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TENDERS are asked by the Commissioner of Railroads of New South Wales for the manufacture and supply of 150,000 tons of steel rails to be manufactured in the colony, as the beginning of what we presume will be the first work of an Australian steel-mill. The movement shows how determined that vigorous young country is to create its own manufacturing industries.

The Yedras mine and 40-stamp mill, 80 miles north of Culiacan, Sinaloa, Mexico, is being placed on the London market, the capital being £325,325 in 65,000 ordinary shares of £5 each, and 325 founders' shares of £1 each. The vendors are to receive £175,000 in cash, 21,000 ordinary, and the founders' shares. Mr. J. H. CLEMES, a well-known engineer, reports £218,219 net in sight, while Mr. CLARENCE KING, who has been connected with the Yedras mine for some years, estimates £250,000 net.

THROUGH the courtesy of Herr M. HONIGMANN, of Grevenberg, Ger. many, we have been favored with a copy of a very interesting report by Professor A. RIEDLER, of the Polytechnic School of Munich, on the tests made by him with the Honigmann condenser. The improvement introduced is based upon the fact that a solution of caustic soda, of a

given concentration and corresponding boiling-point, absorbs steam, liberating latent heat. The steam of an engine may therefore be exhausted into a solution of soda, and the heat thus obtained be utilized to generate steam for the engine, until the boiling-point of the solution by its dilution has been reached and its power of condensing steam ceases. Thus, if the condenser is filled with a solution of soda, the boiling-point of which is from 185 to 200 degrees Celsius, the engine may start with a steam pressure equivalent to a boiling-point of water at 166 degrees, and continue to exhaust into the condenser until the lye has reached a dilution corresponding to that boiling-point. Then it can not absorb any more steam, but the process can be continued by exhausting into the air until a boiler pressure corresponding to the boiling-point of water at 144 degrees is reached. Then exhausting into the lye may go on again until it has reached the dilution that will prevent further condensation. It will be seen, therefore, that an engine, a tramway or mine locomotive, may start on its run with a boiler filled with superheated water from a stationary boiler, and with a condenser filled with concentrated lye. Thus equipped, it runs along exhausting into the condenser until the latter will absorb no more steam, when the pressure in the boiler is allowed to go down by running without the condenser until it is low enough to begin exhausting into it. After the run, the lye is evaporated and the caustic soda used over again for the same purpose. The result of the practical tests made thus far with tramway locomotives has been very satisfactory. The pressure in the boiler remains nearly constant, and the difference in the temperature between the steam and the lye is only from 6 to 10 degrees Celsius. If a hot solution of soda, containing from 20 to 25 degrees Celsius, is filled into the condenser, it is only necessary to charge the boiler with warm water having a temperature of from 80 to 90 degrees Celsius. After a short time, the latter is so heated by the adjacent hot solution that a start with a boiler pressure of from 4 to 5 atmospheres can be attained. The advantages of such a system of driving engines for transportation in underground workings are particularly striking. They can start off without any fire, work noiselessly, do not give any heat, and do not vitiate the air by smoke or exhaust steam. These fireless locomotives are to be employed in two great collieries in Germany, and the results of the trials, on a practical scale over a long period, will be watched with much interest.

THE PRICE OF SILVER IN 1883.

The heavy decline in the price of silver in the months of September, October, November, and December of 1882, which carried values down from \$1.14 to \$1.08, or fully six cents per ounce, was stayed during the year 1883. The year 1883 has on the whole been a very uneventful one, and after \$1.10 was once reached, that figure, with slight fluctuations above and below it, remained the average for the year. The following table will show the course of the market from week to week :

FLUCTUATIONS IN THE PRICE OF SILVER IN 1883.

Week ended.	HIGHEST.		LOWEST.	
	New York. Cents.	London. Pence.	New York. Cents.	London. Pence.
January 6th	109 1/4	50 7-16	108 3/4	50 1/2
" 13th	109 1/4	50 1/2	108 3/4	50 1/2
" 19th	109 1/4	50 1/2	109	50 1/2
" 27th	109 1/4	50 1/2	109 1/4	50 3-16
February 3d	110 1/4	50 9-16	109 1/2	50 7-16
" 10th	110 1/4	50 9-16	109 1/2	50 1/2
" 17th	110	50 1/2	110	50 7-16
" 24th	110 1/4	51	109 1/2	50 1/2
March 3d	110 1/4	51 1-16	110 1/4	51
" 10th	111	51 3-16	110 1/4	51 1/2
" 17th	111	51 3-16	110 1/4	51 3-16
" 24th	110 1/4	51	109 1/4	50 1/2
" 31st	110 1/4	51 1-16	109 1/4	50 1/2
April 7th	110 1/4	50 1/2	110 1/4	50 1/2
" 14th	110 1/4	50 1/2	109 1/4	50 1/2
" 21st	109 1/4	50 9-16	109 1/4	50 1/2
" 28th	109 1/4	50 1/2	109 1/4	50 1/2
May 5th	109 1/4	50 1/2	109 1/4	50 1-16
" 12th	109 1/4	50 1/2	109 1/4	50 1-16
" 19th	109 1/4	50 1/2	109 1/4	50 1-16
" 26th	109 1/4	50 1/2	109 1/4	50 1-16
June 2d	109 1/4	50 1/2	109 1/4	50 1-16
" 9th	109 1/4	50 1/2	109 1/4	50 1-16
" 16th	109 1/4	50 1/2	109 1/4	50 1-16
" 23d	110 1/4	50 1/2	109 1/4	50 1-16
" 30th	110 1/4	50 11-16	110 1/4	50 7-16
July 7th	110 1/4	50 1/2	110 1/4	50 7-16
" 14th	110 1/4	50 1/2	110 1/4	50 7-16
" 21st	110 1/4	50 1/2	109 1/4	50 5-16
" 28th	110 1/4	50 1/2	110	50 1/2
August 4th	110 1/4	50 1/2	110 1/4	50 7-16
" 11th	110 1/4	50 7-16	110 1/4	50 7-16
" 18th	110 1/4	50 1/2	109 1/4	50 7-16
" 25th	110 1/4	50 1/2	110 1/4	50 1/2
September 1st	110 1/4	50 1/2	109 1/4	50 1/2
" 8th	109 1/4	50 1/2	109 1/4	50 1/2
" 15th	110	50 11-16	109 1/4	50 1/2
" 22d	110 1/4	50 13-16	110 1/4	50 1/2
" 29th	110 1/4	50 15-16	110 1/4	50 1/2
October 6th	110 1/4	50 15-16	110 1/4	50 1/2
" 13th	110 1/4	50 15-16	110 1/4	50 1/2
" 20th	110 1/4	51	110 1/4	50 1/2
" 27th	110 1/4	51	110 1/4	50 1/2
November 3d	110 1/4	50 15-16	110 1/4	50 1/2
" 10th	110 1/4	50 15-16	110 1/4	50 13-16
" 17th	110 1/4	50 13-16	110 1/4	50 11-16
" 24th	110 1/4	50 1/2	110	50 1/2
December 1st	110 1/4	50 1/2	110	50 1/2
" 8th	110 1/4	50 13-16	110 1/4	50 9-16
" 15th	110 1/4	50 13-16	110 1/4	50 1/2
" 22d	110 1/4	50 15-16	110 1/4	50 1/2
" 29th	110 1/4	51	110 1/4	50 15-16

The year opened with an active demand for Eastern exchange, which

checked the previous decline; and with such an advance of sterling exchange here, values were gradually carried upward here, though remaining quiet in England. The low rates for India exchange, however, stimulated imports from India, and the London silver market improved correspondingly, until, in February, absence of continental orders began to cause a weakening. The advanced rate at which Indian Council bills were awarded toward the close of the month caused values to rally. The rise in London was, however, neutralized here in the beginning of March by a receding sterling exchange market, and when London commenced to go downward, the price here gave way. The completion, in the beginning of April, of a small continental order and a decline in India exchange caused a falling off in London, which, however, was nearly met here by an advance in sterling exchange, and the market continued dull and almost nominal and stagnant until nearly the end of May. Liberal sales of bills on India by the Council in London, meeting all the demands for exchange, retarded an advance in silver. The beginning of June witnessed some symptoms of weakness, soon superseded by a more active inquiry and an advance which would have been more striking here but for the weakness of the sterling exchange. A decline in the exchanges in India caused July to open less promisingly, and the market weakened until the close of the month. In August, silver was tolerably firm abroad, but, with sterling exchange weak, showed a declining tendency, especially toward the close of the month, when large receipts aggravated the evil. September passed quietly, with a stiffening of prices in London. The advance was barely held in October. November opened dull, and, in sympathy with a decline in the price of exchange on India, values receded till the close of the month. December ushered in better values, and after a temporary weakness, the market exhibited greater strength.

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.]

The Examination and Survey of Mineral Lands.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It is not for the purpose of carping criticism that I write, but to express my high appreciation of W. G. W.'s thoughtful article upon the "Examination and Survey of Mineral Lands," which appeared in your issue of January 19th, 1884. Concerning the discussion of the right relations of "theory and practice," which is now undergoing one of the periodical revivals in the newspapers of the West, it is very seldom that one finds any intelligent utterances upon the popular side. While mining engineers in the practice of their profession are bored half to death by the arrogance and ignorance of the charlatan miners whom they are often compelled to employ, the public is duped by the charlatan engineers who have been intrusted with interests which require most skillful handling by thoroughly trained and experienced men. W. G. W. has done good service to our righteous cause by contributing his remarkably clear and thorough diagnosis of the three types of men who are liable to be employed in the examination of mineral lands, and whose reports are made to form the basis of future operations.

While complimenting your correspondent upon the brilliancy of his production, and asking him as a favor to the profession at large to continue his valuable contributions, I have to suggest two small objections to his otherwise admirable paper. The first is the use of initials only in the signature. I don't think I am alone in the desire to become more intimately acquainted with one who so valiantly wields the pen in the defense of the much abused and long-suffering brotherhood of mining engineers. The second objection I must put in the form of a kindly protest against the introduction of such an ill-timed term as "diascopography" and its legitimate train of derivations, as *diascopogram*, *diascopographic*, *diascopographical*, *diascopographically*, etc. Without discussing the manifold objections to the terms themselves, even if our vocabulary were deficient in words to express the meaning, where is the necessity of a substitute for the much more euphonious and literal word "geognosy," which has long been used by English geologists exactly as W. G. W. now uses his remarkable combination of Greek roots?

SILVERTON, COLO., Jan. 30.

THEODORE B. COMSTOCK.

ACME BRONZE TELEGRAPH AND TELEPHONE WIRE.—The Ansonia Brass and Copper Company, of this city, has begun manufacturing what it calls "Acme Bronze" wire, specially for telegraph and telephone wires. Mr. G. A. Hamilton, of the Western Union Telegraph Company, reports the following as the result of his tests:

Weight per mile	110.9 lbs.
Resistance, temperature 75 degrees Fahr.	5.162 ohms.
Weight per mile ohm.	903.5 "
Conductivity (compared with pure soft copper) ..	99 per cent.
Breaking strain	360 to 365 lbs.
Elongation	2 to 4 per cent.
Twists in six inches.	20.5 to 37.5

Mr. C. F. Brackett, of Princeton, reports:

Length	102,440 feet.
Diameter	0.0828 inch.
Resistance at 60 degrees Fahr.	0.1526 ohm.
Resistance of standard (reduced to same diameter) ..	9.15104 "
Conductivity as compared with chemically pure copper ..	99 per cent (98.98)

NOTES FROM ALABAMA.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The Warrior Coal and Coke Company, which was recently organized, is preparing to begin mining immediately at Warrior, twenty-five miles north of Birmingham, and expects to be shipping coal by May 1st. The company owns about 10,000 acres of land (deeds to some of which have been secured only in the last few days), beginning near Warrior and extending into Blount County. According to the prospectus, these lands were selected by Mr. Fitzhugh, a civil and mining engineer of intelligence and long experience, who is thoroughly familiar with the entire property, having had it under personal supervision for two years or more. He is therefore considered competent to speak positively of its value, and he unhesitatingly asserts that, for general advantages and the quantity and superior quality of its coal, it can not be surpassed by any body of land in the State. These lands are admirably situated for conducting mining operations to advantage, and especially on a large scale. The construction of a railroad branch from one and a half to two miles long will reach a point from which about 600 acres can be mined by drifts; and by extending the branch one half to three quarters of a mile farther, another location will be reached from which about 400 acres more can be mined in the same way. Consequently, no additional expense for extending the branch road need be incurred for a number of years, even if the operations should be upon the largest possible scale.

The cost of constructing the branch road to the points referred to, according to the estimate of Mr. Fitzhugh, will not exceed \$2500 per mile for grading and cross-ties. The Louisville & Nashville Railroad will furnish the iron, merely charging interest on its value, estimated at \$28 per ton, and the road can be extended through its lands when found necessary or desirable, at about the same cost per mile. The prospectus refers to the proximity of the company's land to the large and rich deposits of brown hematite and red fossiliferous ores in Murphy's Valley, and the almost assured fact that a railroad will be built from the Louisville & Nashville to these ore-fields and through the lands of the company. The Louisville & Nashville Railroad Company has agreed to take 50,000 tons of the company's coal annually, at a rate that will pay a fair profit. John T. Wheelless, of Nashville, is president of the company, and Major G. D. Fitzhugh, of this city, secretary and general manager.

The total amount of last year's output by the Pratt Coal and Iron Company was 550,640 tons of coal.

Track-laying on the Cahaba Coal Mining Company's Railroad has been somewhat retarded on account of the severe weather during the early half of this month. It is expected the remaining two miles will be finished by the middle of February, when the company will commence the shipment of coal from its mines.

Books of subscription to the capital stock of the Birmingham Mineral Railroad will be opened at the office of R. W. A. Wilda, in this city, on the 11th of February, 1884. This railroad will run southwest from Birmingham along the base of Red Mountain, tapping all the ore mines along the mountain, and will be a competitor of the Alabama Great Southern Railroad in the ore-carrying traffic to this city, which at present it seems as if the Alabama Great Southern Railroad was not in a position to handle to the satisfaction of its patrons.

The industrial trades of this section have been in a somewhat stagnant state for the last month or so, both on account of the holidays and bad weather. The Birmingham Rolling-Mills resumed operations last Saturday, after having been shut down nearly seven months, on account of a strike of the union men. The resumption of the mills will be a great stimulus to business in this section. The men at present employed in the mill are all non-union men, who were brought here from Pittsburg and surrounding cities.

BIRMINGHAM, ALA., Jan. 29.

THE RESILIENCE OF STEEL.

At the last meeting of the Engineers' Club of Philadelphia, Mr. Wilfred Lewis read a paper upon the Resilience of Steel, reviewing some of the means employed for the storage of energy, and showing the place occupied by steel among them. Among the means now employed, compressed air, hot water, and the storage battery were cited from an English writer as being about equal in value, and as giving out about 6500 foot-pounds of work per pound of material used. Steel springs, according to the same writer, were said to yield about 18 foot-pounds per pound. The project of using steel springs as a motor for street cars was referred to as the most hopeless of all possible means of locomotion. To test the accuracy of this statement in regard to steel, several experiments were made by the writer upon tempered specimens, both for tension and flexure. Contrary to expectation, the highest results were shown by the flexure of a small spiral clock-spring weighing 2040 grains, which gave out, when wound up, about 45 foot-pounds of energy, or in other words, 154 foot-pounds per pound. The transverse strength of this steel within the elastic limit was found to be about 800,000 pounds per square inch, and its modulus of elasticity about 30,000,000. Such extraordinary strength, with such a low modulus, was so far beyond conjecture that it seemed to give a new hope for the success of the project referred to; but after making the necessary allowances for weight of car and efficiency of driving mechanism, it was found that not more than about 20 foot-pounds per pound of car would be available for locomotion. It was therefore improbable that such a car could ascend a hill over twenty feet high. It was also a matter of doubt whether larger springs could be made to show results which would even approach these figures, and on this account the experiments about to be tried might be looked for with some interest.

Mr. H. C. Lüders presented a description, illustrated by photographs, of the ancient ship found near Sandefjord, in Norway. He also exhibited specimen of rolled and annealed phosphor-bronze of maximum ductility, and consequently of minimum tensile strength, and submitted the following data of the test thereof: Length, 2 inches; diameter, 0.57 inch; subjected to a strain of 18,620 pounds, equivalent to 58,400 pounds per square inch; elongation, 70.5 per cent; reduced area at point where fracture would occur, 0.3 inch; elastic limit, about 18,000 pounds per square inch. Hard rolled rods tested without turning off the surface have shown a tenacity exceeding 90,000 pounds per square inch,

KEROSENE—THE ORIGIN OF THE NAME, THE HISTORY OF A GREAT INDUSTRY OF YEARS PAST, AND THE POSSIBILITY OF ITS REVIVAL.

Written for the Engineering and Mining Journal.

As early as 1739, there appears in the records of the Royal Society of London, in an account of the experiments of Dr. Clayton, the statement that, in the distillation of coal for gas, there appeared a black oil, which, however, was not examined closely, gas being the object of interest. In 1781, the Earl of Dundonald obtained a patent in England for distilling coal for gas, and in 1805 Mr. Northern, of Leeds, England, mentions oil as resulting from coal distillation. Laurent and Reichenbach noticed and wrote upon the oils from coal by distillation. In France, Selligie first distilled the bituminous schists of Autun for burning-fluids. Mansfield in 1847 patented in England his mode of obtaining the volatile liquids from tar for dissolving rubber. In the same year, Dr. Abraham Gesner, in treating the pitch of Trinidad, obtained various products, and burned them in lamps at one of his lectures at Halifax, Nova Scotia, and at Charlottetown, Prince Edward's Island. The Earl of Dundonald, at that time admiral on the North American station, and at Halifax a part of the time, afforded Dr. Gesner facilities for experimenting with the pitch of Trinidad, he being owner of a portion of the great Pitch Lake of that island, and interested, as may be supposed, in the results of the distillation of bituminous substances. Numerous patents followed that of Dundonald, who again, in 1852, obtained patents in England, some of them based directly or partly on oil-making from coal and coal tar. In 1850, James Young, of Manchester, obtained a patent in England for paraffine oil, naming it from the solid hydrocarbon "paraffine" usually found in coal. He used Boghead coal principally, and began the industry in that country four years after. Dr. Gesner patented "kerosene oil" in the United States in 1854, and in 1856 obtained a patent for improvements in its manufacture. The writer, a near relative of the patentee, recalls the debate upon the name to be given to the new illuminating oil, and the reason why "kerosene" was decided upon.

Paraffine, which occurred in the manufacture, has a waxy appearance, and was formerly called "tar-wax," and it was suggested that Greek words which signified "wax-oil" might form a proper name. Therefore *keros*, wax, and *elain*, oil, were chosen. At that time, camphene, a compound of alcohol and spirits of turpentine, was in use as an illuminator, and it was decided to adopt its termination, the public being familiar with it, and accordingly "Kerosene," instead of "Keroselain" was decided upon. The patentee used the word to distinguish certain portions of the distillate from coal also. The name "paraffine" has a much less fanciful origin; but kerosene has kept its place in popular use, being applied to all kinds of mineral illuminating oils, and has passed into the language through the dictionary since it was originated thirty years ago. The first kerosene or oil distilled from coal in this country was made in 1854 by Dr. Gesner at the works of the New York Kerosene Oil Company at a place now called Blissville, near Penny Bridge, on Newtown Creek, Long Island. The coal used was a certain description of cannel from Dorchester, New Brunswick. It was low in yield, but produced a fair burning oil. The chemicals used, oil of vitriol and caustic soda, came from the works of Martin Kalbfleisch at Bushwick; Stillman & Allen (the Novelty Iron-Works) supplying the apparatus. The agents of the company were Messrs. John H. Austin and George W. Austin, and they disposed of the oil at their place of business in Beaver street, near Delmonico's corner.

The new illuminating oil met with the strongest opposition from the turpentine and alcohol trades. Its odor, which was not then so well removed as it was later on, gave those interested a weapon against its introduction, which at times seemed likely to be wielded fatally. After a time, however, its soft, steady light and perfect safety, in contrast with the poor light and fiery rays of camphene, gained it friends, and enabled its manufacturers to make headway against all opposition. Mr. John H. Austin greatly assisted in the introduction of kerosene into common use by bringing from Europe an improved burner, the "Vienna burner," which has formed the basis of numberless so-called improvements since. Camphene and "burning fluid" had to give way, and by the time that petroleum, the discovery of which was led up to by coal-oil distillation, appeared in large volume, there were fifty-six coal-oil works in this country. There were thirteen in Pennsylvania, thirteen in New York, twelve in Ohio, ten in Kentucky, six in Massachusetts, and two in Connecticut. Those in New York and the Eastern States brought their material from various mines. Those in the other States named, almost without exception, worked the cannel coal of seams near at hand. There are yet to be seen the ruins of coal-oil works in the States of Ohio and Kentucky, and their neighbors, probably. These works, like those of the seaboard, made no stand against the wave of petroleum which swept over them. They could do so now if they were alive. Between 1854 and 1860, a large number of "experts" in coal-oil appeared, and in the States named and around the cannel coal regions, were as frequently seen as the "chemist from Freiberg," who now turns up where gold and silver are worked in the far West. Some of these "experts" became in time very skillful in their business. They had not had the time to become very familiar with the chemistry of hydrocarbons generally, and "light product," to designate one portion of the distillate, and "heavy product," to distinguish another, almost comprised their nomenclature; but they were practical and intelligent men, and none the less efficient for being unacquainted with the very remarkable substances and compounds which, since then, chemists have been so good as to discover in the "crude distillate" from coal. At first, the farmers in Ohio, at least, were rather opposed to any distillation which would not produce whisky, and made objections to disposing of lands offering good coal prospects, for which the coal-oil distillers soon developed a very keen scent. The country ministers, in many cases, could not be persuaded that any thing could be distilled from coal, and insisted that coal distillation was a cloak for another kind, much more to the taste of their flocks. The writer remembers being denounced in meeting as "Satan's messenger," because he had brought two cast-iron stills and a lot of condensers into Muskingum County from Cincinnati, and was hunting up work on a cannel coal seam which promised well.

Following kerosene, came Breckenridge, paraffine, Lucasco oil,

Downer's kerosene, and others. The kerosene patents passed into Downer's hands after a few years, and he used the Albert coal, or asphaltum rather, of New Brunswick largely at his works in Boston. The Breckenridge Company worked under Young's patent, and produced an excellent burning oil. The processes described in both patents were much improved as time went on. Mr. A. C. Ferris, of Tarentum, Pa., introduced the first burning oil made from petroleum. This was the "carbon oil."

In all cases where coal was used, the result in yield and quality of oils was largely influenced by the heat employed in procuring the "first distillate." To effect the distillation of all of the products from coal, and at the same time to produce the smallest quantity of gas or uncondensable matters, was the object. The distillation was usually conducted in gas retorts, with a condensing apparatus attached. Large clay retorts were also used. An invention of Luther and W. Atwood was tried, with good results. It was called a "meerschau," and was an upright furnace resembling the bowl of a pipe, into which the coal was dumped, the fire started from the top, a suction-blower carrying it down through the mass, and the condensable products running off at the bottom. It was capable of working large quantities of coal at a time. When coal is cheap, and a not very fine quality of oil is expected, it might prove useful and profitable.

The crude distillate, however obtained, was distilled and separation made of the different parts, as ascertained by the hydrometer. These separated parts were treated with their proper proportion of sulphuric acid and caustic soda alternately, then usually redistilled and treated, the products of the whole manufacture being naphtha, burning oil, and lubricating oil. The gas produced was usually collected and used as fuel or for lighting the works. Coke-making coals afforded fuel also. Pitch or tar from stills was also made. The carbolic acid and ammonia were not taken account of, and were permitted to run to waste, nor was the sludge acid recovered in any way.

Petroleum refining is rather an easy affair compared with coal-oil refining, and the latter certainly costs more; yet though petroleum has brought great wealth to the country, and to look closely into it may seem rather like looking a gift horse in the mouth, it is a question whether it would not, on the whole, have been a good thing for the United States if petroleum wells had never been discovered and opened. Petroleum has destroyed, in the most frightful way, many thousands of lives. It is never, in a crude state, or when improperly refined, as safe as gunpowder in destructive properties. It is not an overestimate to place the loss at one fifth of all the value it has produced, to say nothing of the lives it has taken. It is true that the price of refined petroleum to the consumer, say 15 cents per gallon, is not high, but the best kerosene or paraffine oil from coal will burn, with equal light, measure for measure, twice as long as refined petroleum, and with perfect safety—an element that may fairly be considered in calculating values.

The able and exhaustive report on "Petroleum as an Illuminator," by Professor Chandler, in 1871, shows how unsafe most of the refined petroleum then was unless it had been manufactured by firms who made a special bid for popular approval by care in that particular. Most of the refined petroleum at the present time is, perhaps, fairly safe, but it never has equaled coal-oil in that respect. The best kerosene and paraffine oils are as safe as need be, the Breckenridge, the Downer, of Boston, and R. S. Merrill's is an illuminating oil which was as safe as sperm oil and not more readily ignited. When coal-oil distillation was abandoned, lamps to burn it were becoming quite perfect. The iron interest would have been greatly benefited by the continuance of the coal-oil distillation, its consumption of that metal being large. The chemical manufacturing industry, which it is hoped will become more and more a domestic one, would also have been benefited by the continuance of coal oil distillation.

In place of being carried on with immensely dangerous storage-tanks in crowded localities, as much of the refining of petroleum now is, coal-oil works would be scattered over a large area, one equal to that of the cannel coal-fields, along the tributaries of the Ohio, the Tennessee and Missouri, each works becoming the center of industry, and each contributing to the wealth of the country in many ways that petroleum never can. The output of such works would be:

Illuminating and lubricating oils, paraffine for candles and other uses, naphtha, and benzole for aniline, ammonia, and carbolic acid.

It would require undoubtedly a very large quantity of coal to supply the oil demand should the petroleum wells cease flowing altogether, not less than 12,000,000 tons per annum of average yielding cannel; but that is a most unlikely thing to occur. It is to fill the demand gradually that coal is to come into play. Sixteen companies are now distilling bituminous shales in Scotland, yielding 25 gallons of paraffine oil per ton, and are reported as paying a good profit.

The time has arrived when coal-oil could be distilled to profit in the cannel coal regions of Kentucky, Virginia, Ohio, and Pennsylvania, at least; not because petroleum has advanced in price, but because all of the products of the distillation of coal are of greater value than they formerly were, their utilization better understood, their heavier oils and paraffine more in demand, and the perfect safety of their burning oils more appreciated by the public. There is little doubt that a burning oil made from coal, and advertised as such, would command a higher price than refined petroleum. The following estimate of the value and cost of the product of a ton of Virginia cannel coal will afford a fair basis for calculating the profits of coal distillation:

PRODUCTS.	
Kerosene (25 gals. @ 10c.)	\$2.50
Lubricating oil (10 gals. @ 16c.)	1.60
Paraffine (12 lbs. @ 9c.)	1.08
Naphtha (10 gals. @ 10c.)	1.00
Ammonia (10 lbs. @ 3c.)	.30
Carbolic acid (10 lbs. @ 10c.)	1.00
	\$7.48

In many cases, the coke and illuminating gas obtained are items to the credit of the coal, to the extent of 1200 pounds of coke, and 4500 cubic feet of illuminating gas per ton. The cost would be for coal, reagents, labor, wear and tear of building, etc., \$4 per ton, the net profit being \$3.48 per ton. Works capable of distilling 100 tons per day of cannel coal would cost at the present time \$100,000, and the profit being \$348

per day, it is not at all a poor one. In a very complete condition, and capable of producing the acid and caustic soda it would consume, \$40,000 in addition would be needed; but the profit would be increased almost in proportion. In the Kanawha Valley and at other places, sulphuric acid could be had from domestic sources, and caustic soda from the salt there made or from that of Louisiana. There is no need whatever of our country depending for its chief chemical reagents upon any other, and yet at the present time Sicily sends us sulphur and England soda ash.

It is doubtful whether there is any coal region known that will compare with that indicated. It is vast in extent indeed. Most of its coal-seams can be mined in the simplest manner, 90 cents per ton being its average cost at works and factories near by. A large proportion can be mined in hills which the seams, four and six feet in thickness, pierce. Adits can be driven in the seams themselves, and drainage and ventilation had to any extent without pumps or furnaces. The investment of \$140,000 to produce 4500 gallons of oil per day may seem large to the petroleum well-owner; but wells cost the owner very frequently very high prices in land values and other costs, and they have no element of stability to compare with that of the coal-seam. The great flowing well soon becomes a pumping well. At the present moment, petroleum is nearly 16 per cent greater in specific gravity than it formerly was, and is entailing some change in its treatment in consequence, as refiners are realizing to their cost. This increase in specific gravity indicates that there is a gradual falling off in the area of light-oil production, and that the oil regions have blown off their froth and must settle down to less profitable production. If the cost of unproductive wells were added to the cost of all, it may be that the coal-seam would show us the best investment.

As a rule, a dull fracture, great comparative lightness, and easy inflammability in a candle-flame, are favorable signs of an oil coal. Sometimes shales and schists of inferior appearance are rich in oil, the value of any of these bituminous substances depending largely upon their situation with regard to rivers, railroads, etc. The value of each item of the distillation must be considered before any proper estimate of the value of any coal can be made. A correct idea of the value of any coal can not be had by merely ascertaining the amount of volatile matter it may yield. Boghead coal yields more volatile matter than Breckenridge, and yet the latter yields ten per cent more of marketable oil. An experimental test of any coal, carrying it out to its last results, is the safest way of getting at its value, varying the heat under which it is distilled to suit its character and to obtain its best results.

The literature of coal-oil is limited. Dr. Antisell, in 1859, published *The Manufacture of Photogenic or Hydrocarbon Oils*. This was a carefully-written work. Dr. Gesner, in 1861, published *A Practical Treatise on Coal, Petroleum, and other Distilled Oils*; and in 1865 a second edition was published of the same work by G. W. Gesner. These were practical works, with drawings and the apparatus used at that date in distilling coal and petroleum oils. Prof. Henri Erni brought out a volume in the same year, giving the chemistry of the hydrocarbons principally. It was entitled *Coal-Oil and Petroleum: their Origin, History, Geology, and Chemistry; with a View of their Importance in their Bearing upon National Industry*. Prof. Henry Wurtz has made very careful examination of coal products, as is shown by his pamphlets. Professor Chandler's report, in 1871, before mentioned, completes the list in this country. These works are out of print, and can only be found at the libraries. There are several German and English writers who have noticed the subject generally.

There is a wide field, in all senses, for the manufacturing chemist in the distillation and treatment of coal-oils. The efforts of many minds had brought coal-oils to a condition almost perfect when the manufacture was arrested. At the present time, it would need only care to arrange all the details of the process of such a manufacture; the processes themselves have been already invented. Whether coal will soon again be called upon or not to supply the demand which petroleum has certainly fostered, there was a great industry begun when, at the works on Newtown Creek, was produced the illuminating oil whose name has become a household word—Kerosene.

TAMPING HOLES CHARGED WITH HIGH EXPLOSIVES.

In one of his well-written letters to the *Colliery Guardian*, Mr. G. André says: I have already had occasion to mention the efforts which are made to effect a saving in the quantity of explosives used in mining operations by systematic application of the charges. I learned the other day from a contractor who is driving a long stone-drift through strong rock that he has reduced his charges of dynamite by one third, and gets as much effect, by tamping his holes with clay. It is customary to use little or no tamping with the stronger explosives, and the time thereby saved is regarded as compensating the cost of the greater quantity required. My informant assured me, however, that this is a fallacy. Tamping with clay pellets, prepared by boys beforehand, occupies but little time; and the more complete combustion of the explosive and the reduced quantity employed lead to a diminished vitiation of the air, so that the men may return to their work immediately after the blast has been fired. In another instance of driving a heading in stone, a saving of about 50 per cent of the cost of explosives has been effected by using dynamite in the strong holes, and black powder in the rest: the proportion in this case is, on an average, one hole charged with dynamite to three holes charged with black powder. The rock is very hard and tough. While on the subject of explosives, I will mention an example of blasting in coal that lately came to my notice in France. The bore-hole was reduced as small as possible in diameter, for the purpose of distributing the pressure over a greater length with a given weight of powder. The latter was used in a cartridge 1 inch in diameter, and was of a quick-burning character. The effect was very good, only a small quantity of "small" being made. Much has been said and written respecting the relative quantities of small coal made by blasting and by wedging, the advantage being invariably attributed to the latter method of "falling." But, so far as my observation has extended, in carefully managed workings, the advantage has been decidedly on the other side. Prejudice has led to exaggeration in this matter, and the evils of "shooting fast" have been overestimated.

ON THE PHYSICAL CONDITION OF IRON AND STEEL.*

By Prof. D. E. Hughes, F.R.S.

In a paper read before the Royal Society, May 5th, 1879, entitled On an Induction Currents Balance, and Experimental Researches made therewith, the author showed that this instrument was extremely sensitive to all molecular changes in metallic bodies. Finding that its powers were remarkably suitable for researches upon the molecular change which takes place in iron and steel when tempered, he made with it a series of researches to determine the cause of tempering in steel. The results of these the author laid before the Institution of Mechanical Engineers (Proceedings, 1883, page 72) in a paper On the Molecular Rigidity of Tempered Steel. In this paper, the author advanced the theory that the molecules of soft iron were comparatively free as regards motion among themselves, while in hard iron or steel they are extremely rigid in their relative positions.

The author has since widened the field of research so as to embrace all the physical changes which occur in iron and steel through chemical alloys, mechanical compression or other strains, annealing, and tempering. The results of these researches he now embodies in the present paper. Believing it necessary that we should be able to tell the physical state of any piece of iron, without destroying or changing that state, the author has sought for and tried several methods, which gave any hope of success in this direction. The physical state of iron has a marked influence upon its electrical conductivity. The differences thus indicated, however, are not wide enough to be appreciated except with metal in the form of wire; and in order to perceive small changes, such as small differences of temper, we should require a wire at least 250 yards in length. The author has found, however, that by the application of certain phenomena belonging to magnetism, we are enabled to perceive clearly the slightest change in the molecular structure of iron or steel, through all degrees of annealing to the finest differences in tempering, and this with pieces of any form or dimensions.

It is already known that soft iron will take a higher degree of magnetism, and retain it less, than steel; and that tempered steel retains magnetism more than soft steel. Consequently we might expect that, by the aid of an instrument which could give correct measurement of degrees of magnetism, we should be able to include all varieties of iron and steel, between the two extremes of softness as in annealed iron, and hardness as in highly tempered cast-steel. The author soon found that this was not the case when pieces of iron were magnetized to saturation, or even partially so.

In a recent paper upon the theory of magnetism† the author said: "During these researches, I have remarked a peculiar property of magnetism, namely, that not only can the molecules be rotated through any degree of arc to its maximum, or saturation, but that, while it requires a comparatively strong force to overcome its rigidity or resistance to rotation, it has a small field of its own through which it can move with excessive freedom, trembling, vibrating, or rotating through small arcs with infinitely less force than would be required to rotate it permanently on either side. This property is so marked and general that we can observe it without any special iron or apparatus."

The author has found, by employing extremely feeble magnetizing powers, such as a weak current of electricity only just sufficient for measurement (or the current from one Daniell cell reduced, as found best for the dimensions of the iron, by passing it through resistance-coils varying from 10 to 100 ohms), that the following laws hold with every variety of iron and steel:

1. The magnetic capacity is directly proportional to the softness, or molecular freedom.
2. The resistance to a feeble external magnetizing force is directly as the hardness, or molecular rigidity.

The author has proved this to be the case with sixty different varieties of iron and steel furnished directly from the manufacturers. And he has found that each variety of iron or steel has fixed points, beyond which annealing can not soften, nor tempering harden; consequently, if all varieties were equally and perfectly annealed, each variety would have its own magnetic capacity, or its specific degree of value, by means of which we could at once determine its place and quality.

If, in place of several varieties, we take a single specimen, say hard-drawn Swedish iron wire, and note its magnetic capacity, we find that its value rises rapidly with each partial annealing, until an ultimate softness is obtained, being the limit of its molecular freedom. We are thus enabled to study the best methods of annealing, and to find at once the degree of softness in an unknown specimen.

Similarly, when we temper annealed iron and steel, we find that we can follow out each degree of temper up to ultimate molecular rigidity; and we may thus appreciate in an unknown specimen of unknown temper the degree of its hardness.

We have thus in each piece of iron or steel a limit of softness and hardness. In soft Swedish iron, tempering hardens but 25 per cent on the scale adopted, while mechanical compression, such as hammering, hardens it 50 per cent. In cast-steel, tempering hardens it 400 per cent, while mechanical compression gives but 50 per cent. Between cast-steel and Swedish iron, we find a long series of mild steel, hard iron, etc., varying in their proportionate degree between the two extremes just mentioned.

The theory which the author has advanced, of molecular freedom as in soft iron, and molecular rigidity as in cast-steel, fully explains all the changes which we are enabled to perceive and measure; but it is not absolutely necessary to accept the theory, in order to appreciate the results. For, leaving theoretical considerations aside, we have one proved fact, namely, that the magnetic power or capacity of a piece of iron, under the influence of an external limited magnetizing power, depends upon its softness; and that the retention of magnetism, when the external power is withdrawn, depends upon its hardness. The same degree of temper or annealing, upon the same iron or steel, gives invariably the same readings; but the slightest change—say from a straw-colored temper to a blue—gives very wide differences.

* From proof-sheets kindly furnished by the author of this paper read January 25th, 1884, before the Institution of Mechanical Engineers.

† Society of Telegraph Engineers, May 24th, 1883.

DESCRIPTION OF APPARATUS.

The instrument which the author has constructed and used in these experiments, and which he has named a "Magnetic Balance," consists of a delicate magnetic needle, suspended by a silk fiber; it is 5 centimeters in length, and its pointer rests near an index having a single fine black mark for its zero. The movement of the needle on each side of zero is limited to 5 millimeters by means of ivory stops or projections. When the north end of the needle and its zero index are north, the needle rests parallel with its index; but the slightest external influence, such as a piece of iron 1 millimeter in diameter placed at 10 centimeters distance, deflects the needle to the right or left, according to the polarity of its magnetism, and with a force proportionate to its magnetic power. If we place on the opposite side of the needle, and at the same distance, a wire possessing absolutely the same polarity, of similar name and force, the two balance each other and the needle returns to zero; and if we know the magnetic value required to balance the first piece of iron, we know the magnetic value of both.

The iron (which may be in the form of wires, rods, bars, plates, or any shape or size desired),* is placed at a fixed distance (preferably 10 or more centimeters), resting against a fixed brass stop. The center of the iron should be in a line with the center of the needle, and it should be placed at right angles to the needle, lying horizontally east and west, so as to be free from the directing influence of the earth's magnetism.

The compensator, placed upon the opposite side of the needle, and at a distance of 30 centimeters, consists of a powerful steel bar-magnet, 3 centimeters width, 1 centimeter thick, and 6 centimeters long. This turns upon its axis, carrying with it the pointer, to indicate its degree of angular displacement on the graduated circle. Generally this bar-magnet is parallel with the needle, the pointer of the compensator and the needle being at zero; but when we wish to measure the amount of magnetism in the piece of iron, the bar-magnet is made to pass through an angular displacement necessary to balance this force, and its index readings on the graduated circle are taken as the comparative values.

In order to magnetize the iron by an electrical current, a coil of insulated copper wire is placed near the needle, the iron then becoming the core of an electro-magnet.

Now as this coil, independently of its iron, acts upon the needle, this action must be balanced by an opposing coil on the opposite side. The position and power of these two coils can be adjusted by means of a lever which allows us to find a position where the two coils completely neutralize each other. If we introduce iron in the coils on either side, the balance is destroyed, and we have solely the magnetic influence of the iron core, whose value we find by an equal opposing magnetism brought into play by the rotating magnetic compensator.

A reversing key serves to change the direction of the current, and thus any difference between north and south polarity in the iron core can be observed. One Daniell cell is all that is required as a battery; but great care must be taken that its electro-motive force is a constant, otherwise all variations in the battery would be read as variations in the quality of the iron itself; and we need in addition a series of resistance coils from 10 to 100 ohms, in order to reduce the current sufficiently to bring the whole series, from soft Swedish iron to cast-steel, into range. Separate and finer determination can then be separately made by an extremely weak force for soft iron, and full or increased battery power for tempered steel. A series of different-sized coils is necessary, whenever we vary greatly the diameter of the core. The first size, with an internal core-opening of one centimeter, will test bars and rods of wire, from one centimeter diameter to the finest needle; but for larger bars, plates, etc., coils must be used which allow free passage for the iron into the core. Great care and some practice are necessary in the use of the instrument, so as to insure that the iron is placed in a neutral field; but when we have really obtained the necessary conditions, we can take several readings in a single minute, with an invariable result for the same kind of iron.

All irons and steel have some traces of remaining magnetism; it is therefore necessary that a double reading (north and south) should be taken by means of reversed currents. In this case, the quadrant is divided into 360 degrees on each side of zero; and the total value of north and south polarity added together is that given in the following tables of magnetic capacity.

Several methods of observation can be employed with the magnetic balance, the usual one being that already described; but there are many others, such as magnetizing all specimens to the same value and noting the amount of current required. We may also observe the remaining magnetism after the cessation of the current; the influence of a weak current after the passage of a strong, etc. Many of these methods give interesting facts, particularly useful to those making researches upon the cause of magnetism.†

By means of this instrument, the author has tested sixty brands of iron and steel, mostly in the form of wires. A wire one millimeter diameter and ten centimeters long was the standard size used, as we can more readily temper small wires than large rods. In all comparative experiments between iron of different grades, we must have one standard form to which all the rest must be similar in form and size. Thus, we could not compare a square or flat bar with a piece of wire; but if all pieces have the same form, then any difference observed between them must be due to their comparative softness, from which we can deduce the quality and place of each on the line ranging from soft iron to cast-steel.

INFLUENCE OF ANNEALING UPON THE MOLECULAR STRUCTURE OF IRON AND STEEL.

The magnetic balance shows that annealing not only produces softness in iron, and consequently molecular freedom, but it entirely frees it from all strains previously introduced by drawing or hammering. Thus, a bar of iron drawn or hammered has a peculiar structure, say a fibrous one, which gives a greater mechanical strength in one direction than another. This bar, if thoroughly annealed at high temperatures, becomes homogeneous in all directions, and has no longer even traces of its previous

strains, provided that there has been no actual mechanical separation into a distinct series of fibers.

TABLE I.
Influence of Annealing upon Swedish Iron, Sample G.

	Approximate temperature.		Degrees of softness indicated upon the magnetic balance.
	Cent.	Fahr.	
Wire hard-drawn as furnished by makers....			230°
Annealed at black heat.....	500°	950°	255°
" dull red.....	700°	1,300°	329°
" bright red.....	1,000°	1,800°	438°
" yellow.....	1,100°	2,000°	507°
" yellow white.....	1,300°	2,300°	525°

From Table I. we see that a regular increase of softness occurs as the temperature at which Swedish iron is annealed increases, the maximum being at a point under that of fusion.

Some difficulty was experienced in annealing all wires to the same standard. The method employed at first was to place the wires in an iron tube heated to the desired temperature; but the temperature of the tube was extremely variable, and also it was found that an interchange of carbon takes place between the tube and wires. Steel wires rapidly lose their carbon, and thus become softer at each successive annealing, while the purest iron absorbs carbon, until it contains exactly the same proportion as the tube itself. It is well known that iron wires at red heat, placed in a porcelain tube through which a current of carburated hydrogen is passing, will absorb sufficient carbon to become hard steel.

Experiments regarding the time required for perfect annealing showed that while hard steel required several hours, soft iron might be cooled in a few minutes without losing its degree of softness; consequently, knowing the great value of high temperature, the author adopted the following method. The tube was heated to a white heat or otherwise, the iron wires to be annealed were introduced quickly, and the instant they had the same temperature, they were withdrawn and simply allowed to cool in the air. The wire employed being one millimeter diameter, the whole operation was complete in two minutes. This is not suggested as the best practical method of annealing, although in the case of these wires it produced the best result; but the experiments show that, whatever method is employed, the heating should be as rapid as possible to a high degree of temperature, and that the wire should cool in a completely neutral medium or atmosphere.

The facts regarding annealing, as pointed out by the measurement of the magnetic capacity of iron wires, have no doubt been in a great measure perceived by ordinary mechanical methods. The results of the author's researches may be thus formulated:

1. The highest degree of softness in any variety of iron or steel is that obtained by a rapid heating to the highest temperature less than fusion, followed by cooling in a medium incapable of changing its chemical composition.

2. The time required for gradual cooling varies directly as the amount of carbon in alloy.

Thus, in absolutely pure iron, rapid cooling, as in tempering, would not harden it, while steel might require several hours or days, even for pieces only one millimeter diameter. Slow cooling has no injurious effect upon iron, when cooled in a neutral field; consequently, where time is no object, we may employ slow cooling in every case.

A wire or piece of iron thoroughly annealed must not be bent, stretched, hammered, or filed; the hardening effect of a bend is most remarkable, and the mere cleaning of the surface by sand-paper hardens that surface by several degrees on the scale.

The following table shows the effect of annealing upon a series of wires, kindly furnished for these experiments by Messrs. Frederick Smith & Co., of Halifax:

TABLE II.

Mark.	DESCRIPTION	Magnetic capacity.	
		Bright as sent.	Annealed.
		Degrees on scale.	Degrees on scale.
G	Best Swedish charcoal iron, 1st variety.....	230	325
F	" " 2d ".....	230	510
T	" " 3d ".....	275	503
S	Swedish Siemens-Martin iron.....	165	430
H	Puddled iron, best.....	212	30
Y'	Bessemer steel, soft.....	150	291
Y	Bessemer steel, hard.....	115	172
Z	Crucible fine cast-steel.....	50	84

From the above table, it will be seen that annealing had a great effect on the iron wires, doubling their value, and that Swedish iron stands far in advance of puddled iron; consequently, for the cores of electro-magnets in telegraph instruments—as in fact for all electro-magnets—Swedish iron is the most suitable, and the magnetic balance may find a field of practical utility in measuring each core before it is used in an electro-magnet, and may also aid us by its measurements in finding the best methods of annealing.

TEMPERING.

The influence of tempering upon the magnetic retentivity, or molecular rigidity, has been shown in every piece of iron or steel yet examined. Swedish iron hardens but 10 to 20 per cent by tempering, while cast-steel hardens 300 per cent;* the molecular rigidity of tempered steel being 18 times greater than that of soft iron. The influence of different methods of

* The smallest rods yet tested have been fine sewing-needles, and the largest bars of 5 centimeters diameter, 1 meter long.
† The author has not patented this instrument, giving it freely to the scientific and manufacturing world.

* For instance, in Table IV. below, the figure for Swedish iron No. 7 annealed is 525, tempered hard 425. On the other hand, the figure for cast-steel annealed is 84, tempered hard 28. The reciprocals of these figures give what may be called a scale of hardness.

But on again forcing the magnetism to a very high point, the figures for magnetic capacity were found to bear exactly the same relation to each other as those for tensile strength. This, however, may have been only an accident, as it only seems true at present in relation to the wires in Table IV.; but it gives hope that by a new method we may some day be enabled, not only to deduce electrical conductivity from magnetic capacity, but also tensile strength. Already in Table IV. we notice a close relation between molecular rigidity, as indicated by the figures for the annealed wires, and tensile strength. The only exception is the wire H, but the cause of this is clearly the small difference between its capacity as annealed and tempered.

Leaving aside all theoretical considerations and hoped-for improvements in the methods of observation, the author believes that he has demonstrated clearly that, by the aid of the instrument and methods described, we can at once determine the physical state of iron, as influenced by tempering and mechanical hardening, from the ultimate degree of softness to that of hardness; that we can at once determine the best iron for electro-magnets, and the best methods of softening it, as well as the best steel for permanent magnets, and the best temper to be given it. He therefore ventures to hope that the magnetic balance will prove an aid of no small value in all researches into the physical state of iron and steel.

EXPERIMENTS ON THE ESTIMATION OF LEAD AS LEAD DIOXIDE BY MEANS OF THE ELECTRIC CURRENT.*

By Frank Tenney.

These experiments were undertaken to investigate anew the practicality of the determination of lead as lead dioxide in acid solution. The first experiments in this direction were made by Luckow† and by May.‡ May used a solution containing copper and 2½ per cent of free nitric acid (calculated as anhydrous HNO₃), and obtained in this solution satisfactory results, weighing the lead as lead monoxide, into which the dioxide was converted by heat. Luckow§ says: "The complete precipitation of the lead occurs only in the presence of at least 10 per cent of free nitric acid, if only lead be present. If the solution contain copper also, less free acid is required. With less than 8 per cent free nitric acid, lead is liable to be thrown down on the negative pole with the copper as metal."

Riche|| proceeds in the same way as Luckow, but warms the solution to 60 degrees to 90 degrees. The work of Parodi¶ and Mascazzino in solutions containing tartrates, and of Classen and Von Reis** in oxalate solutions, relates to the precipitation of metallic lead, and has therefore little connection with the present subject.

The substance used for analysis in the present experiments was lead nitrate whose purity was proved by estimating the lead. This was done by igniting the lead nitrate and weighing the residual oxide, PbO.

Two determinations gave:

	I.	II.	Theory requires.
Weight PbN ₂ O ₆ taken.....	0.8005	0.9713	
Weight PbO found.....	0.5395	0.6542	
Per cent of Pb.....	62.5400	62.5400	62.54

A solution was made of this lead nitrate containing 1.4690 grams to the liter, and 25 cc. of this solution were taken each time for analysis. Of this solution, 25 cc. should yield 0.0266 gram dioxide.

In a neutral solution, the lead was deposited partly as metallic lead on the negative, and partly as lead dioxide on the positive electrode. Three portions of the solution were then taken, and to No. I. 1½ per cent of free nitric acid (calculated as anhydrous HNO₃), to No. II. 5 per cent, and to No. III. 10 per cent, were added. After sixteen hours' action of the current, the amount of lead dioxide thrown down was found to be:

I.	II.	III.	Calculated.
0.0216	0.0253	0.0265	0.0266

The coating on No. I. was not strongly adherent.

In the next trial, No. I. received 10 per cent, No. II. 13½ per cent, No. III. 16½ per cent of free nitric acid. The results were:

I.	II.	III.	Calculated.
0.0266	0.0274	0.0272	0.0262

In the next trial, 50 cc. solution of lead nitrate were taken and ten per cent of free acid added. The results were:

I.	II.	III.	Calculated.
0.0533	0.0533	0.0452	0.0532

In No. III., owing to irregularity of the current, the dioxide came down unequally and scaled off badly.

A solution of copper containing 0.2920 gram copper in 25 cc. was made up, and three portions, each containing 25 cc. of this solution and 25 cc. of the lead solution, were subjected to the action of the current after adding to No. I. 1½ per cent, to No. II. 5 per cent, and to No. III. 10 per cent of free nitric acid. The results were:

I.		II.		III.		Calculated.	
PbO ₂	Cu.	PbO ₂	Cu.	PbO ₂	Cu.	PbO ₂	Cu.
0.0.78	0.2967	0.0281	0.2924	0.0275	0.2930	0.0266	0.2920

The copper was in all cases slightly black.

In presence of iron with 1½ per cent, 5 per cent, and 10 per cent of free acid, the results were:

	I.	II.	III.	Calculated.
PbO ₂	0.0281	0.0259	0.0200	0.0266

The last one scaled off badly, thus accounting for the low result. The electrodes used had areas of 73.18, 75.19, and 66.49 square centimeters respectively.

To sum up, one may say this method is reliable where the amount of lead is not too large and where there is a sufficient amount of free nitric acid present. Where the lead does not exceed 0.02 gram, it may be thrown down as lead dioxide and weighed on ordinary

flat electrodes. Where larger amounts are present, aliquot parts of a solution must be taken, or a platinum dish may be made the positive pole and the dioxide washed by decantation.

Since these experiments were made, this method has been largely used in this laboratory for the estimation of lead in galena and in slags and mattes. From 10 per cent to 20 per cent of free nitric acid should be present; if there is too much, the lead dioxide, as fast as it is thrown down, redissolves in the nitrous acid resulting from the decomposition of the strong nitric acid. In slags and mattes, the most satisfactory method is found to be as follows: After decomposition in the usual way, the lead and copper are precipitated as sulphides with sulphureted hydrogen, these sulphides are dissolved in nitric acid, and the solution put in the circuit. A perfect and complete separation of the lead and copper is obtained. The small amount of sulphuric acid formed by the solution of the sulphides in nitric acid does not affect the accuracy of the determination.

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SINKING THROUGH QUICKSAND AT AN ENGLISH COLLIERY.

Mr. Ritson Wilson has given a description of the difficulties encountered in sinking through quicksand at the Minnie Pit, Podmore Hall Colliery, Audley, in a paper read before the North Staffordshire Institute of Mining and Mechanical Engineers, at Stoke-upon-Trent. The boring was done to a depth of 70 feet, the first 38 feet of which was quicksand highly charged with water, having only a surface soil of 2 feet. Wrought-iron pipes were provided to secure the bore-hole through the quicksand section, the pipes being made with screw-joints. The tubing was made of cast-iron, in segments, about 7 feet long, 3 feet deep, and 1 inch thick, the bearing width being 5 inches. The finished diameter of the pit was 18 feet. The external part of the tubing was made with a smooth back suitable for sliding, the flanges all being cast on the inner side. The seams and flanges were all arranged to admit ¼-inch pitch-pine sheeting, which was put in as each ring of tubing was put on, and was therefore ready for wedging as soon as the tubing was once bedded. The flange seams were all assisted by internal ribs and bracket stays, to resist the strain the process of wedging put upon them. In each segment there were corresponding bolt-holes for the purpose of bolting the rings of tubing together while the tubing was sliding; and when the tubing was bedded, the bolts that strapped the respective rings together were removed, and the holes tightly wedged up by pitch-pine plugs. This was done in order to dam all the water back, and proved satisfactory. The tubing was so arranged that, when solid ground was reached with the foot of the tubing, the same might be safely rested and the sinking proceeded with until suitable ground was met with for the wedging bed being laid. The bed being complete, the tubing was brought up from the bed in the usual way and joined to the tubing temporarily rested. This enabled a good dry bed to be taken, as all water at the foot of the rested tubing was gathered with a temporary garland or ring. It was also advisable to so arrange the flanges of the tubing that masonry could afterward be built flush by the inner edge of the tubing, which not only prevented the tubing from corroding, but would prevent any thing that might fall down the pit from breaking the flanges off. The arrangements for hanging the tubing were as follows: To the eight screw-bolts hanging rods were connected, and brought down the face of the tubing and coupled to links attached to the eyes or loop-holes cast on the low ring of the tubing for the purpose. The sinking began in April last. Before beginning to sink, three rings, or three yards of tubing, were bolted together and hung to center line and level by the hanging bolts. Sinking was begun with nine men to each shift, and, as each few inches of pit bottom were dug out, the tubing was lowered in by the screws, and when a depth of 4 feet was reached, the water began to come in at the pit bottom at the rate of 70 gallons per minute. This, however, did not interfere with the speed of the sinking much till a depth of 9 feet was reached. Then it was found that the ground was beginning to subside for a considerable distance all round the pit mouth, and the sand in the pit bottom began to lift freely 2 feet above the nose of the cutting curve. After working for two hours the lifting in the bottom considerably abated, and it was possible to make good headway till the sixth yard was reached, when the bottom began to make water at the rate of 140 gallons per minute. The surface all around the pit gradually sunk, but the subsidence was made good by ashes and other loose material. When the tubing reached the clay section, the tubing sank more freely on one side than on the other. The hanging rods were brought into requisition, but were broken. They were, however, caught up by ropes attached to them and prevented from falling upon the men. The tubing got 8 inches out of plumb. To restore it to a straight position, the clay bed on one side had to be undermined. Afterward, the marl on one side of the pit was thicker and stronger than on the other side. The tubing began to wrench, and three rings of it were broken through. This wrenching was checked by driving some legs under the first flange of the tubing, which made a temporary foundation sufficiently strong. Wrought-iron plates were afterward screwed across the cracks of the broken segments. Soon after starting again, three other rings or segments broke, and the strengthening of these was done in the same manner as the others had been before. The idea of sliding the tubing any farther was abandoned. This necessitated securing the deep side of the pit by spiling, and the sinking was proceeded with at a reduced diameter, or 16 feet 3 inches finished. To maintain the safety of the foot of the tubing inside the spiling, a second length of sliding tubing was arranged and made 16 feet 3 inches in diameter inside. Three lengths of this tubing were put in, which reached to center and level, and the space between the outer and inner rings of tubing secured with concrete and wedging. Then the sinking went on in the usual way, and as each length of sinking was done, a ring of tubing was bolted on to the lower end of the inset tubing, which remained a fixture, being secured by legs in the pit bottom and held by the wedging as between the rings. This was repeated for the first six yards below the sand. Then a wedging curve bed was bored for, and by the boring suitable ground was proved to lie about 4 yards down

* From the *American Chemical Journal*.
† *Zeitschrift für Analytische Chemie*, 11 (1872), 9-12; 19 (1880), 1.
‡ *American Journal of Science* [3], 6, 255.
§ *Zeitschrift für Analytische Chemie*, 19, 15.
|| *Annales de Chimie et de Physique* [5], 13, 508.
¶ *Zeitschrift für Analytische Chemie*, 18, 588.
** *Berichte der Deutschen Chemischen Gesellschaft*, 14, 1622.

from the foot of the last tubbing ring, or about 10 yards below the foot of the sand. The wedging bed was made of solid cast-iron, 18 inches by 5 inches, with two escape-valves, and securely wedged. Then from this bed the tubbing was brought up in the ordinary way, and jointed to the tubbing hung below the foot of the sand. This tubbing had been wedged and made the pit altogether down through the sand sections secure. The first 11 yards of the quicksand sinking were accomplished in nine days. After that, the men were engaged several days in strengthening the broken segments and securing the foot of the top length of tubbing. Since the wedging referred to, the sinking has altogether gone on very favorably, and is now averaging from 7 to 8 yards per week finished pit. During the quicksand sinking, there was a flow of water of about 170 gallons per minute, which was disposed of chiefly by a pulsometer pump.

CHANGE OF VOLUME OF METALS AT MELTING.

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 results of these experiments were communicated to the *Annalen der Physik und Chemie*, and have been abstracted for the January number of the *Journal of the Chemical Society*, from which we quote: The dilatometer method was employed. The substance was inclosed in a closely-fitting glass cylinder, at the upper end of which was fixed a capillary tube. The most convenient liquid for filling the apparatus was found to be oil, which has the advantage of not evolving air when heated to 200 degrees; 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 to 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. The intervals of time required for cooling five degrees were carefully measured; the reciprocal value for these times may be taken as a measure for the velocity of cooling of the metal. In three experiments, it was found that tin on melting expanded in volume 1.76, 1.69, 2.20 per cent. These results are in direct contradiction to those of Nies and Winkelmann, who melted a large quantity of the metals and then dropped in a solid fragment of the same metal and observed whether this fragment floated or sunk. But the author points out that in this method it would be exceedingly difficult to avoid convection currents, which would be liable to carry up the solid fragments to the surface in the center of the vessel. Experiments also proved that soft solder expands almost two per cent of its volume in melting. An alloy of bismuth and lead, corresponding to Pb_2Bi 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. $PbBi$, sp. gr. 11.03, expands abnormally between 127 degrees and 132 degrees, melts at 146 degrees and 125 degrees. $PbBi_2$, sp. gr. 10.96, expands abnormally between 126 degrees and 132 degrees, melts at 140 degrees and 124 degrees. $PbBi_3$, sp. gr. 9.73, expands most markedly between 120 degrees and 136 degrees, melts at 125 degrees and 200 degrees. $PbBi_4$, 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 results of these experiments show that these alloys contain a definite compound of composition between $PbBi$ and $PbBi_2$, 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. From the changes of volume at temperatures above the first melting-point, one can conclude whether the metal in excess expands or contracts on melting. The experiments would seem to indicate an expansion of lead and a contraction of bismuth, a result in accordance with previous observations. For example, the alloy $PbBi$, consists of an alloy of low melting-point, in which the excess of bismuth dissolves; if it be gradually warmed to 120 degrees, the alloy and the excess of bismuth expand regularly. At this temperature, the alloy melts with marked expansion, and contains the solid bismuth in suspension; above that point, the bismuth gradually dissolves and melts.

A NEW PORTABLE HORSE-POWER.

As a part of the portable mining machinery to which Messrs. Ribon & March, of Jersey City, have given special attention, they have just brought out a horse-power, for from one to four horses, which is very neat and compact in design, as our illustration shows. The object of combining strength with lightness led to the adoption of the C frame chosen. The power is transmitted by the gearing as shown, the journals being babbitted. The size we illustrate is intended for one or two horses, the total weight being 419 pounds, while the heaviest piece weighs 190 pounds. The larger size, for from two to four horses, weighs 1137 pounds, the heaviest piece being 324 pounds in weight. The universal coupling is made of steel, and special attention has been given to avoiding the use of bolts and nuts. The machine is provided with shaft, 24-inch pulley and pillow-block complete, so that all that is needed to put it into use is to put in the pole, and lay on the belt.

RECENT IMPROVEMENTS IN COKE-OVENS.

The following particulars are mainly a reproduction of a valuable paper by Messrs. De Vaux and Eich, of Liège, published in a recent number of the *Revue Universelle des Mines*. In it the most recent and improved systems are fully described, under their two main headings: (1) Ovens in which the gases are drawn off from above; (2) those in which they are drawn off from below. We begin with the first of these classes, and take, as its first representative, the Pernolet oven.

The Pernolet Oven.—This oven was described, in October, 1872, by Mr. A. L. Steavenson, at a meeting of the North of England Institute of Mining and Mechanical Engineers, and is a modification of the old-fashioned bee-hive ovens. It is charged from above. The gases pass through a condenser composed of horizontal pipes, through scrubbers or columns filled with coke, and subsequently pass beneath the floor, above a small hearth, at which they ignite. The sides of the oven are thick. The heat rises from the bottom to the top, and, in order to prevent combustion in the upper parts, the vault is given a great height, and the reverberation of the heat is thus greatly diminished. The internal diameter is about 11 feet. In 1872-73, Messrs. Bell Brothers experimented with 36 of these ovens. The charge was 5 tons per oven, and the yield was 63 per cent of merchantable coke, to which must be added 3.5 per cent of small coke, used on the grates. The by-products were coal-tar 2.4, and ammonia liquor 5.2 per cent of the weight of the coal used. Sulphate of ammonia was extracted from the liquor, giving a yield of 4.5 per cent, or 0.185 per cent of the weight of coal.

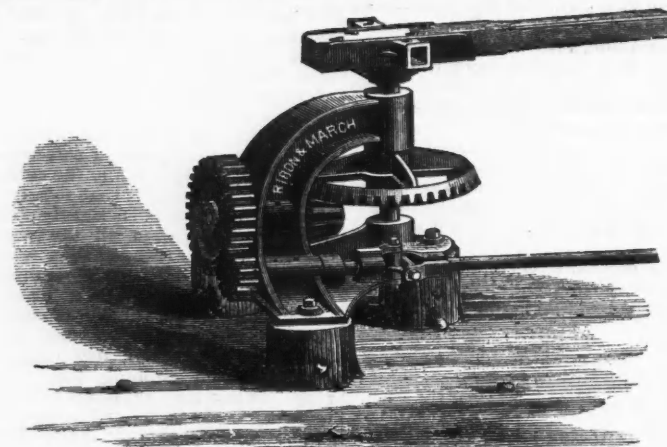
The experiments of the Wigan Iron and Coal Company are of greater importance. They constructed 120 Pernolet ovens, slightly modified. The gas, after passing below the floor, enters flues arranged inside the roof, a practice contrary to the theory of the inventor. The yield was 60 per cent of coke only. The sulphate produced, per month, allowing for the ovens under repair, was 0.26 per cent. The oven was not very

successful. The coke produced was of inferior quality, and the costly repairs involved, yearly, a loss of time amounting to six weeks. After four months' working, the entire oven had to be renovated; but this may be to a large extent ascribed to the bad quality of the fire-bricks, which could not resist the heat of the gas in the flues. The stoppages were less frequent in France, but no returns of results exist.

The Knab and Pauwel's Oven.—This is used by the Société des Produits, near Mons. It is rectangular, length 8 ms., breadth 1.20 ms., and height 1 meter to the keystone of the arch. The charge of coal occupies a height of .80 ms. There are two hoppers, the centers of which are 2.18 ms. apart. The gases escape through an opening placed in the arch. After having passed the condensers, they are led back under the

floor and above a small hearth. Beneath the floor, three flues are formed by small rectangular pillars, placed in order, to obtain uniform heating. At the end of the floor, the hot gases enter the horizontal flues contained in the upright sides. The chimney attached to each oven is divided into two parts, each serving for one of the ovens. Originally, there were only two chimneys per group, one at each end, and the gas was collected in one common receptacle. The Société des Produits has 62 Knab ovens, arranged in two groups. The older comprises 30 ovens with a capacity of 5½ tons, and the discharge is performed by hand, and lasts 40 minutes; the newer comprises 32 ovens, having a capacity of 4.2 tons each, and the discharging is mechanical. When the oven is charged, the doors are carefully luted. Coking lasts 72 hours. The coal of the Produits cakes but little, flames greatly, and is rich in bituminous matter. The small coal destined to feed coke-ovens is mechanically prepared. It is divided into two portions in the separating screens. Dust less than 4 mm. in size goes directly to the crushers, and slack, that is, pieces exceeding 4 mm. in size, are riddled, and again divided into two classes, which are sent to special washers. Two Carr disintegrators are kept perpetually at work. The coke obtained is very porous, and useless for metallurgical purposes, though it is used in breweries and chicory factories. The coal-tar is distilled in boilers containing 1800 kg., and yields from 50 to 60 kg. of water, 50 kg. of light oil at 25 degrees, which is sold for benzoline, 4.0 kg. of oil at 15 degrees, fit for open air illumination, 850 kg. of heavy oil from which the anthracene is strained. The residuum is used as creosote to pickle wood, or mixed with linseed or colza oils to grease wagon-axles. Finally, there are from 400 to 450 kg. of tar.

The Simon-Carvès Oven.—The Simon-Carvès oven is an improvement on the Knab. It was introduced into France in 1866; by 1867, 25 were at work; and by 1879, the number had risen to 100. They are rectangular, and thus permit of mechanical discharging. They are charged through two openings in the roof. The uncondensed gases serve for coking; they ignite at a small hearth below the floor, beneath which they circulate, and then pass into the horizontal flues in the sides. The ovens are high and narrow. The dimensions of the mass of coke are as follows: Length, 9.15 m.; height, 1.85 m.; breadth, .061 m. Coking takes place in forty-eight hours; but with ovens of 0.91 m. to 1 m. in width, the process requires from sixty to seventy-two hours. The yield amounted at Besseges (belonging to the Société de Terre-Noire) to 75 per cent of coke. The repairs are unimportant. The masonry immediately above the hearth wears most rapidly. From 1867 to 1879, the average percentage obtained at Besseges from the coal was as follows: Coke (after deducting the water contained in the coal), 71.60 per cent; coal-tar, 1.80; ammoniacal liquor, 8.80 per cent. Messrs. Pease, of Darlington, have used these ovens with even better results than at Besseges. The coke is very hard,



A NEW PORTABLE HORSE-POWER.

of good quality, and is perfectly adapted for smelting purposes. The yield is 75 per cent, the moisture being deducted; whereas, from the same coals, only from 62 to 65 per cent had formerly been obtained. The by-products were valued at from 5s. to 6s. per ton of coke. Fifty ovens have been established on this system by Mr. Hüssener, at Gelsenkirchen, in Westphalia, more or less modified by himself. These ovens are 9 ms. in length, taper horizontally, and measure in the center of their length 0.575 m. by 1.80 in height. Their useful content is 88 per cent of the total capacity, and they receive 5½ tons of small coal. Coking takes place in 56 or even 52 hours, as against the original 72, but 60 hours is the normal rate. Since November, 1882, the yield per cent on the coal used has been as follows:

	With gas-coal.	With rich coking coal.
Large coke.....	61.70	75.00
Small coke.....	12.68	2.00
Coal-tar.....	2.720	2.77
Sulphate of ammonia.....	0.924	1.10

The coke from the gas-coal is only used in blast-furnaces when mixed with ordinary coke. That from the coking coal is much sought after, and employed alone. Analysis of the latter yielded 58.83 of volatile products and 39.51 of tar; loss, 1.66 per cent. The temperature of the gas before condensation is from 75 degrees to 80 degrees C. in the pipes above the oven, and it has a pressure of 2 mm. of water. After condensation of the products, that is, in the pipes leading from the purifier, the temperature is only 15 degrees C., but the pressure from 90 to 110 mm. of water. The gases which escape toward the chimney, after being burnt below the oven, contain 8.1 per cent of carbonic acid, 0.4 of carbonic oxide, and 0.3 of oxygen. Their heating power varies from 9 to 1 kg. of water evaporated for 1 kg. of coal coked. In ordinary coke-ovens, where the by-products are not collected, the gases can evaporate from 1 to 1.25 kg. of water per kg. of coal coked, according to experiments made by Krupp, at Essen. The ammoniacal liquor is immediately converted into sulphate of ammonia, and contains, at a mean density of 3½ degrees B., 1.1655 per cent of ammonia. The sulphate ammonia contains an average of from 20.3 to 20.5 per cent of nitrogen. The loss in manufacture amounts to 0.970 per cent in liquids, and 0.032 per cent in solids, together 1.002 per cent. An analysis of this ultimate residuum gives 60.965 of water per 100 parts. The dry residue is composed as follows:

3.041 Sulphate of lime.
22.369 Carbonate of lime.
2.126 Chloride of lime.
12.206 Carbonate of magnesia.
3.742 Oxide of iron and alumina.
0.186 Sulphate of ammonia.
1.376 Coal-tar.
53.925 Material insoluble in acids.

99-001

Mr. Hüssener points out the increased yield in salts of ammonia, while in gas-works it scarcely rises to 0.7 or 0.9 per cent of the weight of the coal. This he attributes to the prolonged contact of the gas with the burning coke, which removes a certain quantity of the nitrogen, amounting in Westphalian coke to 0.9 per cent.

Coal-tar is chiefly used in Germany in the production of artificial colors. The demand per annum to produce benzoline and anthracene is 400,000 tons, while the total production of the gas-works in that country does not amount to more than 90,000 or 100,000 tons. The price of anthracene has lately fallen from 70 to 75 per cent, but benzoline has risen sufficiently to increase the value of coal-tar by 25 per cent, and the price at present is from 50s. to 55s. per ton again. If all gas-works were to transform their ammoniacal liquor into sulphate instead of losing part of it, Germany would produce 10,000 tons annually, which would still fall far short of the demand, as the importation has lately risen to from 36,000 to 37,000 tons, of which the London market regulates the prices. Saltpeter, from Chili, is the most serious competitor, and lately caused a drop of from 12 to 15 per cent in price.

M. Seibel, of France, has likewise modified the Carvès furnaces, by abolishing the grate, with astonishing results, according to the *Annales Industrielles*.

Otto Oven.—This is a modification of the Coppée oven, having, instead of one pipe below the floor, two resting one above the other. The gases, deprived of their condensable elements, are forced into the interior of the oven, where they ignite and pass to the chimney through the vertical pipes in the side, a principle previously adopted in the Aitken oven. The Otto ovens are divided into two classes. These ovens are in pairs, and the openings form the communication between the upper pipes which are connected with the chimney. The following results were obtained from ten Otto ovens during seven months' working (June to December, 1882), at the Holland colliery, near Bochum. The charge was 5200 kg. of coal per oven. The process occupied seventy-two hours, but the coal used was very damp, and it is thought that under more favorable conditions coking might be achieved in forty-eight hours. The yield per oven and per twenty-four hours was 1800 kg., amounting to 75 per cent. Yield and value of coal-tar per ton of coal used was:

	Per cent.	Value, fr.	Per cent.	Value, fr.	
June.....	3.13	1.75	October.....	3.40	1.94
July.....	3.90	2.17	November.....	3.10	1.84
August.....	3.81	2.17	December.....	3.15	1.77
September.....	3.60	2.04			

The average value of coal-tar throughout the period was thus 1.95 fr. per ton of rough coal. The ammonia liquor was sold according to its density in degrees Baumé, the value per ton of coal being:

	Fr.	Fr.	
June.....	1.25	October.....	1.54
July.....	1.37	November.....	2.44
August.....	1.47	December.....	3.15
September.....	1.11		

Or an average of 1.76 fr. The total value of the by-products per ton of rough coal was 8.71 fr.

We come now to the second class of ovens, in which the gases are drawn out from below.

THE NEW FORTH BRIDGE.

The most interesting structure at present in progress, says *Engineering*, is the Forth Bridge, the largest ever undertaken. It will consist of two spans of 1700 feet, two of 675 feet, fourteen of 168 feet, and six of 50 feet, with a clear headway for navigation of 150 feet above high water of spring tides. The two large spans are two cantilevers, each 675 feet long, with a central girder 350 feet long, the depth of the cantilevers being 350 feet at the piers and 50 feet in the center. To hold aloft and to maintain the immense weight of steel of which the cantilevers and girder will be composed, piers will be required of corresponding magnitude. The central pier, on the island of Inchgarvie, will consist of four cylindrical masses of concrete and masonry, 45 feet in diameter at the top and 70 feet at the bottom. They will be founded on rock at a depth below high water varying from 24 feet to 70 feet, and will be carried up to 18 feet above high water. The length of the bridge will be more than a mile, and of the viaduct approaches 2754 feet. The contract has been let for £1,600,000. Considerable progress has been made with the masonry, about 17,000 cubic feet of granite masonry having been set, and the number of men employed will soon reach 800. As it is intended to manufacture the steel superstructure of the bridge on the spot, very extensive works lighted by electric lamps have been constructed at Queensferry, and the plant provided includes about fifty steam-engines of various classes, and a large number of specially designed hydraulic tools, drilling-machines, and other tools for dealing with the 45,000 tons of steel which will be used in the bridge. The manufacture of the superstructure of the bridge will soon be commenced. All the important members subject to compression will be of a tubular form, as will have been gathered by those who read the paper on the subject read at Southampton in 1882, by Mr. Baker. About three miles of steel tubes, ranging from 12 feet to 5 feet in diameter, and from 1½ inches to half an inch in thickness, will be required. Plant, including gas and other furnaces, has been provided for this purpose. The steel plates are heated in gas-furnaces, and stamped to the desired curvature in a 2000-ton hydraulic press; the edges planed and the plates temporarily clamped together to form a tube about 400 feet in length. Traveling drilling-machines will then traverse the tube and drill all the holes required to rivet the plates together, but this riveting will not be done until the bridge is erecting, plate by plate, across the Forth. All the machinery required to begin the manufacture of the tubes in the new works has been designed by Mr. Arrol, one of the contractors.

THE DISCUSSION OF MR. HUNT'S PAPER ON SOME PROPERTIES OF STEEL.*

Mr. Metcalf said: I do not know that I have much to say, Mr. President. I think most of the positions Mr. Hunt has taken are very good. The paper is so much a text that it is almost impossible to discuss it in detail. One or two points spoken of struck me particularly; one in regard to the piping of the ingots. In making the finer steels, piping can be obviated to some extent by pressure, but I think if any gentleman will try it carefully in the small ingots that are usually required for tool steel, he will find that the expense of reducing the pipe by mechanical means is greater than by knocking the end off with a sledge. It seems like a very serious loss, and so it would be if all the work of finishing had been done on it. But the pipe should be knocked off before the price of skilled labor is put on it; you have then only to bear the expense of remelting the pipe part; but you can not avoid the necessary expense of applying mechanical pressure of any kind when it is spread over several hundred small ingots in a day. The great difficulty is in keeping the ingot molds so that they will resist such pressure. You will find, after all, the pipe is the cheapest, if the steel is well melted.

In regard to large ingots, a little care in teeming them will prevent any excess of piping.

One other matter Mr. Hunt spoke of in reference to that large ingot. I have no doubt that the calculations are entirely correct. To make an 18-inch shaft, with the work proportioned to what we ordinarily do in making small bars, would require a 57-inch ingot, but I doubt very much whether in making a large structural mass like that, it is necessary to reduce the whole grain of the mass to the fine condition necessary for fine tool steel. Tool steel, of course, is necessarily fine-grained. A good piece of steel, when it is tempered for that purpose, should be so fine that the grain is imperceptible to the naked eye. But that condition, I can not conceive, is necessary in large structural steel.

Now, if we take into consideration the experiments of Tchernoff, the Russian engineer—he went into the matter very thoroughly in the gun foundry in Russia—he made some very beautiful experiments several years ago, which were beautifully illustrated in *Engineering*, and his work is a classic on steel. It is well worth any body's time and trouble to hunt it up and study it. He made this beautiful illustration of the fact of the crystallization of steel in cooling. He said that taking a solution of some salt of alum, I think it was, at any rate one of the crystal salts, in settling from solutions, the crystallization being allowed to go on quietly, the crystals were extremely large; but if, when the precipitation or crystallization commences in this solution, the vessels were vibrated but a little, the crystals were all formed much more uniform in size and much finer and smaller, and so it goes on when a large mass of steel or any molten metal cools. If it cools slowly as it does in an ingot, and especially in the interior, these large crystals form in the center, which you will always find in any large mass of iron, whether cast, wrought, or in steel, and the only way to overcome the excessively large crystals, which are elements of weakness in the mass, is to reheat the ingot thoroughly, heat it through and hit it hard. It should be heated to an orange heat, say a lemon color, heat it uniformly through and hammer it very quickly and under a heavy hammer. My impression, is that what Mr. Hunt says is all true; yet it must be borne in mind that, for instance, an 18-inch shaft could be obtained from a 24-inch ingot, if handled in that way, namely, well heated, heated soft, and then hammered under a ten-ton hammer, especially with rounded dies, swedge-dies, and hit quick and hard.

* Proceedings of the Engineers' Society of Western Pennsylvania, January, 1884.

You can get in this way all the results that are necessary in a large structural mass, so that I doubt whether the argument of Mr. Hunt's as to the common practice as applied to tool steel is necessary at all in the making of large masses for structural purposes.

Mr. Miller said: Mr. Chairman, I do not pretend to know a great deal about steel, but I have hammered considerable in the last few years, and I think, if Mr. Hunt's theory was to be carried out about those large ingots, there would have to be some larger hammers built. I am manufacturing some steel crank-pins at the present time, 18 inches in diameter, and I thought if I got ingots 24 inches in diameter that I would give as much hammering as would be necessary, for the simple reason that if I had had larger ones they would have to be heated so much the more, and that I thought would do more harm to the steel than benefit. I thought 24-inch ingots, well heated, to be the correct thing—heat it slowly—and I think we can make very good crank-pins with the 24-inch ingots.

I have repeatedly had some large ingots where we were necessitated to draw one part down very small and the other part had to be left large, and I have several times experimented with them to find out whether the small or the large part was the best, and so far as my knowledge goes, I can not see a great deal of difference whether it was hammered so excessively or not.

Mr. Gottlieb said: With reference to hammering this steel, I would like to ask Mr. Hunt upon what rule or from what experience he would support his theory that he would have to take an ingot 57 inches in diameter to make a shaft 18 inches in diameter. I have seen something of that this summer. I had occasion to visit Mr. Krupp's works, at Essen, last August, and saw them forging a steel block 5 feet by 6 feet and about 18 feet long. I saw that piece of steel taken out of the heating-furnace, brought under a 50-ton hammer and forged down. I afterward saw a finished gun, of such size as the block was intended for. It was for the Chinese government, and that gun was about 48 inches in diameter at the breech end, so it apparently did not take more than 5 feet to reduce it to 48 inches, and probably to 54 inches, because the gun I saw finished was turned off, and there must have been something for waste. The hammer was a 50-ton hammer, the blows were very slow and very few on that block. Then they brought it back to the furnace again. The steam-hammer was rather a disappointment to me, because I had been led to believe the steam-hammers were on a similar pattern to those we have here, with steam pressure on top. But it was simply a drop-hammer; for when the hammer was lifted up, the steam escaped and the hammer drops back by its own weight. It is very slow, and they can not strike very many blows before the steel gets cold. But I should like to have Mr. Hunt give the information as to forging an 18-inch shaft from a 57-inch ingot.

Mr. Hunt said: I wish to speak with a great deal of deference to the much more extended experience of the gentleman who have just preceded me. I fully agree with Mr. Metcalf that structural steel ought not to be required to have the same fine grain as crucible or tool steel. The point in the paper was, that open-hearth and Bessemer structural steel required to be worked down to about one tenth the area of the cross-section of the original ingot, in order to have the material show its best results, and that one of the most common sources of failure in large steel masses was, that it had not received a sufficient amount of work.

It is a fact that some of the engineering societies of the continent have recently condemned steel for large shafting, and steel is getting into bad repute for such purposes in many places in this country on account of its failing—breaking short off while in service. I have examined some of this shafting of from twelve to fifteen inches in diameter broken thus short off like a pipe-stem, and have found that the fractures showed no seams or flaws, the material being sound throughout; have analyzed the steel at several places in the fractures, and have found it to be homogeneous and all right, the fracture, however, showing large unworked crystals in the center which grew finer toward the surface.

In the testing-machine, steel shows this lack of work very markedly. For an illustration, I will cite the results upon some steel ingots of carbon 0.28 per cent and manganese 0.60 per cent. An ingot of 24 inches diameter was forged to 16 inches diameter, and test pieces taken from disks cut from the forging. A part of the forging was reduced down to eight inches square, and test pieces taken in like manner from it; another portion of the same material was rolled into a plate, and test pieces taken from it as well. These test pieces were broken in the testing-machine; the test pieces slotted out of the forging at 16 inches diameter broke off short at 60,000 pounds tensile strength, and with less than 5 per cent in reduction of area and with a granular brittle fracture. The test pieces taken from the 8-inch square block of the same steel ran up to about 75,000 pounds tensile strength per square inch the contraction of area increased to about 14 per cent and the fracture very much less granular and brittle in appearance. The test pieces taken from the plate of the same material rolled down to about $\frac{3}{4}$ -inch went up to 85,000 pounds per square inch tensile strength and the contraction of area increased to 18 per cent, and the fractures showed fibrous and tough.

These tests are only typical illustrations. I have made many such with the same results, and I think it is a universal experience to find steel to give better results as it is properly worked down, and until ordinary steel has had considerable work, much more than the preceding gentlemen have mentioned, that it breaks off under strain in the testing-machine short and brittle, and the fractures have just the appearance that the fractures of the large steel shafting material has which has failed in our river boats and the like. I agree with the gentlemen in the difficulties of heating and forging large steel ingots, and have, in fact, mentioned them in the paper.

It was in this connection that I believe Mr. Billings's compression process to be a step in the right direction. I think that Mr. Metcalf will find upon investigation that the expense, after the first cost of the apparatus, of compressing several hundred small ingots per day will not be so great as he apprehends; but it is not in the saving of the pipe, however much of an advantage that may be, that I think the chief use of the compression process will be, but it is in so pressing the molten metal as to drive out the occluded gases, reduce the size and number of the blow-holes, and so solidify the ingot as to do away with this necessity for so much work.

Mr. Metcalf said: It seems to me, in the first place, it is impossible in

any large forging of that kind to bring the strain on the whole mass to such a degree as to require the same strength in the center to resist the strain that you do on the outside. Take the case of a crank-pin or any piece of metal like that. If you have the outside for a small distance in of the tenacity of 75,000 or 80,000 pounds, you have a very safe shaft. Then if the shaft in the interior is not sound by reason of bad working or careless heating, if it is subjected to any strain, it will break, and it will start to break on the outside, the limit of the strain on any piece being of course the strength of the weakest part. The strain, I take it, in any large mass of that kind is brought on a very small part of the mass first, and if there is sufficient material back of it, or stiffness to do the work required, you have all that man can get.

I have a case in mind that occurred in our works that is perhaps illustrative of this whole question. There is a 9-inch shaft, 8-inch journal, 16 inches long. It carries an 8-foot pulley, or did at the time I am speaking of, of 2-foot face, and it was run by a six-ply gum belt, 2 feet wide. This drove a 3-inch mill at one end, with a speed of from 225 to 250 revolutions. At the other end, it drove a 14-inch mill, which frequently pulled out strands 5 or 6 inches wide, down as thin as 18 gauge and 150 feet long. You will see what a strain there was on the shaft. I want to tell where the shaft came from, because I believe it was sent to us as a joke by our friend Jones. We sent for a large ingot to make that shaft. After that shaft was forged and finished, we found a pipe right through it, from one end to the other, big enough to drive your fist through. Mr. Parkin called my attention to it, and we looked at it; and, as we had some experience in pipes and much sympathy for them, we concluded to put it in. After it had been run for some time, the engine ran away. The engineer ran out to shut the steam off, and while he was doing so one of the boys thought he would help matters by making a pass through the rolls. The result was there was not a piece of those fly-wheels left more than three or four feet long. A large hole was cut through the iron roof. After the dust had cleared away, we made an examination. We examined this shaft, and found that neither it nor the shaft of the engine was sprung. We examined the counter-shaft, and it was not sprung in the slightest degree. We put on an 8-foot pulley with 3-foot face with a 3-foot gum belt, and we are driving the same mills with it to-day, and the shaft will drive any thing you can get into the rolls.

This illustrates my point, that I do not believe in the necessity, except in a gun, for instance, that the material need be fine-grained. You must simply regard the initial strains that act upon the surface of it, provided the whole mass is free from interior flaws, due to uneven or irregular heating or work of that kind. Therefore I can not believe there is any necessity for the excessive amount of forging that Mr. Hunt speaks of, although I do not question his figures at all. The results as he gives them are such as I should expect to find; yet where the tenacity is 75,000 or 80,000 pounds at the outside, that would be the useful strength of that forging, if the whole mass were put into use without any disastrous strain.

Mr. Hunt: The usual pressure is about 100 pounds; but it is an initial pressure. Diameter of cylinder is 42 inches with 9-foot stroke.

FRAME FOR LARGE BLUE-PRINTS.—Mr. W. B. Parsons, in the *School of Mines Quarterly*, gives the following description of a device made for a railroad office at Port Jervis, New York. It overcomes difficulties usually found in using large glasses: "The glass was 58 inches long, 34 inches wide, and $\frac{3}{4}$ of an inch thick, heavily framed with ash. The back was made of thoroughly seasoned ash strips 1 by 1 inch, carefully planed and glued and screwed together, while across the ends were fastened strips, with their grains running transversely. This back was then covered on side next to the glass with four thicknesses of common gray blanketing. The holding pressure was effected by two long pressure strips running across the back, placed at about one quarter the length of the frame from the ends, and held by a screw in the center. The ends of these strips fit in slots in the frame at a slight angle, so as to give a binding pressure.

"This arrangement, instead of holding the back at the edges only, and so allowing the center to fall away from the glass, distributed it evenly over the whole surface and always kept it in position. The frame was run in and out of the printing-room on a little railroad on which it rested on four grooved brass sheaves, one pair being at one end, while the other was just beyond the center, so the frame could be revolved in the direction of its length without trouble. The back is lifted or lowered by a pulley-wheel fastened to the ceiling with a ring on the rope attached to a hook at the side of the back."

FURNACE, MILL, AND FACTORY.

The Penn Iron-Works, of Lancaster, Pa., resumed operations February 1st in all departments except the puddling-mill, where the operatives are on a strike against a reduction of wages.

The Union Rolling-Mill, at Cleveland, O., which was burned about a month ago, is rebuilding, and is expected to be in operation by March 1st.

The Chester, N. J., furnace of W. J. Taylor & Co. reached an output last week of 304 tons, exceeding its late unusually good weekly average of 290 tons. The ores used were three quarters Chester sulphury ores, which, previous to going into the blast-furnace, were roasted in the Taylor-Langdon ore-roasting furnace. The iron made from these ores is very strong and tough, and is used almost entirely for special mill purposes, thus demonstrating their value when properly prepared and desulphurized. The roasting is done with gas made in separate gas-producers, and no coal is used in the roasting-furnace. One and a half cwt. of pea coal or screenings from the furnace is used per ton of ore roasted.

Fifty patent coal-cars have been contracted for by Australian parties after the model of one now on exhibition at Rochester, New York.

The Youngstown Car Manufacturing Company has received an order for a number of iron cars to be shipped to copper mines in Arizona.

The Calumet & Hecla Mining Company has recently ordered a link-belt elevator for elevating sand and water, illustrating another phase of adaptability of the link-belt. The Link-Belt Machinery Company, of Chicago, will ship in a day or so, and its working will be watched with nearly as much interest as the mammoth scoop-wheels mentioned in our issue of February 2d.

W. E. Johnson & Co., coal dealers at Chicago, have recently put in a link-belt elevator for elevating coal. The barrow-men dump into the boot of the elevator, whence it is taken up and spouted over a fine screen, dividing the coarse and fine. This screen is over the fine coal-bin, and delivers to the coarse coal-bin. The coal is then spouted from bins into the wagons over a dust-screen. The apparatus is very successful, and promises a revolution in coal handling. The Link-Belt

Machinery Company, of Chicago, set up this machinery, and expects to put in a more complete outfit when the yards are empty.

The Pittsburgh *Telegraph* summarizes the situation at the mills in that city at the beginning of the month as follows:

At the American Iron-Works, the puddlers are working double-turn, which they did during the whole of last year, turning out chiefly polished and other grades of iron. At the upper South Side mill of Oliver Brothers & Phillips, the puddlers started on double-turn. The plate-rolls with two furnaces were put on single-turn. It is nearly a year since barely half time was made on this train. Formerly, it was nothing to get orders of from 300 to 500 tons, and now they have dropped to 40 and 50 tons. Two small trains of finishing-rolls are also on single-turn at the lower mill. At the works of A. M. Byers, nearly 60 tons of muck-iron are turned out a day; but in addition to this, a great deal is purchased from mills outside of the city.

At J. Painter & Sons, the puddlers went from double to single turn on six heats last Monday, and all the finishing-mills are on single-turn. At Lindsay & McCutcheon's mill, nothing but the finishing-mills were in operation last week; both puddling-mills were idle on account of scarcity of coal, which is usually shipped down the Monongahela River. At the mill of Oliver Brothers & Phillips, in Alleghany, the puddlers are working double-turn and the finishing departments are all on single; a considerable amount of muck-iron is always shipped to the mill from other places, to fill the orders for finished iron; recently, a great deal of muck-iron has been hauled from their South Side mills. The Pittsburgh Forge and Iron-Works, better known as the Pork-House Mill, has been on a single-turn for about five months, up to the present time. At the Kensington Works of Lloyd & Sons, the puddlers and the finishing rolls are on single-turn, and at the Pennsylvania Iron-Works of Everson & Macrum, the puddlers are working double-turn and the sheet-rolls on three turns. The other rolls are all on single-turn, chiefly on skip-iron.

The Keystone mill was lighted up a few days ago; the bar rolls on single-turn on pipe-iron, and the guide-rolls on different shapes of light grades. The puddlers are yet idle, but will go to work in a short time. The Sable Iron-Works of Zug & Co. have been on single-turn for four months, but last week the puddlers started to work double-turn, but the finishing department is still on single-turn. At the Fort Pitt Iron-Works, the puddlers are not working very steadily, this being mostly on account of a great deal of steel handled there. The puddlers at the Vulcan Iron-Works, at Chartiers, are now on single-turn. From the time when the works—which are new—were first set in motion, they were working double-turn. The Union Railroad Supply Mills, in this city, are working their puddlers double-turn, but a great deal of the muck-iron is worked up at the other Union Iron Mills of Carnegie Brothers & Co. At the Solar Works of Clark & Co., the puddlers are continuing on six heats, and the finishing mills are all on single-turn. At the Millvale works of Graff, Bennett & Co., the puddlers are working double-turn; but the Danks puddling-mill, which contains ten furnaces, is idle. The finishing mills are principally on skip-iron, but all on single-turn, and the universal train is turning out channel and bridge material. At the Juniata mill, the puddlers are on double-turn and have been for more than a year. At present, a train of nail rolls are on nail iron. A great deal of steel in the light special qualities is manufactured, which keeps the works in operation to the utmost capacity. The same is about the state of affairs at the Wayne Iron-Works of Brown & Co. At the Etna Iron-Works, at Etna, a great deal of inconvenience is experienced, caused from the insufficient supply of gas; the puddlers are working double-turn, but not more than 20 out of 27 furnaces are lighted. Recently the entire departments were closed for three days, to keep the finishing mills and the pipe mills in operation. But with present supply, it is impossible to run every department. A new well is drilling, and it was expected to get an additional supply by the 17th inst., but it was not obtained. The Eagle Mill of J. W. Friend, on the South Side, and the Manchester Steel and Iron-Works in Alleghany, are both shut down in every department. These two are the only works in this city whose resumption seems uncertain. The Anchor Nail and Tool-Works of Chess, Cook & Co., also on the South Side, are closed in every department excepting the tack factory, which is a very insignificant matter to the muck-iron supply, as a small amount will suffice.

The Vesuvius Iron and Nail-Works, at Sharpsburg, are shut down, but a reaction is looked for after the eleventh of next month. The supply of muck iron is very small. There is scarcely a mill in the city with a stock of 200 tons, and most of them carry from 300 to 800 tons. It is evident that it will not pay to make muck-bars for sale or for further use. The orders for railroad supplies, that is, for rolling-stock, have fallen off somewhat from the demand of a year or more ago.

The Lechner Manufacturing Company, Columbus, Ohio, manufacturer of elevators and roller detachable chain belting, has received orders for another coal elevator from W. P. Rend & Co., Chicago, for their mine at McDonald, Pa.; also, an order for a coal elevator from the Great Western Mining and Manufacturing Company, Peach Orchard, Ky. This company has also furnished Gay, Kimball & Gay, Rutland, Vt., and the Daniel Shaw Lumber Company, Eau Claire, Wis., with detachable chains for various purposes.

Mr. Lee Burt, manager of the Vulcan furnace, at Newberry, Michigan, states that the furnace is making pig metal at the rate of 35 tons per day, all of which is stocked.

LABOR AND WAGES.

The heaters, puddlers, roughers, and several other employes of the Duncansville rolling-mill have struck on account of a reduction of 10 per cent, and will leave that place for other parts.

The workmen in the Shoenerberger iron mill, at Pittsburg, Pa., having refused to accept a 10 per cent reduction in wages, the works have been closed.

The coal miners at the Rafferty mines, who struck five weeks ago against a reduction, returned to work February 4th at the reduced rate.

The miners at the Buffard and Averick coal-shafts, at Steubenville, Ohio, have been notified that after February 4th a reduction in their wages from 85 to 75 cents per ton will be made. The men were advised to resist the reduction by Mr. Thomas A. Armstrong, but they accepted it, claiming that a strike would be of no benefit. A general reduction in the price of mining in the State is now expected.

The machine molders, who have been informed of a reduction of twenty-five cents per day in their wages, met at Pittsburg, Pa., February 3d, to consider the matter, and have decided to resist the proposed reduction.

Secretary Davis, of the Pennsylvania State Miners' Association, says that two thirds of the miners in the State are out of employment, but that the present outlook is brighter than for several months past. In the anthracite districts, not over half the men have work, and matters are in about the same condition in Clearfield County. In the Pittsburgh District, it is estimated that 8000 men are idle. All the river mines are closed, and many of those along the railroads are running on half-time. In view, however, of the fact of the glass men going to work and the revival of the iron trade, increased activity in the near future is expected.

The formation of a Central Labor Union in Philadelphia has been announced. This union will act in concert with the New York organization on labor bills before Congress.

Notice has been posted in the Keeley Stove-Works, an extensive establishment at Columbia, Pa., that an immediate reduction of 10 per cent in the wages will be made. When times were good, this establishment voluntarily increased

wages 10 per cent, and, in view of this fact, the men will make no resistance to the present reduction.

Cumberland manufacturers are opposed to Governor McLane's proposition, making eight hours a legal and actual working day.

Some forty railers and feeders lately employed by the Pottstown Iron Company, who struck against a reduction of wages in December, have secured places at Clifton, Ohio, and have started for that place.

About forty men are at work at the Southwest Gas-Coal Company's mines at Buena Vista, Pa., not sufficient to operate the mines successfully. The suits against the strikers will not be pushed unless they refuse to allow the men to work.

RAILROAD NEWS.

The Union Pacific Railroad Company will operate its new line between Denver and Leadville on or soon after February 1st. The distance from Denver to Leadville is 151 miles, a saving of twenty five miles over the old route, and making the Leadville line shorter than that of the Denver & Rio Grande by 126 miles. In view of this opposition line, the latter company has reduced the fare from \$22 to \$10.

The President of the Fort Worth & Denver City Railroad Company has recommended the extension of the road to Fort Worth and to the Wise County stone quarries and coal-fields.

The Tennessee Coal, Iron, and Railroad Company's report for January shows that 13,579 tons of coal and 8553 tons of coke were received directly from mines, making a total of 22,132 tons.

The Leadville extension of the Union Pacific road, from Dillon to Leadville was finished and opened February 5th. It will be called the High line.

At the annual meeting held at Philadelphia, February 5th, of the Union Canal Company, a corporation controlled by the Philadelphia & Reading Railroad Company, a committee was appointed to consider what is best for the interest of the bondholders in connection with the \$2,000,000 first mortgage of the company. This loan fell due in November, and steps have been taken to foreclose the mortgage.

COAL TRADE NOTES.

ARIZONA.

A correspondent of the *Globe Chronicle* writes as follows of the Deer Creek coal fields, which are situated about one mile within the limits of the San Carlos Reservation: "There is one shaft 180 feet deep sunk on one of the veins, which shows coal the entire depth. At the bottom, the vein was cross-cut, and the cross-cut was extended through the sandstone formation to a parallel vein of coal; but unfortunately, the men encountered so much water they were compelled to abandon that level, after striking coal in the vein they were working toward. They run a cross-cut about 80 feet from the surface, which shows a good vein, from which coal was taken and brought to Globe, until the agent at San Carlos prohibited the removal of any more. The agent also bought some for his use at the agency. There are several other shafts and inclines which will show coal; but owing to the interference of the government officials, all work had to stop, and the locators and owners were forcibly removed from the property."

CANADA.

PROVINCE OF NEW BRUNSWICK.

SPRING HILL.—The annual meeting of this company was held at St. John, January 29th. The directors' report shows that the output of coal for the year has been of all kinds 199,696 tons, namely, 125,842 tons rounds, 4848 tons stove, 15,575 tons nut, 49,487 tons slack, and 3944 tons of run of mine. The financial exhibit was declared to be satisfactory. The following board of directors was elected: Alexander McFarlane, R. G. Leckie, John McDougall, J. R. Cowans, Robert Cowans, G. G. Gilbert, and C. J. Townshend. At a subsequent meeting of directors, Hon. A. McFarlane was elected president.

PROVINCE OF QUEBEC.

The *Montreal Gazette* states that the principal holders of anthracite coal in that city agreed, on February 1st, to advance prices 50 cents per ton, owing to the rapid absorption of supplies and a threatened scarcity, if the present raid upon stocks in store continues. Stove and chestnut are now worth \$8 per net ton delivered in city limits, and egg \$7.75. The demand is not confined to the usual run of small orders received at this season of the year, but embraces quite a number of lots of from 8 up to 50 tons. A large lot of about 900 tons of egg was placed a few days ago on private terms. Another important feature is the demand for car-lots from country points along the Grand Trunk and Canadian Pacific railroads, and if this branch of trade increases, it alone will cause a material shrinkage in stocks. The present advance is due to the extraordinarily heavy consumption during January, brought about by the protracted period of intense cold in that month. This state of affairs, however, is not unprecedented in the annals of the coal trade of Montreal, as there are dealers who remember one winter when consumers were in such a tight fix that prices ran up as high as \$14 per ton for stove size.

COLORADO.

The workmen who are engaged in putting the tunnel through the Bingham Hill for the Pleasant Valley and Lake Canal Irrigating Company at Fort Collins, Lorimer County, recently encountered a vein of coal, not very thick, but which is pronounced by judges to be of a fine quality.

COLORADO COAL AND IRON.—The verdict of the coroner's jury, at Crested Butte, states the following: From the effect of an explosion in a mine of the Colorado Coal and Iron Company at this place on the 24th day of January, 1884, fifty-seven people lost their lives. Said explosion was caused by carbureted hydrogen gas coming in contact with a naked light. We believe that the explosion occurred in room 18, entry No. 2, and that some person or persons employed therein entered said room with a naked light, in violation of the rules of the company and contrary to the instructions of the fire-boss. We believe that the use of open lights in this mine is a dangerous practice, and we recommend that hereafter the owners or management require their employes to use safety-lamps only.

CARBONERIE COAL AND COKE COMPANY.—The company publishes the following in local papers: "The consumers of coal in Silverton need not feel uneasy—fearing that the deep snows or bad roads at Durango will prevent coal being hauled to the railroad or make the price go higher. This company, whose mine is located on the track, and the only one that does not have to haul coal to the railroad, is loading from three to five cars per day for use of smelter and domestic trade. It can double the production with three days' notice. It is loading its fine kernel coal, that is best adapted for use in grates, range and parlor use, at \$3.50 per ton in car-lots, while it loads its carbonerie coal, which can not be excelled for heating stoves, at \$2.50 per ton. Coke is \$7 per ton in car-lots, and it can furnish screenings for engine use, at present time on siding in Silverton, at \$3.50 per ton. It will furnish the finest blacksmith coal, free from sulphur (if orders are made at once), on siding in Silverton, at \$4.75 per ton in car-lots."

ENGLAND.

The new North Staffordshire Coal and Iron Company has suspended payment, owing to the depression in the coal trade. The colliery is one of the largest in the kingdom, employing 1200 men, with an output of 1000 tons daily. With the unanimous consent of creditors representing £100,000, a liquidator will be appointed, with special authority to execute large current contracts.

IOWA.
CLAY COUNTY.

A correspondent of the Chicago *Inter-Ocean* states that coal has been found near the town of Peterson at a distance of 120 feet below the surface. There are three beds, aggregating nearly ten feet of coal, in a distance of twenty-five feet, the spaces between the coal consisting of a fine fire-brick clay. The same stratification and corresponding veins of coal were found at a distance of more than two miles higher up, in the valley of the Little Sioux. The surface of the valley, at both points, is probably 100 feet below the tops of the surrounding bluffs. A mining company with shares of \$1,088,000 is organized and working to develop the mines. The incorporators are mutually bound not to sell out before the value and extent of their mines are fully ascertained. Several shafts have been started, and abandoned on account of the difficulty of keeping out the water and quicksand encountered. The workmen are now engaged on a shaft where, from previous boring, it is expected no quicksand will be found. A large building, in which hoisting machinery is to be placed, is erected over the shaft, and nearly finished. This "find" is close to the track of the Chicago & North-western road. It is important as being thirty miles farther north than any coal deposit, except in "pockets," has heretofore been found in Iowa.

MARYLAND.

Mr. Cochrane has introduced a bill to establish a mining school in Alleghany County, in connection with the public school system, which provides that free evening schools shall be opened in the county for the study of mining and mechanical knowledge, and all necessary studies preparatory thereto. The professors and teachers shall be paid out of the public school fund of Alleghany County, the school commissioners to fix the amount; the schools to be opened on the first Monday in November and close on the last Friday in April.

OHIO.

The Brookfield bank is running very slowly. The cold weather has increased orders for coal, and for the past two weeks the mine has been running half-time. The mill at Sharon has started up.

There seems to be a revival of business at Weathersfield. Ground has been broken at Pine Hill, by Evan Morris & Co., for sinking a shaft to the block coal. The mines on Mineral Ridge are running steadily, but the general complaint is that they are overcrowded.

At Chapman, Shriver's mine is not ready for hoisting coal yet. Sippo continues to do well. The Youngstown Coal Company has increased lately, owing to the cold weather. The stone quarry here will be started again on the first of next month if the weather permits. It is also reported that the Kitzmiller quarry will be opened again this spring.

PENNSYLVANIA.

ANTHRACITE.

The Lehigh Valley Coal Company has leased the Alden collieries of the Alden Coal Company, near Nanticoke, for a term of five years. The men there, who have been on strike for a month past, are jubilant, as the change will settle the difficulties.

Advices from Hazleton, Feb. 7th, report that a square in the business portion of that town dropped down about three feet this afternoon, wrecking a hotel and three or four houses. The caving in was caused by the giving away of the timbers in the Sugar-Loaf colliery beneath the borough. Great excitement was naturally caused, and many apprehensions as the ultimate result. Fortunately no lives were lost, and no one was injured.

By an act of the Legislature of June 1st, 1883, the governor was authorized to appoint a board of commissioners, made up of a miner and coal operator from each of the six anthracite coal-producing counties of the State, to act in conjunction with the six mine inspectors of the State, to revise the mine and ventilation laws of the anthracite coal regions of the commonwealth, and report the result of their investigations and deliberation to the next legislature. This commission has been appointed, and the appointees are now in receipt of their certificates of appointment. The roll of the commission, which is apparently incomplete, is as follows:

James Fisher, Nanticoke, Luzerne County, miner. Thomas H. Phillips, Kalima, Schuylkill County, operator. James Brennan, St. Nicholas, Schuylkill County, miner. Alexander Fulton, Shamokin, Northumberland County, operator. Thomas Roney, Mount Carmel, Northumberland County, miner. Lewis A. Riley, Centralia, Columbia County, miner. Samuel Hines, Scranton, Lackawanna County, operator. James White, Scranton, Lackawanna County, miner. M. S. Kemmerer, Mauch Chunk, Carbon County, operator. Philip Coyle, Nesquehoning, Carbon County, miner.

No understanding as yet exists as to when or where the above gentlemen and the inspectors will meet for organization, but they will probably do so at an early day.

The work at the new North Franklin colliery is progressing rapidly.

The Lippincott coal lands are again advertised for sale on the 20th inst. East Bear Ridge colliery has been changed from St. Nicholas to Girardville district, thus giving Superintendent Gregory eight collieries.

It is rumored that L. A. Riley & Co. intend putting up twenty houses and a large store at Myersville; also a breaker, one third larger than Logan.

Hickory Swamp colliery, at Shamokin, is to resume after having been abandoned for several years. A new slope has been sunk.

The Reno colliery trial slope is still going down with 3½ feet of coal. It is supposed they are sinking on one of the leaders that is between the Mammoth and Buck Mountain seams.

COKE BROTHERS & Co.—The number of employes in the various collieries operated by these gentlemen is 1833. Last year, the company mined 643,000 tons of coal, being an increase of almost 100,000 tons over the production in 1882. It is also shown by the reports received by Mine Inspector Roderick, that the company produced 160,000 tons of coal last year for every life lost in and about the mines.

LEHIGH VALLEY.—An explosion of fire-damp occurred in the Derrance shaft of the coal company's mine February 1st, doing considerable damage to the brattice work in the mines. Cornelius McCall was so seriously burned that he can not recover. The explosion is supposed to have been caused by the ignition of the gas from the naked lamp on McCall's hat.

SUSQUEHANNA.—The officials of the Susquehanna Coal Company celebrated the first annual production of a million tons of coal by the company with a banquet at Nanticoke, February 2d. The repast was provided by Colonel Joseph Stickney, of New York, who was superintendent of the company from 1869 to 1881, and who early in 1883 intimated a desire to hold this celebration if a million tons were mined. The result was greatly in excess of all anticipation. The product was 1,119,320 tons last year, an increase of 217,000 over 1882, or about one tenth of the entire increase of the anthracite region. The tonnage for 1884 is expected to reach 1,200,000, in which event another supper will be spread, this time by the company. The company employs 2900 men and boys, who labor the entire year, these works not being bound by a coal combination. Last year's product was prepared for market by four breakers, two of which produced 836,000 tons, being the greatest quantity produced by any two breakers belonging to a single company. The average number of days worked by the company in 1883 was 288.

BITUMINOUS.

Coal mining in the Fourth District continues slow, and there is no immediate prospect of an early start at Du Bois. The Hildrup mine has done nothing of consequence this month—the cause alleged, no orders. The Rochester mine is doing nothing of note, owing to the Buffalo Division of the Rochester & Pittsburg Rail-

road being snowed up. The Walston mine, at Punxsutawney, is on a par with the former, and the Falls Creek mine of McConnell & Co. is now reduced to one-fourth time. It is said, on good authority, that mining matters will continue as they are until spring.

COKE.

The coke syndicate, formed some time ago for the purpose of regulating the output and prices, has dissolved on account of the impossibility of securing unity of action. The larger operators favored the pool.

The Moorewood Coke Company, Limited, is one of the largest works in the Mount Pleasant region. It has 470 ovens, turning out 50 cars of coke per day. It has two shafts designated as A and B, and the black diamonds are reached at a depth of 100 feet. The works are in the suburbs of Mount Pleasant, at the terminus of the Moorewood branch road, and are distant some four miles from Scottsdale. This company furnishes employment to 450 workmen. Moorewood has 900 acres of coal at this point, as yet untouched. Moorewood has been in operation for the past four years, and has been running very steadily during the past year. Lately they have been running but four days in the week. The general impression here is, that brighter days are dawning for the coke country. The Alice mine, Col. J. M. Schoonmaker owner and operator, is doing its share of work with 200 ovens, turning out some 400 tons of coke per day. There are 300 acres of coal yet unworked. The works are situated on the June Bug branch road, and are distant some four miles from Scottsdale. There are 70 tenement houses, and employment is furnished to some 225 workmen. Colonel Schoonmaker has a large furnace in these mines, and the air-current is good, while the roads are not surpassed by any works in the region. The Hazlett mines, owned and operated by Messrs. Boyle & Rafferty, are one mile below Mount Pleasant. They have 261 ovens, turning out, when running full, 30 cars of coke per day. They are running four and five days a week, shipping by the Baltimore & Ohio and Southwest, Pa., roads. These works have been in operation the past twelve years, and are turning out a good quality of coke. They furnish employment to some 120 workmen. Coal is reached by means of both shaft and slope.

The Baltimore & Ohio Railroad Company, February 5th, filed an affidavit of defense to the suit of J. M. Schoonmaker, which was mentioned in the last number of the JOURNAL. Mr. Schoonmaker claims an overcharge on freight to have been charged in violation of a contract made in September of 1879 with the firm of Brown & Cochran, then coke dealers. The railroad company avers that no such contract for a less rate of freight was ever entered into by it with Brown & Cochran, from whom the plaintiff in this suit claims to have purchased his coke-works, and at the same time assumed the fulfillment of such contracts as they had on hand at the time of the purchase. The defendant had no knowledge of plaintiff's purchase of the coke property of Brown & Cochran. The defendant also denies that plaintiff complained about the alleged overcharge of freight, but thinks the rates charged from January, 1880, were reasonable.

WEST VIRGINIA.

ANTHRACITE COAL COMPANY.—The *Baltimore News*, in a recent number, announces the organization of a company operating in the neighborhood of Cherry Run tunnel in opening a mine for anthracite coal, which is supposed to exist in large deposits there. The *Cumberland Times* remarks that as the capital stock is \$1,000,000, but no shares put upon the market yet, it will be well for the public and capitalists to wait awhile before investing their funds. There is a bed of shale much resembling hard coal, the northern outcrop of which begins at or near Flintstone, and runs down Green Ridge, crossing the Potomac River below Oldtown. The southern or anticlinal outcrop is at Siding Hill and the small hills on the Virginia side of the river, making a basin fifteen or twenty miles wide, with an undeveloped length. In this neighborhood, the vein is considered of no value, and those desiring to invest money would do well to await developments before buying into the Anthracite Coal Company of Maryland and Virginia.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY.

BENSON MINING AND SMELTING COMPANY.—This company advertises that it will pay the following rates for ores: Lead ores containing from 85 to 40 per cent lead, 30 cents per unit for the lead and \$1 per ounce for all silver, less \$15 per ton working charges.

Lead ores containing from 45 to 60 per cent lead, same price for lead and silver, less \$10 per ton working charges.

Lead ore going above 60 per cent lead, same price for lead and silver, less \$5 per ton working charges.

Usual book rates paid for dry ores.

Where large lots of ore are offered, an effort will be made to secure low railroad rates.

SILVER BEAR.—This company is sinking a well near the New York mine, to obtain water for the smelter. It is intended to consolidate the New York with the Silver Bear, and to at once erect the smelter, which is now on the ground, and begin operations.

TOMBSTONE DISTRICT.

CONTENTION.—The formation in the bottom of the shaft is so soft that the working barrel of the pump buries itself whenever the ground is moved about its base. Arrangements for supporting the pumps are now making, and, when completed, sinking in the main shaft will be continued.

GRAND CENTRAL.—The pumps are running at full capacity, and are steadily but slowly gaining on the water. No sinking is done.

HEAD CENTER.—Work has been resumed in the north workings.

PROMPTER.—Another assessment (No. 5), of ten cents per share, has been levied. The last assessment was in October; since then, the new hoisting-works have been erected, and have been running since the 3d day of January. The main shaft (No. 5) has been retimbered to the 200-foot level, and is now getting in order for working on the 350-foot level. The drifts east and west on the first and second levels are pushed ahead as fast as possible, some very fine ore being raised.

TOMBSTONE.—The product of the mill for the past year, officially reported, shows \$595,579 (assay value), and that of the furnace for the same period \$190,812. These are the net cash returns (after deducting freight) from refineries. The ore-bodies recently found in the West Side on the 500 level are developing very favorably, the ore being of a very good grade and easily mined. Sinking below this level continues, and no water is encountered.

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

The recent greatly exaggerated reports of the rich strikes in the Bodie mine have not only been of benefit to the stock speculators, but have also revived the interest in the mines of this district. Work has been resumed on several properties which have been idle for a long time.

CHAMPION.—Work has been resumed.

GOODSHAW.—The machinery of the hoisting-works is getting in order, and operations at the mine will be resumed shortly.

PLUMAS COUNTY—GREENVILLE DISTRICT.

PLUMAS CONSOLIDATED.—A new board of directors has been elected, and there is a probability that work may be resumed in the spring.

YUBA COUNTY.

GOLDEN GATE & EXCELSIOR.—The men employed by these hydraulic mining companies at Smartsville, both of which are largely in arrears to their employes, fearing that they would lose their pay altogether, recently levied attachments on the property of the companies. The men of the Golden Gate seized and carried away all the quicksilver and other portable property they could lay their hands upon. It is stated that the Golden Gate Company contemplates putting up a large stamping-mill to crush the cement gravel found in the claim.

COLORADO.

ARAPAHOE COUNTY.

The old Swansea Smelting Company's property, about three miles southeast of Denver, has been sold to a syndicate of Colorado capitalists, who for some time past have been looking around for a suitable site to erect smelting-works. The purchase was effected through Col. P. R. Smith, late manager of the Miners' Smelting and Reduction-Works, of Golden, recently absorbed by the Boston & Colorado Smelting Company, which is now closed down. The capital stock of the new company will be \$1,000,000, divided into 10,000 shares of the par value of \$100 each. The buildings of the old company, now in a dilapidated condition, will be renovated. They stand upon a plot of ground containing 7 1/2 acres of land, affording ample ground to conduct the work of smelting upon an extended scale. Six new McNair reverberatory gas-furnaces, with a daily capacity of fifty tons each, are to be erected. The Kansas Pacific Railroad runs within a few yards of the works, which will afford all necessary transportation conveniences. All gold and silver ores will be smelted and refined that can be handled either at the Miners' or Argo works.

BOULDER COUNTY.

CROCKER PROCESS.—This reduction company has started its new dry concentrator, and is well pleased with the results of its work. It is shipping concentrates to the smelters steadily. This concentrator is entirely new, and is watched with great interest.

GOLDEN AGE.—This mine is showing up more and better ore than ever before. With a good force of men at work, the cross-cut tunnel from Castle Gulch is going steadily ahead, and it is hoped will cut the vein within the next two or three months.

SILVER GLEN.—This company has begun work on the Roman Eagle mine, and a shaft is sinking preparatory to extensive development in the near future. This company owns the Roman Eagle and Wellington lodes, both of which show silver ore.

SMUGGLER.—The mine is showing some splendid tellurium ore, and the company anticipates putting up a good concentrator near the mine very soon.

THUNDERBOLT.—A valuable body of sulphurets and galena has been struck in this lode, at a depth of 40 feet, which mills over 100 ounces in silver, with 1/2 ounce of gold per ton, and from 30 to 40 per cent of lead.

CLEAR CREEK COUNTY.

HUKILL.—Work on this mine is progressing much faster than was anticipated. The tank which is used for drawing out the water from the shaft holds about 250 gallons, and is worked at the rate of thirty times per hour. The shaft had, at the beginning, 200 feet of water, and they are now within twenty feet of the bottom. The main shaft is in very good condition, and will not require new timbers. Only a small number of men can be worked at present.

EAGLE COUNTY.

GOLD PARK.—The United States marshal at Red Cliff recently offered this company's property for sale. On the fourth bid, it was knocked down to J. P. Heisler, attorney for William Brown, of Jacksonville, Ill., for \$6950.

LITTLE CHIEF.—The output of this property, owned by the American Mining and Smelting Company, will shortly be increased to fifty tons a day.

HINSDALE COUNTY.

CROOKE MINING AND SMELTING COMPANY.—It is reported that the old employes are standing out for the old prices—when \$4 per day was paid—and that the management will not accede to these terms, but, if forced to do so, will send out for a crew of miners sooner than pay their prices. The local press says that the cost of living and of every necessity of life has been greatly reduced since the \$4 per day rate was established in this country, and wages must fall in proportion.

JEFFERSON COUNTY.

The *Golden Transcript* says that reports from these new copper mines continue to come in encouragingly, and the prospect for lively work here in the spring is excellent. All the samples brought in as depth is attained are improving daily.

On the Maggie, they are now down over 80 feet, and it shows a crevice with native copper sheets all through it. Most of the mines are worked.

LAKE COUNTY.

The *Leadville Herald* reports the following:

ACCIDENT SELLERS.—The parties owning lease on this mine in California Gulch have thrown it up, having failed to make it pay expenses. The mine shipped considerable ore, which must have been of very low grade. This feature, together with the fact that the mine was ill provided with machinery and worked at an unusually heavy expense, was the result of the failure.

IRON SILVER.—The Stone mine continues making large shipments of fine smelting ore. The remainder of the company's properties show a slight reduction in their output. The production of the Stone mine also shows a slight reduction compared with four or six months ago. This is due to the decreased value of the lead, and which made it necessary for the company to sort its ore closer than heretofore, followed naturally by a reduction in the tonnage of the mine's yield of ore. The sinking of the Moyer shaft is making excellent headway, and it is expected that the vein will be encountered shortly. The strike made in the Moyer last fall was not made in the shaft, but in a drift which intersected the vein on its rise to the westward. The shaft will be continued through the vein to form a sump, but it has not yet been decided whether to sink it to sufficient depth to allow drifting and cut the vein on its dip to the eastward, or drive an incline on the vein. The manager expects to make a contract with Pueblo smelters for a considerable quantity of the Moyer ore.

MATCHLESS VS. DOLPHIN.—The jury in this case, after being out nearly thirty hours, failed to agree, and Judge Goddard dismissed them.

MORNING STAR.—The management has failed to make any satisfactory definite contract for its ores. A temporary arrangement has, however, been made for the product of the mine, to be continued at the pleasure of the contracting parties. The Evening Star mine, it is thought, will suspend further ore-shipments for the future. The advisability of removing the steam-pumps from the McHarg shaft of the Morning Star consolidation and replacing them with sufficient Cornish plunging-pumps is considered. At present, the pumps are handling the water, but their operation is very expensive, while with the approach of spring more water will be made by the mine than the present plant is capable of handling.

ST. LOUIS.—Arrangements have been completed for the erection of a gold amalgamating and concentrating mill of sufficient capacity to handle the entire product of the mine. The mill is to be erected on the old site of the Colorado Prince mill, and is to be completed by April 1st. The properties constituting the St. Louis lode of to-day were formerly known as the Miner Boy and Colorado Prince lodes.

TERRIBLE.—The lessees of this company are employing forty-five men and taking out considerable ore of paying grade. The sub-lessees, who have a strip of ground running across both lodes, embracing two shafts on the Terrible lode, have recently developed a large body of lead ore, but are not shipping a great

deal at present. Other sub-lessees on the property are doing fairly well, and constant stream of ore is coming from the mine.

TWIN LAKES PLACER.—Theodore F. Van Wagenen has instituted suit against this mining company for \$41,400.

PUEBLO COUNTY.

More ore is delivered to the Pueblo smelters now than ever before. In several instances, large contracts have been made for mineral that has been hitherto shipped elsewhere.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—According to the *Denver Republican*, a supersedeas was granted in the Supreme Court February 1st, in the suit of L. B. Parker vs. the Robinson Consolidated Mining Company. In June, 1882, Mr. Parker leased the Robinson property, and, after opening up the mine, was afterward deposed by Mr. Davis. He brought suit against the company, which was mentioned in the *JOURNAL* at the time, for breach of contract and damages, and notice was served upon W. R. Hall, an alleged stockholder, and one Donaldson, at one time the agent of the company. The company did not appear to fight the suit, and a judgment of \$40,000 was obtained by default. An application was made in the District Court of Lake County to vacate the judgment, the company claiming that no notice had been served. A hearing was had last week, and the court refused to vacate the judgment. The case was then brought to the Supreme Court on a writ of error from Lake County. A supersedeas was asked and granted in the Supreme Court to enjoin the writ of execution. Mr. Willard Teller argued the case an hour before the court in behalf of the application. Now that a supersedeas has been secured, the company will make a fight to have the decision of the District Court reversed. In the District Court at Leadville, February 1st, judgment was rendered against the Robinson Consolidated Mining Company, and in favor of Cummings & Finn, for \$3934 and costs of suit. The claim was based on the violation of a contract for ore the plaintiffs made with the Robinson Company's manager several years ago.

DAKOTA.

CALEDONIA.—The mill has started up, and the strike of a rich body of ore is reported.

FATHER DE SMET.—The superintendent writes under date of January 18th as follows: Inclosed find express company's receipt for bar No. 175, containing 714.85 ounces of gold, the result of run of mill for the first half of January. This is a small improvement over the first run of December, and in proportion to number of days run, about as well as can be expected now, though I am in hopes that better results will be obtained in the near future. The mine is looking about as usual, showing up plenty of ore, but very spotted and bunched in quality. South header, 3d level, does not look quite so well this week, but I think it is changing for the better. The mill is in good condition and putting in regular time.

MAINE.

DOUGLAS.—At a meeting of the directors of this company, recently held in Boston, it was deemed advisable to levy an assessment of twenty-five cents per share on the capital stock, payable February 5th.

MEXICO.

The Legislature of Oajaca has passed a law for the promotion of the mining industry, exempting from taxation capital invested in mines, the mines themselves, and works for the treatment of minerals, the minerals produced, and the machinery and materials used in mining and treatment of minerals. All persons engaged in the mining industry, from proprietors to laborers, are exempt from military service and municipal duties except in case of foreign war.

The following table, published by the *Mexican Financier*, gives the figures of precious metals exported during the first months of the fiscal years ended June 30th, 1882 and 1883:

	First quarter of 1883.	First quarter of 1882.	Average exportation per quarter in the six years from 1877 to 1883.
Precious metals.			
Coined silver	\$6,360,694.71	\$4,806,167.61	\$4,126,329.91
Silver amalgam	1,153,806.51	886,280.17	855,964.13
Silver ore	169,064.95	48,703.39	111,957.84
Silver sulphurets	22,618.64	6,346.00	4,564.67
Silver earths		36.00	4,122.84
Silver ore pulverized	1,715.00		
Silver in slag	1,500.00		
Worked silver			213.95
Argentiferous lead			2,963.55
Coined gold	42,318.50	52,935.50	182,827.19
Gold in bars	182,892.05	139,704.32	93,756.66
Gold dust	7,361.19		
Coined foreign silver	37,041.25	44,734.30	73,224.61
Coined foreign gold	6,787.50	26,019.55	48,681.23
Total metal exports	\$7,985,899.30	\$6,004,827.14	\$5,504,586.58

Showing an increase in 1883 of \$1,981,072.16. The total exports, including the precious metals, were \$10,813,414.42, against \$8,350,956.37—an increase of \$2,462,458.

MEXICAN GUADALUPE.—This company has received a grant from the government of the State of Nuevo Leon of concessions of water rights of the Villadama River; of telephone rights in the town of Villadama; and of turnpike rights in a road between the town and the mountain range in which its properties are situated.

MICHIGAN.

A correspondent of the *Pittsburg Chronicle-Telegraph* writes from Marquette: We are passing through a winter of unusual quietness in the Lake Superior iron district, owing to unsatisfactory state and uncertain future of the ore market. The mines are all working light forces, and making no effort to raise much ore against the time when active shipping will begin in the spring, that is, such of them as have not shut down altogether, of which there are a number. It is conceded to be the dullest winter in the iron district of the upper peninsula that has been known since the worst effects of the panic of 1873 were off, and although there are hopeful indications discernible, it is by no means certain that the current year will bring any marked improvement in this greatest of our industries.

DEER LAKE.—This company, which has been prosecuting explorations to the west of the lands of the Ropes Gold and Silver Mining Company, has met with the most encouraging results, having disclosed a fine vein of gold-bearing quartz at a distance of 1200 feet west of the Curry shaft on the Ropes property, which is without doubt a continuation of the Ropes vein.

HURON.—Official reports to the Boston office state that No. 10 shaft, now down 45 feet below the seventh level, is still showing a good paying lode, and the same may be said of the seventh level, going north of this shaft. No. 8 shaft, sinking below the eleventh level, is opening up a good bunch of paying ground. There seems to be a large amount of ground in this part of the mine that will pay to remove. The seventh level north of No. 6 shaft, both in the drifts and stopes, is showing a large and rich lode for barrel and stamp copper. There is a piece of copper in sight at this point that is too large to be called barrel-work. It will doubtless make a mass of a ton or two, if not more. On the whole, the mine never looked better than it does to-day.

OSCEOLA.—The present principal lode in the south end of this mine, which is now being penetrated, is showing a marked improvement. In the direction indicated, the company has a long stretch of territory.

FEWABEC.—We have cut, official reports state, into the east lode at the thirty-third level about four feet. It is much harder than any thing we have seen on

this lode from the levels above. So far as seen, it is not very rich. Some lower-grade stamp was taken out of it yesterday. There are doubtless many feet to go yet before we shall reach the foot-wall. Until then, we can not tell much about its value. No change to notice in any other part of this mine, except in the thirty-first level on the main lode north of the shaft, which seems to improve a little.

MONTANA.

LEWIS & CLARKE COUNTY.

It is stated that the prospects are, that within the next twelve or eighteen months reduction-works like those at Wickes will be established both on Ten Mile, at the head of Lump Gulch, at Boulder, and at various other points in the vicinity of Helena. Prominent parties state that it is safe to say that no less than six such works will be in operation in this vicinity within twelve or eighteen months from this time.

MONTANA (LIMITED).—The large engine at the air-compressor building has been started. The machinery worked smoothly. Almost the entire population were spectators of the event, which is a real commencement of extensive operations by this company.

SILVER BOW COUNTY.

BELL.—The development of this mine continues with very excellent results. Operations are confined to the 400-foot level west of the old east shaft. At the smelter, about six hundred tons of ore that samples from 15 to 20 per cent, and a few tons of a much higher grade, have accumulated, and it is likely that the smelter will soon be fired up to reduce them. Recently, a crude ore shipment was made to Swansea, consisting of a twenty-ton lot, assaying thirty-five per cent copper and fifty-five ounces in silver.

LEXINGTON.—The recent strike on the 500-foot south level is opening up magnificently. It has now been explored for a length of upward of 200 feet, and is found thus far to have a uniform width of six feet. Assays show that the ore carries over sixty ounces, and the pulp-assays in the mill give the same result.

MOUNTAIN CONSOLIDATED.—At a recent meeting of the stockholders, it was determined not to resume operations on this property at present. There is no doubt, however, that the property in the near future will be extensively developed, as the utmost confidence in the result of its thorough exploration is expressed.

MOUNTAIN VIEW.—In the north 500 foot cross-cut, on the foot-wall of the north ledge, a considerable body of good copper ore has been discovered. One streak, which is more than a foot wide and is strong and compact, assays forty-two and six tenths per cent copper and \$20 in silver. On each side of this streak is good concentrating ore. On the 300-foot level, the south cross-cut has penetrated the ledge to the hanging wall through 150 feet of vein-matter, of which 50 feet is solid quartz. This cross-cut is evidently run above the copper zone, though it uncovered some bunches or pockets of excellent copper ore. On the 400-foot level, the south cross-cut has just tapped the ledge, which has so far been penetrated but a few feet. The strike in the north 500-foot cross-cut is regarded as very important.

POSER.—The proposition of some Eastern parties to erect a mill upon the mine for an interest in the property is under consideration by the owners: no definite arrangement has yet been arrived at.

NEVADA.

ESMERALDA COUNTY.

HOLMES VS. NORTHERN BELLE.—A motion for a new trial and arrest of judgment in the case of the Holmes Mining Company vs. the Northern Belle Mining Company has been denied by the United States Circuit Court. The case is on appeal from the Nevada Circuit Court, wherein the plaintiff obtained a judgment for \$360,000.

STOREY COUNTY—COMSTOCK LODGE.

Work of sinking the combination shaft below the 2800 level has commenced. There is already a sump 85 feet in depth below the 2600 level, so that they have but 115 feet to go to reach the 2800. As the shaft is 19 by 38 feet in size, it will probably be a month or so before they are ready to begin explorations on the 2800.

The Enterprise reports that the rise from the main north drift on the 2900 of the Sierra Nevada has now but a short distance to go to reach the 2700 level. This connection will cause a change of draught at several points, and will so improve the ventilation that prospecting-work may be economically undertaken in places where streaks of good ore are known to exist. On the 3100 level, the northeast drift is constantly cutting small seams and streaks of ore, some of which are very rich. These streaks for a time lie in the course of the drift, when they are left behind and new ones cut into. The streaks widen and narrow from day to day, so far as followed. At some point, they perhaps connect with deposits of workable size, but this remains to be ascertained in cross-cuts to be run hereafter.

In the Union Consolidated, the main north and south drifts are now fast nearing each other. The men working in the two headings can now very distinctly hear the sound of the drills. This will be a very important connection, as it will form an air-gallery and base of operations on the 3100 level from the Ophir on the south to the Sierra Nevada on the north. Once the connection is made, new life will be seen in the north end mines. Prospecting-drifts will be started both east and west in the Union Consolidated and Sierra Nevada, and operations will be resumed on the 2900 level and at other interesting points in the Mexican.

At the Gould & Curry, the north drift on the 1200 level is being cleaned out and repaired to the Consolidated Virginia line, where it will be taken up by Senator Jones and pushed forward into the California, where prospecting operations will be commenced in the old upper levels, and where ore is known to exist at several points.

At the middle mines, all is going on well. The new hydraulic pump is doing excellent work, and the Chollar-Norcross-Savage shaft is now sinking to the 2800 level as rapidly as possible. The sinking will be continued to the 3000, but at the 2800 level a station will be opened and a drift started to the west.

The Hale & Norcross winz has reached the 2800 level, and a sump is now sunk below that point. As soon as the sump has reached a proper depth, a station will be opened and prospecting begun. The bottom of the winz shows much quartz of a promising appearance.

At Gold Hill, the low stage of water in the Carson River still retards all ore extraction except that required to keep going the few stamps that can be run.

PENNSYLVANIA.

Dispatches from Titusville state that the drill at the Porter well, in the McKinney District, Sheffield, reached sand on the morning of February 4th, and yellow oil gushed forth copiously into the huge tanks. The well was immediately shut down. However, after the first half-hour, the flow of oil decreased so rapidly that deeper drilling was determined on. The tools were set in motion, and kept going until the sand had been pierced fully six feet. By this time, the flow of oil was tremendous, the gauge for the first two hours showing it to be 140 barrels. This is the third well completed in the McKinney District, and conclusively demonstrates its fertility. The latest reports received from the "Gusher" say it is declining and will not yield more than 800 barrels the first twenty-four hours. Some reports place it even a trifle lower than this. The Porter well is situated a few hundred feet southwest of the McKinney well, on the side of a forest-clad hill, overlooking Tionesta Creek, which flows by, through flooded gorges, to the Alleghany River. On this hillside, are most of the operations of the McKinney District, numbering about twelve wells, three of

which are flowing. A gauge was taken in the afternoon of the McCallmont well No. 1, which was opened Sunday. In the first 181 hours, it produced exactly 1000 barrels. At half-past three this afternoon it was flowing sixteen barrels an hour. The total daily production of the entire McKinney field is now about 2000 barrels. Grand No. 19, in the Baltimore District, has drilled deeper, and like No. 15, found a second oil streak. In the first two hours, it produced 35 barrels. February 2d, the Balltown Oil Company's No. 17, after having commenced flowing at a great rate, suddenly stopped. Deeper drilling has begun, through a hard sand, and according to latest reports, it yielded four barrels an hour.

SOUTH CAROLINA.

A report published by the Charleston News and Courier shows that the value of the products of the mines and quarries in 1883 was \$2,440,000, against \$16,573 in 1870. The total value of the agricultural, manufacturing, and mining products in 1883 was \$76,554,725, against \$59,888,562 in 1880, and \$54,455,707 in 1860.

ANNUAL FINANCIAL STATEMENTS.

We give below some reports of the financial standing of mining companies. These statements are taken from affidavits filed with the County Clerk, and are, therefore, accurate:

	Indebtedness.	Reporting Officer.
American Iron Company	\$5,000.00	Howard Bunting, Secretary.
Auraria Gold Mining Co. of Georgia	8,395.55	James H. George, Secretary.
Aurora Gold Mining Company	13,000.00	T. C. Platt, President.
Barbee & Walker Silver Mining Company	50,000.00	De Lacey Loucks, Secretary.
Bellevue Mining Company	2,500.00	A. S. Menet, President.
Bessemer Mining Company	13,000.00	Charles F. Bates, Secretary.
Bonaparte Hill Gold and Silver Mining Company	28,000.00	Thomas C. Thorne, President.
Bondholder Mining Company	6,000.00	M. S. Isaacs, President.
Borva Copper Mining Company	1,000.00	F. W. Brooks, Secretary.
Brooklyn & San Miguel Mining and Reduction Company	90,000.00	C. C. Savage, Secretary.
Bull-Domingo Mining Company	12,000.00	D. S. Draper, President.
Calaveras Water and Mining Company	200,000.00	R. K. Southwick, Secretary.
Castle Dome Mining and Smelting Co.	93,000.00	R. K. Southwick, Secretary.
Chicago Mining and Manufacturing Co.	55,000.00	John M. Hills, President.
Clifton Hydraulic Mining Company	1,130,877.94	H. S. Ogden, President.
Columbia County Anthracite Coal Company of Pennsylvania	500.00	R. M. Funkhouser, President.
Conway Castle Mining Company	1,500.00	George H. Brown, Secretary.
Consolidated Bodie Gold and Silver Mining Company of Arizona	10,000.00	James W. Smith, President.
Dana's Gold Mining Company of Georgia	3,000.00	M. L. La Branche, Secretary.
Diamond Flume and Hydraulic Company	5,842.70	James King, President.
Doxology Group Mining Company	300.00	James W. Hilton, President.
Ducan Gold and Silver Mining Company of Idaho	6,000.00	H. Johnson, Secretary.
Eagle River Cons. Mining Company	82,000.00	C. T. Hulburd, Secretary.
El Oro Mining Company	490,000.00	Benjamin F. Guyton, Sec.
Empire & Silver State Silver Mining and Milling Company	78,065.92	W. Ferguson, Secretary.
Esmeralda Mining Company of New York	87,500.00	Chester R. Buckley, Secretary.
Fayette Coal and Coke Company	11,064.08	Fred. A. Brown, Secretary.
Felix Grundy Mining Company	10,000.00	E. S. Munroe, President.
Garfield Mining and Milling Company	28,818.87	L. C. Voorhes, President.
Golden Rule Consolidated Mining Company of Nevada	3,000.00	M. S. Isaacs, President.
Gold Vein Mining Company	5,000.00	Charles E. Lockwood, Sec.
Grand Mesa Mining Company	17,000.00	Ed. F. Hollister, Secretary.
Graphic Consolidated Milling and Mining Company	12,000.00	Edward Beadle, Secretary.
Great Eastern Gold and Silver Mining Company	3,500.00	R. A. Olmstead, Secretary.
Heusen Creek Reduction Company	40,000.00	R. L. Harrison, Secretary.
Hudson River Ore and Iron Company	95,723.66	James A. Barden, President.
Idaho Consolidated Gold and Silver Mining Company	5,000.00	George P. Platt, Secretary.
Indianapolis & Southwestern Coal Co.	1,000.00	C. E. Lockwood, Secretary.
Inez Gold Mining Company	25,200.00	Gabriel Furman, Secretary.
Iron Bonnet Silver Mining Company	7,000.00	Asa C. Brownell, President.
Kent Mining Company	3,000.00	Peter J. Claussen, Secretary.
La Ligua Gold Mining Company	250,000.00	John H. Flagler, President.
Landon Hill Mining and Manufacturing Company	1,000.00	John L. Randall, Secretary.
Lexington Copper Mining Company	100,000.00	L. C. Warner, Secretary.
Little Kanawha & Elk River Petroleum and Mining Company	30,000.00	Willard Parker, Jr., Pres.
L. M. Mining Company	7,282.24	W. M. Barnum, Secretary.
Little Rapid Placer Mining Company	10,000.00	Benjamin Homan, President.
Magnetic Iron Ore Company	10,000.00	Samuel O. Brown, Secretary.
Manganese Iron Ore Company	50,000.00	E. A. S. Man, Secretary.
Montrose Mining Company	15,000.00	Alfred H. Roach, Secretary.
Morning Star Gold and Silver Mining Co.	250.00	R. H. Spencer, Secretary.
Nes Silicon Steel Company	488,608.32	J. L. Bearislee, President.
New York & Colorado Company	1,387.87	H. Groenemeyer, Secretary.
New York & Ohio Iron and Steel Co.	149,445.77	Frederick J. Stone, President.
New York & San Jorje Hydraulic Gold Mining Company	81,512.35	A. F. Pruyn, President.
New York Refining Company	55,894.70	G. C. Thorp, Secretary.
Night Watch Silver Mine	230.27	R. G. Glover, Trustee.
North Carolina Mining and Developing Company	2,000.00	C. E. Lockwood, Secretary.
North Clear Creek Gold and Silver Mining Company	1,200.00	A. S. Cady, President.
Old Dominion Copper Mining Company	600,000.00	Fred. W. Brooks, Secretary.
Ophir Gold Mining Company	340,000.00	Luther C. Warner, Secretary.
Osprey Cons. Mill and Mining Company	3,000.00	Louis G. Clark, Secretary.
Pierce Gold Mining Company	24,000.00	B. F. Guyton, Secretary.
Prince of Wales Coal Company	94,968.60	Albert G. Allen, Secretary.
Princeton Mining Company	6,750.00	Thomas H. Edsall, President.
Pro pect Mining Company	7,000.00	George H. Brown, Secretary.
Queen of the West Silver Mining Co.	40,000.00	Jas. A. Alexander, Vice-Pres.
Quintera Mining Company	119,008.00	Ed. Hegewisch, Secretary.
Rappahannock Gold Mining Company	6,000.00	J. A. MacPherson, President.
Reese River Consolidated Company	116,637.73	John Rankin, Secretary.
Resumption Mining and Smelting Co.	100,000.00	William V. Carr, Secretary.
Richardson Gold and Silver Mining Co.	3,000.00	Thomas J. Barbour, Sec.
Rollins Gold and Silver Mining Company	8,117.85	Elisha Cole, Secretary.
San Juan & N.Y. Mining and Smelting Co.	114,050.00	George F. Peabody, Sec.
Silver Peak Mines	275,998.63	C. J. Canda, Secretary.
Silver Peak & Red Mountain Gold and Silver Mining Co.	149,336.42	H. Groenemeyer, Secretary.
Sir Roderick Dhu Gold Mining Company	70,000.00	John McGinnis, Jr., Pres.
Somerset Mining Company	173,306.55	J. J. Higginson, Vice-Pres.
Sparta, Chester & St. Louis Railroad, Coal, and Coke Company	500.00	Henry Seligman, President.
Stringfellow Gold Mining Company	4,000.00	T. Cornwall, Secretary.
Sun and Moon Beam Mining Company	2,500.00	Clarence Sackett, Secretary.
Terrible Mining Company	8,000.00	H. K. McHarg, Secretary.
Tom Moore Mining Company	3,000.00	Joseph B. Fay, President.
Torrence Mining Company	62,765.37	F. W. J. Hurst, President.
Union Gold Mining Company of Colorado	25,000.00	F. A. Potts, Secretary.
United States Ore Separating Company	47,300.00	Robert Schnell Rudd, Sec.
University Gold Mining Company	2,000.00	W. H. Van Deventer, Sec.
Wide West Mining Company	10,000.00	E. T. Rice, Jr., President.
Winona Gold Mining Company	27,000.00	Aug. Stein, Secretary.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Feb. 8.

The mining market this week was mostly confined to dealings in the low-priced fancy stocks, and there was very little of interest outside of them. The Bodie stocks continue to sell at very strong prices, but are not very largely sought after. Horn-Silver suffered a decline, and Hall-Anderson was also weak. The State Line stocks came to the front again this week, and were largely dealt in at advancing figures. To-day, the general tone of the market was weak, and it was a noticeable fact that while the better class of stocks was moderately dealt in at weaker prices, the fancies were, under manipulation and through "wash" sales, very active and somewhat stronger than for some time past. Below will be found a complete summary of the market. The total number of shares sold aggregates 185,237, as against 144,087 last week.

The Comstock shares were almost neglected. California was very quiet at 27c. Consolidated Virginia records a small business at steady prices, selling from 21@25c. Sierra Nevada sold at \$2.50, with one small transaction. Sutro Tunnel was quiet and a little weaker, selling from 17@15c.

The Bodie stocks continue to sell at very strong prices, and were liberally dealt in. Bodie Consolidated was moderately active at very strong prices; it sold from \$10@12.75@10.38. Bulwer was active and strong, selling from \$1.85@2.70@2.25. Standard was quiet and steady at \$6.88@6.63. Goodshaw sold at 32c., Tioga at 25c., and North Standard from 14@10c.

The Leadville stocks were but moderately dealt in at steady prices. Amie was a little weak, under a small business, selling from 10@8c. Chrysolite was quiet and steady, selling from \$1.10@1.15. Dunkin sold at 22c. and Breece at 13c. Iron Silver was strong and was fairly dealt in; it sold from \$2.10@2@2.05. Leadville rallied under a small business, and was strong, selling from 57@60c. Little Chief sold also at strong prices, being quoted from 45@55@53c. under an active business. Little Pittsburg was quiet and steady at 45c. Climax sold from 5@7c.

The Tuscarora stocks were strong and were moderately dealt in. Grand Prize sold from 25@24c. Belle Isle was strong, with a small business, selling from 51@55c. Navajo advanced from \$2.90@3.15 under a small business, and was quite strong. Independence was also strong, advancing from 30@60c., with small transactions. Elko Consolidated sold from 7@8c.

In the miscellaneous list, Bassick was a little weak, selling from \$8.50@8, with a small business. Green Mountain suffered a slight decline from its recent strong prices; it sold from \$2.05@1.95, with small transactions. Hall-Anderson was moderately active and weak; it sold from \$1.40@1.25. Horn-Silver displayed some weakness, under a fair business, declining from \$7.50@6.38. Northern Belle was quiet, and sold from 3@7c. Robinson Consolidated was fairly dealt in, and was quite strong at one time, but declined toward the close; it sold from 28@60@33c., closing to-day at 35c. Stormont was stronger, under a moderate business, selling from 15@17c.

American Flag was very active and was a little stronger; it sold from 4@8@6c. Barcelona was quiet and steady at 14@15c. Decatur sold at 4c., with a fair business. Harlem was quiet and sold at weak prices, being quoted at 11@7c. Oriental & Miller was very actively dealt in at stronger prices, selling from 13@20@15c. Rappahannock was liberally dealt in and was strong; it sold from 13@15c. Sonora Consolidated records a large business at steady prices, selling from 9@11c. The State Line stocks were very actively dealt in at steady prices. Nos. 1 and 4 sold from 2@5@4c. and Nos. 2 and 3 from 3@8@5c.

DIVIDENDS.

The Bonanza King Consolidated Mining Company, of California, has declared a dividend (No. 3) of twenty-five cents per share, payable on the 15th inst.

The Quicksilver Mining Company, of California, has declared a dividend of three per cent on the preferred capital stock, payable on the 26th inst.

The Standard Consolidated Mining Company, of California, has declared its usual monthly dividend of twenty-five cents per share, payable on February

12th, at the office of the Farmers' Loan and Trust Company.

The Syndicate Mining Company, of California, has declared a dividend (No. 1) of ten cents per share, payable February 5th, at San Francisco.

PIPE LINE CERTIFICATES.

The oil market this week was somewhat duller, and the fluctuations were within a narrow range and generally on the decline. On Saturday last, the market opened at \$1.09, advanced to \$1.10, and then suffered a decline to \$1.09, closing unsettled at \$1.09. Monday, the market was dull, and the weakest price, \$1.08, was reached. Prices rallied, however, and the market closed at \$1.09 and with a better feeling. On Tuesday, the market was strong and more active. Opening at \$1.09, prices advanced to \$1.10 and closed strong at \$1.10. Wednesday, the market was exceedingly dull, and the fluctuations were not of a very wide nature. Opening at \$1.10, prices declined to \$1.09, and then rallied and closed firm at \$1.10. Thursday, business was better, but the market was weak. Opening at \$1.10, prices rose to \$1.10, and then declined to \$1.09, closing at that figure. To-day, the market was dull and weak, declining from \$1.09 to \$1.08, closing unsettled at \$1.09.

There was but little news from the oil regions. Reports in the early part of the week stated that the new Porter well was opened with a production of 170 barrels in the first four hours, but later, the output declined to the rate of 15 barrels an hour; later, it is said to have yielded 70 barrels an hour on being drilled deeper. It was also reported that the new Balltown No. 17 well had stopped flowing. A dispatch yesterday states that the Dale well, in the Cranberry tract, south of Oil City, had reached sand, and was yielding 600 barrels.

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

	Opening.	Highest.	Lowest.	Closing.	Sales.
Feb. 2	\$1.09	\$1.10	\$1.09	\$1.09	5,140,000
4	1.08	1.09	1.08	1.09	3,187,000
5	1.09	1.10	1.09	1.10	3,593,000
6	1.10	1.10	1.09	1.10	2,911,000
7	1.10	1.10	1.09	1.09	3,895,000
8	1.09	1.09	1.08	1.09	3,334,000
Total sales					22,040,000

SAN FRANCISCO MINING STOCK QUOTATIONS.
Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Feb. 1.	Feb. 2.	Feb. 4.	Feb. 5.	Feb. 6.	Feb. 7.
Albion						
Alpha						
Alta	1 3/4	1 3/4	1 3/4	1 5/8	1 7/8	1 3/4
Argenta						
Bechtel						
Belcher			.90	1	1	1
Belle Isle	.20			.30	.55	.65
Best & Belcher	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
Bodie	11	11 3/4	13 3/4	11 3/4	10 3/4	11 3/4
Bullion						
Bulwer						
California	.05	.05		.25	.25	.25
Chollar	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Con. Pacific	.50	.50	.55	.60	.65	.55
Con. Virginia	.25	.20	.25	.20	.20	.20
Crown Point	1	.90	.95	.90	1	1
Elko Cons						
Eureka Cons	2		2	2	1 1/2	1 3/4
Exchequer						
Gould & Curry	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Grand Prize	.20		.20	.15	.15	.20
Hale & Norcross	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Independence						
Martin White	.50					
Mexican	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
Mono						
Mount Diablo			2 3/4	2 3/4		
Navajo	2 1/2	2 1/2	2 3/4	2 3/4	3 1/4	3 1/4
Northern Belle			.10	.05	.05	
North Belle Isle						
Ophir	2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Overman						
Potosi	.65	.65	.60	.60	.65	.60
Savage	.75	.80	.75	.70	.70	.65
Scorpion						
Sierra Nevada	2 3/4	2 3/4	2 1/2	2 3/4	2 3/4	2 1/2
Silver King						
Tip Top						
Union Cons.	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
Utah	1	1	2	2	2 1/2	2 3/4
Wales Cons.						
Yellow Jacket	2 3/4	2 1/2	2 3/4	2 1/2	2 3/4	

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, February 7.

The market in copper stocks the past week has been confined to the three leading dividend-paying mines, which continue to be in active demand on investment orders, and which absorb about all the stock offered

for sale. Calumet & Hecla advanced from \$232 1/2 to \$234 on sales of less than 100 shares, principally in small lots. The demand comes largely from miners and others in the Lake Superior regions, who know the value of the mine, and who feel satisfied of its capacity to pay dividends for a long time to come, and are content to receive regular dividends of about 9 per cent on their investment. Franklin is gaining in public favor since its ability to pay dividends has been conceded, and it is now sought for by investors at present prices. The sales were at \$10 early in the week; but yesterday, stock was taken at \$10 1/2 @ \$10 3/4, and to-day at \$11, which was bid for it at the close. We anticipate a further advance within the next thirty days. The January product was 175 1/2 tons. Quincy has shown a good degree of activity, and advanced from \$41 @ \$43, ex dividend, closing, however, a little weak, at \$42 sales and bid. The January product was 180 tons, against 170 in January, 1883. With dividends averaging about \$8 a year, Quincy, at present prices, is cheap. Atlantic sold at \$8 for 50 shares, a gain of 3/4 over last sale, January 24th. Pewabic sold at \$1 1/2, same as last week. A sale of 400 shares of Pontiac is reported at 12 1/2 c.—the first for a long time.

In silver stocks, Silver Islet declined from \$1 1/4 (January 4th) to 50c. The company has issued circulars to the stockholders calling upon them to furnish the means for carrying on the explorations at the mine, which of late have not been very satisfactory. Harshaw sold at 50c. Sullivan declined from \$1, December 29th, the last sale at the old Board, to 45c. At the Mining Exchange, where the stock is largely dealt in, it further declined to 30c. a share, with a slight rally to 35@36c. It is rumored that another assessment is among the probabilities of the near future, and many of the holders who have paid in to the concern all they care to prefer to dispose of their stock at the most they can get. Bowman Silver is dull and without feature. The decline in Empire from 32 1/2 @ 22c. the past week has caused some surprise to its friends, as the reports from the mine are all of a favorable character, and the stock should advance rather than decline, on its merits. The stock of the American Electric and Illuminating Company has been listed at the Board, and sales have been made at \$3 3/4 @ \$4 1/4 for the common and \$9 1/2 @ \$10 for the preferred. The prospects of the company are said to be of a very encouraging character, and much higher prices for its stock are confidently predicted.

3 P.M.—The market this afternoon was without feature. Calumet & Hecla sold at \$234, and Quincy at \$42 1/2. Franklin, \$11 1/2 bid, \$12 1/2 asked. Osceola, \$14 bid. Huron, \$1 1/2 bid, \$1 1/2 asked. Pewabic, \$1 bid. Silver Islet, offered at 50c. Atlantic, \$7 1/2 bid, \$8 asked. Allouez, 50c. bid.

METALS.

NEW YORK, Friday Evening, Feb. 8.

Copper.—The market continues quiet. Occasionally small lots of Lake may be picked up at 14 1/2 c., but more frequently 15c. must be paid. The question has been repeatedly raised whether or not the small lots of Lake continually appearing in our market come from the smaller mines. It should be stated here that the bulk of this copper is handled by the Detroit smelting-works, which distributes it in the West about the New York prices. Other brands of copper we quote at the range of 14@14 1/2 c. Certain favorite brands do not reach our market at all, going directly into the hands of consumers from the refining works in the heart of the greatest copper manufacturing district in Connecticut. The quantity presumably is small, however.

England unfortunately shows increased signs of weakness, the latest cables to-day placing it at £53 10s. against £56 17s. 6d. for Chili Bars last week. How far it is a movement to force our Lake producer to consent to sell at a low figure remains to be seen. It is hinted, also, that it is an organized attempt to squeeze a large speculator in London.

Lead.—The position of this metal has again changed. Early in the week, speculative purchases, aggregating about 500 tons, were made at about 3-75c. and since the metal has been advanced by holders to 4c. It is not likely that much is obtainable at that figure, though probably the odd lots that always make their appearance on a rising market

will turn up. It appears that when, some weeks since, lead was so suddenly advanced, Western corrodors made an agreement to keep out of the market. When figures dropped down again, the corrodors began to show a disposition to buy, but found the stray lots picked up and holders firm. How much the latter may be forced to buy in of the available stock remains to be seen. Consumers in the East are pretty well supplied, and will probably show no eagerness to aid in driving up prices. We repeat what we said at the time of the former rise. The market is capable of being manipulated, especially at such a quiet season in manufacturing as this is; but the general situation is against the maintenance of high figures.

The Utah freight war has been patched up as expected, and rates on base bullion from Salt Lake City to Missouri River points have been advanced from \$5 to \$18. On a production of 80 tons per day, this means an addition to the costs of Utah producers of \$1200 per day.

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

It appears to be generally conceded that the market has touched bottom. Sales during the early part of the week were at 3-50c. for both Refined and Hard lead, but a speculative feeling manifested itself within the last two days. Holders, anticipating better prices, have withdrawn from the market at present, and refuse to make sales for future delivery at present quotations, and are holding higher. Stocks in hands of holders are but limited.

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

Our market is strong and higher through a speculative move. The price asked is 3-75c; but the best bids bring 3-65c. Consumers are very cautious.

London cables £11 2s. 6d. for soft Spanish.

Spelter.—The market is quiet and dull at 4¼@4½c. for Common Domestic. England cables £14 15s. for Silesian spelter.

Antimony.—This metal is firm at 11@11½c. for Hallett's, which is scarce, and 11½@12c. for Cookson's.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Feb. 8.

Mr. James M. Swanck has just in the *Bulletin* published final details of his statistics of the production and stocks of pig-iron by States. His totals are the same as those reprinted in our last week's issue. The following figures on the stocks of pig-iron in certain districts are of interest:

	Jan. 1, 1883.	July 1, 1883.	Jan. 1, 1884.
Pennsylvania.			
Lehigh Valley anthracite	24,969	53,509	50,600
Schuylkill Valley anthracite	24,029	41,897	25,448
Upper Susquehanna	11,173	9,484	8,839
Lower Susquehanna	7,935	15,325	14,324
Shenango Valley coke	22,045	28,397	27,195
Alleghany County coke	17,272	36,308	27,240
Miscellaneous coke	33,194	45,006	30,822
Charcoal	10,241	8,950	11,336
Hanging Rock coke	12,608	9,516	11,128
Mahoning Valley coke	24,672	20,264	19,307
Hocking Valley coke	6,109	8,300	5,153
Miscellaneous coke	15,540	10,073	12,327
Hanging Rock charcoal	27,483	21,206	24,236
Miscellaneous charcoal	828	280	985
Ohio.			

American Pig.—Business is quiet, some of the furnace companies, notably the Thomas Iron Company, having booked all the contracts required to keep the works running for a long time. At an early date, this company will have two more furnaces in blast. The Crane Iron Company is reported to have sold during the week several thousand tons at \$20 and \$21, and one lot of 1000 tons at \$22, for delivery toward the latter part of the year. For forge iron, the outlook is unfavorable, the action of the Glendon and Andover companies, referred to in our last issue, having produced a bad effect in spite of the special circumstances attending it. For Foundry iron, the Thomas Iron Company is now asking \$19.50 and \$20.50 respectively. Our quotations, however, remain unchanged, as follows:

Foundry, No. 1, \$20@22; No. 2, \$18.50@19.50; and Gray Forge, \$17.50@19. Bessemer pig is quiet at \$19.50@20, while 20 per cent Spiegel has been selling at \$25 ex ship.

At the Exchange, the following transactions were recorded:

200 tons American No. 1 Pig, March, \$20; 100 tons American No. 1 Pig, July, \$20.50; 200 tons American No. 1 Pig, April, \$20.12½; 200 tons American No. 1, May, \$20.25; 100 tons American No. 1 Pig, March, \$19.62½; 100 tons American No. 1 Pig, March,

\$19.50; 200 tons American No. 1 Pig, April, \$19.62½.

Scotch Pig.—The market is firm and quiet. Buyers still hesitate to pay the advance.

We quote ex ship and to arrive: Coltness, \$22.50@23; Langloan, \$22.50; Summerlee, \$21.50@22; Eglinton, \$20.50@21; and Dalmellington, \$20.50.

At the Exchange, the following cable quotations were received to-day, f. o. b. Glasgow: Coltness, 57s. 6d.; Langloan, 54s. 6d.; Summerlee, 52s. 6d.; Gartsherrie, 53s. At Ardrossan: Glengarnock, 52s. 6d.; Dalmellington, 48s. 6d.; Eglinton, 46s.; and Warrants, 42s. 8d.

Steel Rails.—The week has been a quiet one, with few transactions limited to small lots at \$24 at mill.

Old Material.—Nothing of any account has been done. We quote Ts nominally \$20@21.

Philadelphia, February 8.

[From our Special Correspondent.]

Pig-Iron.—There is less of uncertainty among consumers of pig-iron now than a month ago, as to the probable supply during the spring and summer, and the probable prices. The action of the Glendon and Andover people has had no effect upon others. One or two companies have been rather holding to firmer prices than otherwise. But this is due to the fact that they have pretty well disposed of their production for ninety days. The percentage of sold-up capacity is increasing. The offerings of stocks of iron on the market are decreasing. While there is no perceptible change in quotations or in selling prices, it may be said that prices have got into a rut where they will remain. The talk of a few furnaces starting in has nothing in it, as the furnaces that blow out will about offset the difference. A good many small lots of Foundry and Forge were sold this week, and two or three negotiations for large lots were brought to a close at \$18@18.50 delivered for Forge. Southern iron is all sold up, and more could be very readily disposed of. There was inquiry to-day and yesterday for some special brands, but makers report stocks not to be had for prompt delivery. It is not as easy to buy at concessions now as during January. Yet it would not be correct to say that there is any real advancing tendency.

Foreign Irons.—Some business has been done within a few days for forward delivery, at a little under \$20 for Bessemer. Several large lots of Spiegeleisen have been asked for, and the only figures made known are \$29 for small lots.

Muck Bars.—\$32 is to-day's inside asking price.

Blooms.—Inside quotations for last sales were \$55 for Charcoal and \$45.50 for Anthracite.

Manufactured Iron.—The movement in refined is about as reported last week. Business is transacted slowly at 1-90@2-05c., the latter being readily paid for two or three special makes. Common iron was sold this week as low as 1-65c., but average quotations are 1-70@1-85c., and there are prospects of from 300 to 500 tons being placed either this or next week, depending upon the acceptance of offers made. Buyers do a great deal of shopping around before placing orders.

Structural Iron.—One establishment in the interior of the State secured some orders for 1200 tons of the 2000-ton orders placed for cable roads. Another firm secured 300 tons. There are negotiations pending for large lots of bridge iron. During January, between 15,000 and 20,000 tons were ordered in this State. Prices are lower than usual. Common Plates have been shaded from 2-25c.; combination prices on Beams and Channels still hold.

Sheet-Iron.—Several good orders were secured this week, but at a strong shading below current rates.

Nails.—Nails are quoted at \$2.50@2.60. Buyers are waiting for lower prices.

Old Material.—Brokers here expect to close negotiations for some large lots for delivery in the interior, equal to \$22.75 here. Double Heads, \$1 higher. Crop-Ends, \$19.50.

Scrap Iron.—The yards hereabouts are pretty well stocked with scrap, but not much of it commands good prices. Best sales were at \$24 for No. 1 in small lots. Other material sold down to \$14, according to quality.

Pittsburg, February 7.

[From our Special Correspondent.]

Among the mills in Pittsburg which are closed are the Manchester Iron and Steel-Works, the Eagle Mills. The Anchor Mill is closed, all except the tack factory. The puddlers of Hussey, Howe & Co. are off. Lindsay

& McCutcheon are idle. Painters are on single-turn, six heats; Vulcan Iron-Works at Chartiers, single-turn, six heats.

The glass-workers will be at their pots in a few days. The Pittsburg Forge and Iron Company started double-turn. Foundry iron is selling at \$18@21, according to quality. A large amount of Gray Forge has sold at \$17@17.50, and some few lots below \$17. Several mills now on single-turn expect to start up double in two weeks, but their action will be determined by the course of trade. Inquiries for refined are backward, but the consumption is large, and buyers will have to place their requirements sooner or later. A few more orders for wrought pipe were secured this week. Crop-Ends are quoted at \$23. There is an active inquiry for old rails, and supply is away behind requirements. Merchant iron, 1-75@2c. The steel rail mills have inquiries for large blocks, but are quoting prices up. No. 1 Scrap, \$21.50; Borings, \$13; Turnings, \$16; Car-Wheels, \$18.

The nail manufacturers met to-day, but adjourned—no quorum—on account of flood, the damage of which can only be estimated. Good judges put it at \$5,000,000 loss. Business is prostrated. The water is higher than in the flood of 1832.

BULLION MARKET.

NEW YORK, Friday Evening, Feb. 8.

DATE	LONDON.		N. Y.		
	Pence.	Cents.	Pence.	Cents.	
Feb. 2	51	111½	Feb. 6	51	111½
4	51	*	7	51	111½
5	51	*	8	51	111½

* 111½@111½

BULLION PRODUCTION FOR 1883.

MINES.	States.	Month of December.		Year from Jan. 1st, 1883.
		\$	¢	
*Alice, g. s.	Mont.	139,880	1,154,920	
*Alta-Montana, g. l. s.	"		\$10,625	
*Belmont	"	4,543	23,012	
Bodie, g. s.	Cal.	21,153	246,820	
Rodie Tunnel, g.	"		51,742	
*Bonanza King, g.	"		426,907	
*Boston & Montana, g.	Mont.		140,323	
California, g.	Colo.	18,000	222,359	
*Central Arizona, s.	Ariz.		35,845	
*Christy, s.	Utah	25,713	262,313	
*Chrysolite, s. l.	Colo.	7,829	303,105	
*Consolidated Bobtail, g.	Colo.	10,341	116,229	
*Contention, s.	Ariz.	60,139	915,025	
Crecent, g. s. l.	Utah		206,498	
*Custer, g. s.	Idaho		43,572	
*Deadwood-Terra, g.	Dak.	48,826	480,358	
*Derbee Blue Gravel, g. s.	Cal.	19,304	147,323	
Dunkin, s. l.	Colo.		47,061	
*Eveing Star, s. l.	Dak.	25,724	350,961	
*Father de Smet, g.	Colo.		208,464	
Freeland, g. s. c.	Utah		77,084	
*Frisco M. and S. Co., g. s. l.	Mont.		323,523	
*Granite Mountain, s.	Colo.	10,570	129,398	
Gunnell, s.	S. C.	2,600	40,542	
*Halle, g.	Ariz.		45,342	
*Head Center Consolidated	Ariz.		89,108	
*Head Center and Tranquillity	Mont.	**	633,979	
*Hecla Consolidated, g. s. l.	Dak.	97,322	1,044,031	
*Homestake, g.	Mont.		82,000	
*Hope, s.	Utah	276,000	3,253,200	
Horn-Silver, s. l.	Ariz.	11,238	205,190	
*Howell S. and Mg. Co., g. s. l.	Cal.		150,642	
Idaho, g.	Nev.		33,611	
*Independence, g. s.	Colo.	122,088	1,481,462	
*Iron Silver, s. l.	Mex.		258,959	
*Jocuitita, s.	Nev.	2,260	24,965	
*Kentuck, g. s.	Mont.	114,688	1,288,323	
*Lexington, s.	Cal.	11,925	99,477	
*Little Pittsburg, g. s. l.	Nev.		74,622	
*Marguerite, g. s.	Colo.		136,317	
*Martin White, g. s.	Nev.		84,428	
*Morning Star, s. d.	Colo.		537,663	
Mount Diablo, g.	"	69,421	451,395	
*Navajo, g. s.	"	39,753	4,045	
*North Belle Isle	"	1,892	576,200	
Northern Belle, s.	Utah	6,693	2,195,835	
*Ontario, s. l.	N. S.		54,055	
*Oxford, g.	N. C.		21,009	
*Phoenix, g.	Ariz.		181,485	
*Pinal Consolidated, s. l.	Cal.	76,714	527,170	
*Plymouth Consolidated, g.	N. S.		2,500	
*Satemo, g.	Mont.		203,947	
*Silver Bow, g. s.	Colo.		972,567	
*Silver Cord, g. s. l.	Ariz.		600,000	
*Silver King, s.	Cal.	1,876	39,148	
*South Yuba, g.	Cal.	69,501	1,155,182	
Standard, g.	Nev.		27,095	
Star, s.	Utah		232,638	
*Stormont, s.	Cal.	15,131	92,040	
Syndicate, g.	Jtah	6,680	43,223	
Tintic M. and M. Co.	Ariz.		57,868	
*Tip Top, s.	"		785,391	
*Tombstone, g. s. l.	Colo.	42,017	98,000	
United Gregory, g.	Cal.		31,541	
Wyoming Consolidated	Nev.		265,885	
Yellow Jacket, s.				

Total amount of shipments to date.....\$24,202,938

* Official. † Net value. ‡ Assay value. § Not including value of lead. G. Gold. S. Silver. L. Lead. The dash (—) indicates that no shipments have been made in the month named. ** Silver valued at \$1.10 per ounce.

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 2-8), SALES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 2-8), SALES.

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 45,087. Non-dividend shares sold, 140,900.

BOSTON MINING STOCKS.

PHILADELPHIA MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 1-7), SALES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 1-7), SALES.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, advanced the bank's minimum rate of discount $\frac{1}{2}$ per cent, to $3\frac{1}{2}$ per cent. During the week, the bank lost £104,000 bullion, and the proportion of its reserve to its liabilities was reduced from 41 9-16 to $40\frac{1}{2}$ per cent, against $46\frac{1}{2}$ per cent at this date last year. The weekly statement of the Bank of France shows an increase of 14,187,000 francs gold, and an increase of 4,574,000 francs silver.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Feb. 8.

Anthracite.

The market is quiet and inclined to dullness. There are occasional orders for prompt delivery which fetch good figures; but on the whole, the tendency is in buyer's favor. There is considerable coal afloat in this harbor, which is placed with concessions, the basis being about \$4.30 for stove coal. The steam sizes are suffering from the competition of bituminous coal, which is selling at low figures and is crowding in at many points, notably in the East. If values of the best bituminous coals continue as low approximately even as they are now, the anthracite producers will have either to make very substantial reductions in the prices or will have to break the coal into smaller sizes and stand the waste that entails. Unless they take action in this matter soon, they will find one of their avenues of consumption closed against them.

In the East, trade is dull, very few orders coming from that quarter.

Bituminous.

The annual contest has begun, and from present indications, threatens to become much fiercer than ever before. The Cumberland producers are evidently determined not to be caught again as they were last year, and are scouring the market with exceptionally low offers. We know that transactions have been made on the basis of \$2.65 at Baltimore, and have heard rumors of offers as low as \$2.50 at that point. It hardly need be said that Clearfield operators are meeting these figures, and it is understood that in some minor contracts, already closed, they have come out victorious. Buyers are taking advantage of this state of affairs and holding off. They are allowing rival sellers to cut figures down. The confidence displayed by the shippers of both of the great regions is an eloquent proof that they expect to be helped through all right by their respective railroad companies, at whatever figure they close.

For years, the experience of the trade has been that the opening figures were the best in the year, and hence the eagerness to secure the largest possible share of the business. It may well be questioned whether history must in this case necessarily repeat itself. That there will be a much increased demand through the displacement of anthracite by bituminous coal, particularly in the East, there can be no doubt whatever. With one of the regions incapable of increasing its output, for the present, because of the fact that the railroad furnishing it an outlet is taxed to its utmost capacity, the increase must be met chiefly by the mines of the Cumberland District. It may be well doubted therefore whether the present scramble is wise.

Philadelphia. February 8.

[From our Special Correspondent.]

Representatives of the anthracite coal trade, in expressing their opinions to-day, said that there were no changes in the trade which called for public comment, but that there were several indications favorable to buyers and shippers, which would come to the surface in a few days. The half-time is strengthening the position of the coal companies. The talk of full-time does not emanate from very reliable sources. The general sentiment is in favor of a rigid adherence to the policy agreed upon, for more than one business reason. The three days' restriction amounts to two days only, practically, when the footings are made up. The capacity for mining in the Schuylkill region will be considerably increased this season, by the Reading Company, which is about closing its negotiations for its fourteenth colliery. The officials of that company stated to-day that the output for the year would be 12,000,000 tons, unless some unforeseen obstacle

should arise. It was rumored to-day that Vanderbilt has secured a controlling interest in the Delaware, Lackawanna & Western Railroad, but this rumor is not confirmed at the Reading office. It is impossible to say what policy will be pursued after April 1st. Those who are depending upon steamer coal are not well supplied, but those depending on other sources of supply have sufficient stocks. Inquiries from Western markets indicate that heavy orders may be expected from that quarter in a short time. A few large orders have been received, but the bulk of business is made up of small orders. The smaller sizes are moving freely, while the larger are dull. The local and line trades are strong and steady, even after several days of warm weather. Less coal is selling below circular rates than for several weeks, and some of the more hopeful managers look for a demand which will enable them to dispose of the entire output at circular rates, although this opinion is not shared by all. Much depends upon the course of Western buyers. The troublesome feature of individual competition, so far as it has exerted any influence upon the trade, will be wanting next year; all the available territory is being brought under control by purchase or lease. The outlook for an improvement in manufacturing demand is not very bright. The output of iron for January shows a decline as compared with that of December. A few mills have started up, but are only buying enough coal to last from week to week.

Some of the more sanguine operators express the opinion that, as soon as the freight rates are fixed, a larger amount of coal will be contracted for. But in a general way, the doleful accounts which have been so frequently published represent the condition of the bituminous coal trade this week. Efforts are making to widen the market for this coal.

There is a great deal of talk as to the probable effect of the Vanderbilt road. A large amount of money has been invested in coal lands along that line, and whatever else may result, speculation will have free play. But it is probable, according to the opinion of one or two long heads in the trade, that purchasers will pay taxes on these lands a long time before developing them. The coal territory of Central Pennsylvania is so far beyond the requirements of the present generation that parties who think it is only necessary to mine and ship coal, in order to find a market for it, will find themselves very much mistaken. But fortunately, the coal will not turn sour, if they do. The Pennsylvania, Vanderbilt's road, and Garrett's road are all interested in pushing short lines through the bituminous coal-fields of the middle and western part of the State, and there is no telling what the outcome will be.

Pittsburg. February 7.

[From our Special Correspondent.]

The coal trade at this point is, like the rest of Pittsburg's industries, about "drowned out" for the present. The mills and factories, three fourths of them at least, are under water, and could not use any coal, even if the railroads could ship it, which is impossible. The tracks and yards are flooded, the tunnels caved in, cars upset, tipples destroyed in some mines, and the whole coal trade, both supply and demand, completely demoralized, both as to the rail and the river interests.

And at the very height of this trouble, when the trade was dead and buried under millions of tons of water, the river miners met in convention here yesterday to talk over higher wages for mining! It was a veritable farce, whose details will be given in your exchanges. Secretary Flannery, of the Miners' Association, is a clever and intelligent Irishman. He issued the call for this convention. I asked him: "Do you issue such a call on authority of a majority of the pits, or not?" "Well," said Mr. Flannery, "we don't exactly do that, but we can generally tell what the men want, and we issue our calls for meetings based on that knowledge." In this instance, however, the call was one thing and the feeling of the miners another. The miners abandoned any idea they might have regarding higher wages for the spring run, and contented themselves with voting in favor of maintaining the present $3\frac{1}{2}$ cent rate. A plain case of leaving well enough alone.

On the other hand, an officer of one of the largest mining concerns on the Pan-Handle road said this to

me: "When it comes to a question of higher wages, it is as clear as daylight that spring rates must be lower than the present rates. I feel satisfied that, if the railroad operators of this district pay more than $2\frac{1}{2}$ cents for mining—or 3 cents at the outside—after April 1st next, they will, without exception, lose money, unless, indeed, there is an unlooked-for and almost miraculous revival in the trade, which none of us can reasonably expect."

The coke-controlling syndicate has gone to pieces. Lack of faith on the part of small operators killed the scheme which the big operators kindly placed on foot for the benefit of themselves in particular and the trade in general. The small fry are unkind enough to say that, if they could get the freight rebates accorded the few big firms, they wouldn't mind the low prices of coke, and that anyhow they won't go into any plan of salvation proposed by the thousand-oven chaps. Prices in coke are wholly unchanged, as is also the demand. The former remain at \$1@\$.25 according to the nature of the order; \$1.75 for crushed.

River trade is, as I have intimated, dead. The water to-day is higher than for fifty-two years, and not a pick is working in a river pit. Since my last, a million bushels—38,000 tons—of coal departed on the river, leaving probably that much afloat, and which will go out when the water recedes sufficiently.

The outlook for the trade is hardly a reassuring one. Pittsburg's rival districts, the Hocking Valley and adjacent regions in Ohio, will reduce wages March 1st, in pursuance of resolutions adopted at Columbus, January 25th, by the operators. This, if successful, must give the operators there additional advantages over those of Pittsburg, and divert orders from this point.

Buffalo. February 7.

[From our Special Correspondent.]

The past week was without incidents worth noting in the anthracite coal trade. In bituminous coal, business is called "passive," prices continue to rule very low, and many factories are working short time, causing a lessened demand. The trouble with prices is, that during the strike last fall in the low-grade coal district, other coals were brought here from new points to make up the deficiency from the usual sources of supply. Since the termination of the strike, these new coals are on the market, and the agents for them are struggling to maintain the little footing they have here, and the result, of course, is a surplus and very low prices.

It is reported that the meeting held in New York to consolidate and harmonize the conflicting interests in the soft coal trade, turned out barren of the results anticipated. The affair is virtually a failure. The meeting proposed to be held on the 8th instant is postponed *sine die*. The Rochester & Pittsburg Railroad folks will not join in the scheme, for reasons which they consider good and sufficient. So the mountain has been in labor and has not even produced a mouse! only a good-sized muss!

The coke trade was also without new features; a fair demand and low prices ruled.

Now for a few items. The receipts by the Lake Shore & Michigan Southern Railroad for January were 5568 tons; 3334 tons for Buffalo, and 2234 tons for through shipment.

One of the new screw-lever side-dump coal cars was on exhibition last week.

On good authority, the statement is made that the New York, Lake Erie & Western Railroad is about to reopen all its coal mines. I have some doubts in the matter, but time will show.

A Chamber of Commerce has been organized at Duluth, Minn. The principal object at present is to endeavor to obtain increased harbor facilities and the improvement of navigation at that point.

It is said that the Lackawanna will store but little coal here this winter, as it expects to have ample facilities for transportation for all the supply required when navigation opens.

The Lehigh Valley is stocking up, and knowing ones say that it will have 200,000 tons of coal ready for shipment when the season begins.

By the bye, if the plan proposed by the representatives of the bituminous coal interests at the New York meeting had been carried out, its practical working would have been the same as the anthracite coal producers, namely, suspend production when accumulation of stocks required such action, and the

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