel happy. They divided nearly \$200,000 received from the Pittsburg syndicate to whom they sell their coke. It is an easy way to do business, and the producers are happy and contented. There will be no change in the prices of coke for the month of June. On the 17th inst., the syndicate met, and finding business required it, resolved to keep prices as at present, namely: For Furnace, \$1.10; Foundry, \$1.25; Picked, \$1.50@1.75. The restricted production will also continue as at present.

Buffalo. May 22.

[From our Special Correspondent.]

There is plenty of anthracite coal here awaiting shipment, as vessels have been and are scarce for ports on lakes Huron and Michigan. The quantity offered for Lake Superior ports is not large. Freights are firm.

The circular prices fixed for Buffalo are well maintained by dealers. The committee in charge of the public contracts at Detroit fixed the price in accordance with the resolution of the joint Western Committee, and this is true also with the public contracts at Toronto, Canada.

The concurrent and harmonious action of these committees has done very much to maintain circular prices at all points. It is highly probable, I prophesy, that, at the meeting of the Committee of Fifteen, to be held in New York City on the 29th of this month, the scope of these committees will be very much enlarged and the number of them increased.

Comparatively little coal has been sold during the month of May thus far. This is said by a dealer to be not an unusual occurrence at this season of the year.

A large quantity of the coal moving Westward from this port is destined for the various yards and depots of the several coal companies at Chicago and ports of distribution.

The trade feels that, with the maintenance of the present schedule of prices during May and June, a remunerative year's business may confidently be expected, although the tonnage is hardly likely to be as large in the aggregate as that of 1883.

The unanimity of action between mine owners, the railroads, and the retailers is a source of dissatisfaction to a class of large consumers. I have reference to the arranged discrimination in prices. For instance, a manufacturer buys say 100 tons of coal for his factory at \$4.55, while the owner of a store or of a large building, like our "Board of Trade," using 500 tons a year, is obliged to pay \$4.90. A man ordering a single ton pays the same price. One institution that I know of has begun using bituminous coal at \$2.60 a ton, and the experiment thus far has proved very satisfactory, and on the year's consumption the gain of at least \$150 will be the result of the change from anthracite to soft coal.

The bituminous coal trade is without any new features, and the immediate prospects for a change are not observable. Stocks are very large, and selling rates low for run of mine—a good thing for our manufacturing and steamboat interests. It is an ill wind that blows nobody any good. The coke trade shows a fair amount of activity. No change to report in supply, demand, or prices.

The first cargo of soft coal to arrive here this season came in on Tuesday last from Cleveland, Ohio.

The Buffalo Courier of yesterday publishes the following: "There are still strikes and rumors of strikes in the coal region, both in the Reynoldsville and Alleghany Valley districts. The present strike at the Falls Creek mines is rather an insignificant affair as there are not more than fifty or sixty miners out yet. As near as can be understood, their particular grievance at this time is the practice of weighing the coal after it has been screened instead of in the hopper. In the hopper, with all the siftings, the coal weighs a third more, and the salary loss is therefore very material to the miners. At the Dagus and Brady's Bend mines, in the Alleghany Valley region, the difficulty is understood to be over a slight reduction in pay, probably five cents a ton. Of the more extensive strikes reported out of Pittsburg, nothing definite is known in Buffalo."

Freight engagements for the past week were at the following rates: To Chicago and Milwaukee, 75c.; to Racine, 85c.; to Duluth, 80c.; to Toledo, 40c.; and to Sheboygan, 75c. per net ton; closing strong.

Shipments Westward by lake from May 15th to 21st, inclusive, were 44,550 tons, namely, 30,910 tons to Chicago, 7300 tons to Milwaukee, 1360 tons to Toledo, 1540 tons to Racine, 3010 to Duluth, and 430 tons to Port Dalhousie.

Canal shipments, none. The nominal asking rate to Albany is \$1.10, and to New York \$1.40 per gross ton.

Superintendent Johnson reports that the Rochester & Pittsburg Railroad is experiencing a "boom." No cheap coal is hauled. What is carried is taken at paying rates, and the quantity is much larger than in the corresponding period in 1883. All regular trains are kept busy, and two additional ones have been started. The road has 17 steam canal-boats and barges; 14 have already arrived and are loading for New York. It is said that the labor market is cheaper at Rochester than at Buffalo, hence the favor shown to the former place.

One of our daily papers, the Times, I think, published this item on Monday: "Rochester papers are booming that city as a coal distributing point. The honor and benefits of the great coal center of the Union came to Buffalo three years ago without solicitation, and came to stay, too. The suburbs are justified in getting what little there is left. We do not envy or blame Rochester."

Receipts by Lake Shore & Michigan Southern Railroad for the past week were 476 tons, namely, 324 tons for Buffalo, and 152 tons for other points.

Boston. May 22.

[From our Special Correspondent.]

Your correspondent can only note this week the continuance of the quiet movement that this market has seen in all its branches for some weeks, although there seems to be a rather better feeling. It is useless to look for any change to sudden activity for the present. The slow ways of the market have come to stay for some time, and the healthiness of the general coal market and the conceded probability that there will be no reduction in cargo prices add nothing to the transactions of the market in the present state. There has been rather more inquiry from cities depending upon the pockets mainly, and, all considered, the trade of the week has probably been a trifle larger than last week, but the increase is not at all important; while, as has been said, there is no improvement in Boston's demand, for the retail trade here is in as bad a condition as last noted.

Cargo prices are not materially changed. There is, perhaps, a firmer feeling in free white ash stove. Quotations continue at \$4 for Stove; \$3.65 for Broken and Egg; \$3.85 for Chestnut at New York. At Philadelphia, the nominal f. o. b. prices continue \$3.80@ \$3.90 for Stove; \$3.40@ \$3.50 for Broken and Egg.

Gas-coal prices still lack confidence and the buying is light. Bituminous steam coal is moving only in cargo lots. The nominal quotations are \$3.90@ \$4

a ton. Provincial culm is coming along slowly, but we hear of no new business in this line.

There is a little less strength to freights, as vessels seem to be more abundant :

New York, \$1@1.20 per ton; Philadelphia, \$1.25 @ \$1.30; Baltimore, \$1.40@ \$1.45; Georgetown, \$1.75; Newport News, \$1.25; Richmond, \$1.30; Bay of Fundy, \$1.50; Cape Breton, \$1.90@ \$2.

There is a slight improvement in retail trade, as the market remains in the condition previously reported, and a few are taking advantage of this abnormal state of affairs to lay in their year's supply. This is the season for retail contracts with large consumers, and a few are made at about \$4.25 for Cumberland and \$4.75 for Broken coal. The low prices on the wharf continue at \$4.75 for Stove, \$4.50 for Egg, \$4.25 for Broken, with more selling at these prices than last week. Delivered prices are for the most part unchanged as quoted :

White ash, furnace, and egg	\$5.50@
" " stove and nut	5.75@
Red ash, egg	6.00@
" " stove	6.00@
Lorberry, egg and stove	6.50@
Franklin, egg and stove	7.25@
Lehigh, furnace, egg, and stove	5.50@5.75
" nut	5.50@5.75

STATISTICS OF COAL PRODUCTION

Comparative statement of the production of anthracite coal for the week ended May 17th, and year from January 1st :

Tons of 2240 lbs.	1884.		1883.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	111,092	1,214,083	101,767	1,305,546
D. L. & W. RR. Co.	113,121	1,650,320	108,665	1,630,458
Penna. Coal Co.	38,021	400,880	33,015	443,885
L. V. RR. Co.	34,240	469,644	45,880	396,232
P. & N. Y. RR. Co.	5,646	70,227	5,185	72,113
C. RR. of N. J.	*	*	52,883	875,232
Penn. Canal Co.	18,766	68,471	15,292	79,989
North & West Br. RR.	10,688	295,596	7,493	182,157
	331,574	4,169,221	373,180	4,990,612
Lehigh Region.				
L. V. RR. Co.	137,923	1,537,499	131,915	1,718,550
C. RR. of N. J.	*	*	52,092	800,479
S. H. & W. B. RR.	2,048	75,347	1,418	16,571
	139,971	1,612,846	185,425	2,535,600
Schuylkill Region.				
P. & R. RR. Co.	308,987	3,589,600	177,409	2,380,022
Shamokin & Lykens Val.	*	*	30,557	483,020
	308,987	3,589,600	207,966	2,863,942
Sullivan Region.				
St. Line & Sul. RR. Co.	3,633	29,592	1,369	22,588
Total	784,165	9,401,259	764,940	10,412,742
Increase				
Decrease		1,011,483		

* Included in tonnage of the Philadelphia & Reading Railroad.

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

Total same time in 1879	8,632,714 tons
" " " " 1880	7,939,037 "
" " " " 1881	9,332,027 "
" " " " 1882	9,178,604 "

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 74,956 tons, as compared with the corresponding period in 1883.

Belvidere-Delaware Railroad Report for the week ended May 17th :

	Week.	Year. 1884.	Year. 1883.
Coal for shipment at Coal Port (Trenton)	4,545	17,848	25,825
Coal for shipment at South Amboy	20,101	242,940	318,593
Coal for distribution	16,512	294,420	301,705
Coal for company's use	3,025	68,152	55,386
Total	44,183	623,360	701,509
Increase			
Decrease		78,149	

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DR. A. ATKINSON, Prof. Materia Medica and Dermatology, in College of Physicians and Surgeons, Baltimore, Md., says: "It makes a pleasant drink, and is one of our best tonics in the shape of the phosphates in soluble form."

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended May 17th, and year from January 1st :

	1884.		1883.	
	Week.	Year.	Week.	Year.
Gallitzin & Mountain (Alleghany Region)	2,479	50,417	2,036	46,100
West Penn. RR.	39	24,332	1,842	39,867
Southwest Penn. RR.	41,440	836,052	41,468	759,188
Penn. & Westmoreland Region, Pa. RR.	4,576	75,276	4,316	93,148
Monongahela, Penn. RR.	2,132	30,706		313
Pittsburg Region, Pa. RR.		136	484	7,628
Snow Shoe (Clearfield Region)		8,111		
Total	50,666	1,025,030	49,786	946,244
Increase		78,786		

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to May 23d.

Ports.	From Philadelphia.	From Baltimore.	From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken.
Alexandria			
Annapolis			
Albany			
Baltimore	.58		
Bangor	.95		
Bath, Me.			1.10
Beverly			1.00
Boston, Mass.	1.25@1.30		.80@.95
Bristol			
Bridgeport, Conn.			
Brooklyn			
Cambridge, Mass.			.95
Cambridgeport			.95
Charleston, S. C.	.60		
Charlestown			
Chelsea			.95
City Point			.95
Com. Pt., Mass.			.95
E. Boston			.95
East Cambridge			.95
S. Greenwich, R. I.			
Fall River	1.15		.75@.80
Galveston			
Gardiner, Me.	1.25		
Georgetown, D.C.			
Gloucester			
Hartford			
Hackensack			
Hudson			
Lynn	1.45		
Marblehead			
Medford			
Millville, N. J.			
Milton			
Newark, N. J.			
New Bedford	.85@1.15		.80
Newburyport			
New Haven			
New London			.65
New-Berne			
Newport			.75@.80
New York			
Norfolk, Va.			.70
Norwich			
Norwalk, Conn.			
Pawtucket			
Philadelphia	1.00*		.90
Portland, Me.			
Portsmouth, Va.			
Portsmouth, N.H.			1.05@1.10
Providence	.85@1.15		.75@.80
Quincy Point			
Richmond, Va.			.70
Rockland, Me.			
Rockport			
Roxbury, Mass.			
Saco	1.30†		
Sag Harbor			
Salem, Mass.			1.00
Saugus			
Savannah			
Somerset			
Staten Island			
Trenton			
Troy			
Wareham			
Washington	.75		
Weymouth			
Williamsbr., N.Y.			
Wilmington, Del.			
Wilmington, N.C.			
St. Thomas, W. I.			

* And discharging. † And discharging and towing. ‡ Se. per bridge extra. § Alongside. ¶ And towing up and down. † And towing. ** Below bridge.

Comparative Statement of the Production of Bituminous Coal for the week ended May 17th and year from January 1st :

	1884.		1883.	
	Week.	Year.	Week.	Year.
Cumberland Region, Md.				
Tons of 2240 lbs.	71,582	894,561	53,655	784,841
Barclay Region, Pa.				
Barclay RR., tons of 2240 lbs.	8,338	133,802	6,421	130,397
Huntington & Broad Top Region, Pa.				
Huntington & Broad Top RR., of 2240 lbs.	4,518	73,677	3,367	79,289
East Broad Top Region, Pa.				
East Broad Top RR.	412	75,455	4,323	96,659
Cearfield Region, Pa.				
Snow Shoe	1,908	4,579		
Tyros & Clearfield, Pa.	77,969	1,127,193	58,525	1,057,836
Alleghany Region, Pa.				
Gallitzin & Mountain	7,427	142,760	7,087	183,574
Pittsburg Region, Pa.				
West Penn RR.	4,844	112,434	4,854	181,586
Southwest Penn. RR.	3,240	63,038	2,423	46,571
Pennsylvania RR.	1,951	109,857	24,202	528,996
Westmoreland Region, Pa.				
Pennsylvania RR.	28,069	424,851	1,503	184,787
Monongahela Region, Pa.				
Pennsylvania RR.	1,345	61,733		
Total	211,603	3,223,940	166,360	3,274,538
Decrease		50,588		

RAIL AND CANAL FREIGHTS.

SOUTHERN CENTRAL RAILROAD AND LEHIGH VALLEY AND PENNSYLVANIA & NEW YORK CANAL AND RAILROAD COMPANY'S JOINT COAL RATE CIRCULAR.

No. 5.

AUBURN, N. Y., May 5, 1884.

On and after May 5th, 1884, the rate on coal, per gross ton from COXTON, will be as follows, to :

- Barton, Smithboro', Tioza Center and Owego . . . \$1.50
- Flemingville, Newark Valley, Berksire, Richard, Harford Mills, Harford, Dryden, Freeville . . . 2.00
- West Dryden, Asbury, Ozmun's, North Lansing, Genoa, Venice Center, Merrifield, and Mapleton . . . 2.00
- Peruville, Groton, Locke, Moravia, Cascade, Ensenore, Wyckoff's, Auburn, Throop, and Weedsport . . . 2.00
- Cato . . . 2.05
- Ira . . . 2.15
- Martville, Sterling, Fair Haven, and North Fan Haven . . . 2.20

The rate on Lehigh coal to the above stations will be 25 cents a ton higher than rates named.

A charge of 15 cents a ton will be collected of each consignee, on all coal not unloaded within twenty-four hours after its arrival, and an additional charge of 10 cents a ton for every twenty-four hours thereafter (Sundays and legal holidays excepted).

No allowance will be made for coal lost from cars on account of broken doors or other defects existing when the coal is loaded. Claims for lost coal will be settled with shippers only.

JOHN TAYLOR, General Traffic Manager, Mauch Chunk, Pa. HENRY L. RICH, Act'g Gen. Freight Agent, Auburn, N. Y.

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- ANDRE, GEORGE G. A Practical Treatise on Coal Mining. 2 vols. royal 8vo, cloth. Lond. 1878. \$28.
- ATKINSON, J. J. A Practical Treatise on the Gases met with in Coal Mines. 16mo, boards. N. Y. 1875. 50 cents.
- ATKINSON, J. J. Friction of Air in Mines. 12mo, boards. N. Y. 1879. 50 cents.
- ATKINSON, J. J. A Practical Treatise on Mining Machinery. 2 vols. 4to, cloth. Lond. 1878. \$28.
- BAGOT, A. Accidents in Mines, the Cause and Prevention. 12mo, cloth. Lond. 1878. \$2.
- BAILES, W. The Student's Guide to the Principles of Coal and Metal Mining. Vol. I. (only). 8vo, half morocco. Lond. 1879. \$8.
- HIGSON, JOHN, F.G.S. Explosions in Coal Mines. 8vo cloth, plates. Manchester, 1878. \$5.
- HUNT, T. STERRY, LL.D. Coal and Iron in Southern Ohio. 8vo, paper. Boston, 1881. 75 cents.
- HYBLOP, JONATHAN, C.E. and M.E. Colliery Management. Second Edition. With Atlas of 17 Plates. Lond. 1876. \$9.
- MATHER, JAMES. The Coal Mines, their Dangers and Means of Safety. Lond. 1868. \$10.
- PERCY, C. M. The Mechanical Engineering of Collieries. With 210 illustrations. Vol. I. Second Edition. 8vo, cloth. Lond. 1883. \$4.50.
- PURDY, WILLIAM. An Essay on Colliery Explosions and Safety-Lamps. 12mo, boards. Lond. 1880. 50 cents.
- ROWAN, THOMAS, C.E. Coal: Spontaneous Combustion and Explosions occurring in Coal Cargoes. Their Treatment and Prevention. Also the Prevention of Fire in Ships from Cargoes of Stores containing Substances of a Volatile or Inflammable Nature. Lond. 8vo, cloth. \$2.
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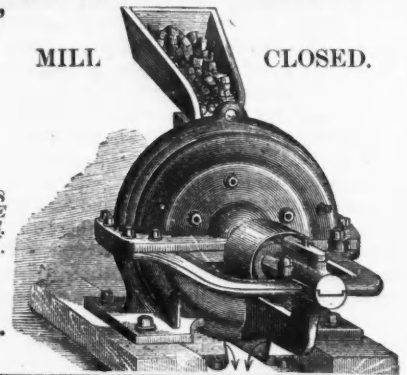
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