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WE are informed that Prof. ALVIN WEISBACH, of the Freiberg School of Mines, will visit this country this summer.

MESSRS. TAYLOR & BRUNTON, mining engineers, have opened an office in Denver, Colorado.

WE have repeated inquiries from correspondents concerning the market value of bismuth, the quantities used in the arts, etc. We should be pleased to obtain any data which might lead to the development of an industry as yet neglected in this country.

PROSPECTS of Tombstone are painted in black colors just now that an effort is making to reduce miners' wages from \$4 to \$3 per day. The Grand Central Company has closed down because it has been losing money since the beginning of the year, and the Tombstone Company sees no chance of making a profit unless the cost of labor is reduced. The men have organized a Miners' Union, and for the time being show a disposition to hold out.

SWEEPING changes in methods in the metallurgy of zinc are of such rare occurrence that they deserve to be recorded specially. Works have

been built in Silesia by the Konig & Laura Company to make sulphuric acid from Spanish pyrites, and use the acid thus produced to extract zinc from low-grade ores too poor to work by ordinary processes. From the solution, the zinc is to be precipitated by a 500 horse-power Siemens dynamo machine.

THE simple expedient that our correspondent G. A. F. recommends in a letter published elsewhere is one of those little knacks that may mar or make an undertaking. We have no doubt that the conversion of an iron amalgamating-pan into what might be styled an improved arrastra may, in many remote localities, where iron is expensive, save very materially in the cost of milling ores. We need hardly add that hints of this kind are extremely valuable, and that we shall always be pleased to make room for them.

FROM North Carolina come reports that are likely to be of the greatest value to the agricultural interests of that State. According to the report recently issued by Dr. CHARLES W. DABNEY, Jr., Director of the Agricultural Experiment Station at Raleigh, phosphate rock has been found in larger or smaller quantities in Sampson, Duplin, Onslow, Pender, New Hanover, Bladen, Columbus, and Brunswick counties, the first two thus far showing the largest deposits. Dr. DABNEY states that the phosphatic rock is found in two different relations in this field, the lower country yielding worn nodules imbedded in comminuted shells, forming a conglomerate; while in the upper country it is found in larger nodules, cakes, or slabs imbedded in sand. In the former district, the conglomerate crops out in places, while in other localities it is covered by limestone, the thickness of the phosphatic bed reaching four feet. Analysis of samples of the nodules yielded from 14 to 42 per cent of phosphate of lime, equivalent to about from 6.25 to 19.25 per cent of phosphoric acid. It has been suggested that a good plan to treat the conglomerate rock would be to burn it, so as to slack the lime and thus reduce it to powder, while the nodules remain comparatively unaffected, so that they can be screened out. In the up-country, embracing Sampson, Duplin, and Onslow counties, the rock, which occurs in a horizontal bed from 6 to 20 inches thick, is covered by marl and sand sometimes to the depth of 20 feet. This rock yields, according to a number of analyses made, from 32.5 to 50.5 per cent of phosphate of lime. From a test pit near Warsaw, three quarters of a mile from the railroad, 46 tons of workable phosphate, running nearly 40 per cent, were taken from 0.11 acre, or at the rate of 418 tons an acre, at a cost of only \$3 a ton on cars, in spite of necessarily crude arrangements. A portion of the rock was experimented with at the works of the Navasse Guano Company, and it was found that 1000-pound charges required only from 600 to 650 pounds of acid, as compared with 900 pounds for South Carolina phosphate, the product containing from 10.78 to 11.63 per cent of soluble phosphoric acid, from none to 0.67 per cent of reverted phosphoric acid, and up to 1.35 per cent of insoluble phosphoric acid. The crude rock treated was not even thoroughly treated. These results are certainly very gratifying, and give promise of the development of an industry very important to North Carolina, and are highly creditable to the vigilance and enterprise of those in charge of the Experiment Station.

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.]

Granite Blocks in Amalgamating-Pans.

EDITOR ENGINEERING AND MINING JOURNAL:
SIR: Having for years past been a close observer of the various amalgamating appliances that have been patented and tested to sink into oblivion without a single one fulfilling the requirements, allow me to give your many readers the result of a forced experiment in this line some years since. Two of us got an old rattle-trap mill with both gold and silver tailings to work on percentage. Having little means, we found ourselves with worn-out shoes and dies for our pans. We tried in vain to get some, but failed. I next decided on dressing out granite three inches thick, and using them arrastra fashion, instead of iron. The stones were uneven, and our first day's run was any thing but a success. The second, however, when the granite slabs began to get properly together, told quite a different story, and the same gold rock that yielded but three dollars a ton in an iron pan gave us eight between the rocks. With the silver ores, we had equally good success. For years, I have been hunting abandoned or idle mills, and have got remunerative results where others have failed. I carry a diamond saw, and when a bargain is struck with a mill-owner to run his tailings, I quietly hunt suitable boulders, saw them into slabs, and substitute them for iron. They are more durable than iron, cost usually about one third, and can be had at all places and all times of the year. By putting in a bottom of the cut rocks with Portland cement, the granite will wear to a mere shell without breaking. Where gold ores are contaminated with lead as sulphides, chlorides, etc., this simple appliance gives excellent results, working fully as close to assay as a well-regulated and managed arrastra. I have no doubt that others have experimented in this line; but the simplicity of the improvement is the cause of its being overlooked.

Respectfully, G. A. F.

THE LATERAL SECRETION THEORY OF ORE-DEPOSITS.

Written for the Engineering and Mining Journal by Dr. M. E. Wadsworth.

The recent publication in the ENGINEERING AND MINING JOURNAL (vol. xxxvii., pp. 186-193, 218-219 232-233) of the interesting chapter of Professor Sandberger's work relating to mineral veins has served to call renewed attention, on the part of American mining men, to the theories of ore-deposits. The theory of lateral secretion (infiltration, segregation, and impregnation), so strongly advocated by him, is very old, and has been a favorite theory among American writers on the subject of mineral veins, appearing even in the older text-books, like Whitney's *Metallic Wealth of the United States*, 1854, pp. 62-68, and Dana's *Manual of Geology* 1863, pp. 712-714. This theory appears to have a direct connection with many other forms of ore-deposits besides true fissure-veins, and to follow from a wide-spread cause, intimately interwoven with the history of the rocks of this globe. It is proposed here to point out this cause and its relation to ore-deposits, and to call attention to the uncertainty of conclusions drawn from the analysis of the wall-rock and its contained minerals. In order to do this, it is necessary to present a brief but comprehensive view of the entire field.

Without entering at all upon the question of the source of those rocks that have come from below the earth's surface, which are known as eruptive rocks, and which form a large portion of the so-called metamorphic rocks, it is sufficient for the present purpose to state that, when they reach the exterior of the earth, their condition is one not adapted to the circumstances in which they are hereafter to exist. For a time, at least, prior to their eruption, they have been subjected to far different conditions from the atmospheric ones on the earth's surface; and of necessity there will be a constant tendency on their part to conform to these changed conditions. This is manifested most conspicuously by their loss of heat and their passage from a pasty liquid to a solid condition. When solid, it may be said that these rocks are in an unstable condition, not only in their temperature, but also in the chemical combinations formed on solidification. Their chemical arrangements, as manifested in their constituent glass and minerals, require a transference to a condition in which they shall be less acted upon by the agencies to which they are then exposed, and this leads to a degradation, dissipation, and loss of energy on their part. In other words, the rocks pass from an unstable toward a more stable state in the conditions to which they are now subjected. The rapidity of these changes naturally depends on the special circumstances in which the rocks are placed, and upon their chemical constitution. In the basic rocks, or those containing much iron, magnesium, calcium, aluminium, etc., the alterations are comparatively rapid, but in the acidic rocks much slower. If rocks of eruptive origin are studied under the microscope, these alterations can be readily traced from their beginnings to the extreme changes, which are usually found to be proportional to their age or some special condition. It is these alterations that have led to the multiplicity of rock names and the confusion of nomenclature, lithologists and geologists generally proceeding on the supposition that as a rock now is, so it was, and always will be. For example, the lava-flows of Keweenaw Point, which were once identical with the modern basaltic lavas of Mount Etna and Mount Kilauea, are, on account of their alteration and age, variously known as melaphyrs, diabases, diorites, etc.; andesite, in its changed guise, is designated as propylite, diabase-porphyrite, porphyrite, diorite, etc.; rhyolite appears as felsite, quartz porphyry, petrosilex, orthofelsite, etc.; peridotites, or olivine rocks, as serpentine, talc schist, etc. The propylite of the Comstock lode is a striking example. In 1879, the present writer called attention to the fact that the fortieth parallel propylites and those collected by Richthofen in the Washoe District and about Silver Mountain were altered forms of pre-Tertiary and Tertiary andesites.* This view has been fully confirmed by Dr. George F. Becker for the fortieth parallel propylites, although he uses the terms diorite porphyry and diabase for the pre-Tertiary forms of andesite.† Dr. Becker further states that every rock in the district has been taken for propylite when decomposed.

The before-mentioned changes or alterations appear to be largely dependent on the action of infiltrating waters; and the rapidity proportionate to their temperature in rocks of the same composition. These alterations appear to consist in general of molecular transferences or chemical reactions in the rock mass as a whole, and are not confined to special minerals; hence has resulted the general failure of theories of pseudomorphism to explain rock metamorphism or alteration, the pseudomorphic changes being, in the rock, but the resulting accident of the greater and more general metamorphosis. In the process of alteration, the original glass of the rock is broken up, forming various minerals according to its composition, and the original crystallized minerals are altered to a greater or less degree; the whole resulting in the formation of quartz, various ores, anhydrous and hydrous silicates, carbonates, etc. In the course of these changes, there is everywhere seen a tendency to localize these secondary products, especially the ores. This is apparently produced by the removal of material of one kind and the deposition of another in the same place, or by the filling of fissures and cavities in the rock. It is not uncommon in rocks to obtain minute veins that, under the microscope, show variation in their filling material as they cut through different minerals. That which has been above described as taking place in one rock takes place in all, and frequently with various interchanges and reactions between different associated rocks. If, instead of minute fissures to be filled and the alterations observed under the microscope, we gradually pass to those visible to the unaided eye, and so on to the joint or fault-planes affecting large masses of rock, to cavities, or to any condition of rock structure that will admit of the deposition of mineral matter, then, whether we have ore-deposits or not, seems to depend upon the activity of the alteration and upon the amount and kind of matter stored. From this it follows, as is well known, that valuable ore-deposits are more apt to occur in regions of eruptive and altered rocks. From the above-described process of the general alteration of rock masses and the partial localization of their contained mineral matter by percolating waters, would appear to arise a large proportion of the ore-deposits found in veins, segregations, and impregnations.

Again, instead of the mineral matter taken up by the percolating waters being deposited in the rock again or in contiguous cavities, it may be borne far away, appearing in spring, river, lake, and ocean waters, and in deposits laid down in them, precipitation taking place wherever the proper conditions occur. If we start, as all geologists do, in the belief in an originally hot fluid globe, all rocks must have been derived primarily from that fluid material. The detrital rocks would naturally partake of the characters and changes of the rocks from which their material came; while in the chemically and organically formed rocks, agencies for the precipitation of useful ores throughout their mass, to be later gathered up by the percolating waters, can be readily suggested in accordance with their special conditions of formation.*

In order to draw any conclusions regarding the reliability of deductions concerning the source of the ore, based on the analysis of the minerals in the country-rock adjacent to an ore-deposit, it is necessary to look into the question of the origin of these minerals. It has been found that, if the point of consolidation of rocks be taken as the datum point, their minerals naturally fall into three classes: 1st. Those of prior origin—foreign. 2d. Those produced by the solidification (crystallization)—indigenous. 3d. Those produced later by alterations in the rock mass or by infiltration—alteration or secondary.† The first class may be conveniently separated into two divisions:

1. The minerals that are characteristic of the rock, whatever may be its locality or age.
2. Those that are accidental, as, for instance, fragments caught up during the passage through or over another rock.

Any rock may have in it all three classes, or only one or two, as the case may be. For illustration, some minerals may be cited. Olivine in the peridotites is an indigenous mineral, but in basalts is foreign, although generally characteristic of them. Serpentine, when not an infiltration or veinstone product, is always a secondary or alteration one. Hornblende, in the recent andesites, is foreign, but in the older forms, and in almost all the older rocks of every kind, it is either a secondary product or is a more or less altered mineral. The micas and feldspars occur as foreign, indigenous, and secondary products, as does quartz. This mineral, as a rule, in the modern rhyolites is foreign, but in the older rocks of this type—felsites and quartz porphyries—it is both foreign and secondary. All hydrous oxides and silicates and carbonates also appear to be alteration products. As a rule, the different modes of occurrence of these minerals may be readily distinguished from one another under the microscope, by their characters and their relations to the rock mass.

Further, it may be pointed out that olivine, except in the more recent rocks, is found, as a rule, to be more or less altered to or replaced by serpentine, quartz, iron ores, carbonates, etc.; augite, by hornblende, biotite, chlorite, epidote, etc.; and the feldspars by quartz, kaolin, mica-cous and chloritic minerals, etc.

These changes are so common that it is rare to find original minerals in the older rocks that remain unchanged. Again, almost every mineral in rocks is found to contain more or less inclusions of other minerals, glass, liquids, and gases, thus vitiating conclusions drawn from their chemical analysis.

Since ore-deposits in general are associated with altered or metamorphosed rocks, and in regions in which thermal waters have been active, the country-rock would naturally be more or less changed, and sometimes completely decomposed. In the process of the formation of the ore-deposit, it may occur that the ore material will be entirely removed from the adjacent rock, or this may have deposited in it ores that never existed there before; or again, the ore material may have been brought from a distance by the percolating waters.

From the above, it follows that chemical analyses alone, either of the country-rock or of its inclosed minerals, lead to unreliable conclusions as to the source of the ores, and to build any theory upon such analyses appears to be an unphilosophical procedure. If any accurate deductions are to be drawn regarding the original source of the ores by chemical analysis, it seems necessary that we should select those rocks and minerals that are known to be fresh, unaltered, and free from any foreign inclusions that would influence the result. Such material could only be obtained from recent lava-flows, recently formed limestones, etc.; for no rock that has been exposed for a considerable length of time to the earth's meteoric agencies can, in the writer's opinion, be said to be in its pristine condition. Most analyses of such rocks now published have dealt too little in tests for minute quantities of such material as comprise the more valuable ore-deposits to permit any general conclusions to be drawn at present. The nearest approach we have is in the meteorites, which, in composition and structure, are closely allied to certain classes of terrestrial basic rocks,‡ and which are unaltered. These are found to contain copper, tin, nickel, cobalt, arsenic, zinc, manganese, chromium, and graphite.

While it would appear probable that the elements of the useful ores were often originally disseminated through the rocks with which they are associated, and later concentrated through the agency of percolating waters, proof that this view is correct is yet wanting; and the theory rests mainly on the observed structure of the ore-deposits, their associations, and the alteration of the adjacent rocks.

Of all theories that have been proposed to account for ore-deposits, there are but few that are not correct for some form of deposit in some localities, and the practical use of these theories is to aid in our understanding the nature of the deposits, as a guide in their exploitation. The difficulty in the use of theories lies in their abuse, through their indiscriminate application to all deposits. The rule ought to be, to study every deposit thoroughly, and after that study, not before, apply that theory which best answers to the observed conditions; since all theories ought to be mere generalizations or expositions of observed facts, with a prophecy for the future.

It is not doubted here that all ore-deposits not of a mechanical or eruptive origin may be attributed to the general alteration and change in rocks, resulting from the general dissipation and degradation of the potential energy of the constituents of the earth's crust in the universal passage of matter from an active state toward a passive and inert condi-

* Bulletin Museum Comparative Zoology, 1879, v., 281, 285, 286.

† Geology of the Comstock Lode and Washoe District, 1882, pp. 12-150.

* The Nation, 1884, xxxviii., 123.

† Bulletin Museum Comparative Zoology, 1879, v., 277, 278.

‡ Science, 1883, I., 127-130.

tion. This general alteration manifests itself in a universal chemical or molecular transference—a transference of substance—leading to the segregation or localization of the ores in the places in which they are now found; and expresses itself in the deposition of mineral matter in veins and cavities, in the body of the rocks themselves, in deposits from springs, bogs, lakes, etc. From the above, it would follow that all ore-deposits not eruptive are superficial phenomena as regards the earth, and dependent on its external agencies; although they may be deep enough, so far as man is concerned. Again, none of these ore-deposits would naturally be expected, except in regions in which percolating waters and their resulting metamorphism have been efficient agents;* while the various forms of ore-deposits should be expected to be associated, and to grade into one another.

MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASS., May 6.

NEW PUBLICATIONS.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. [No. 2, 1883.] London and New York: E. & F. N. Spon. 1883. 8vo, pages xii + 888 + lxiv.

This, the latest volume of the Iron and Steel Institute published, contains the papers by Mr. R. Dixon, on the Simon-Carvès coking system at Pease's West Collieries, Durham; by J. Jameson, on the Jameson coking system for the recovery of waste products; by R. M. Daelen, on hydraulic cranes for Bessemer works; by T. Wrightson, of Stockton, on a center crane for steel-works; by E. A. Cowper, on recent improvements in his hot-blast stove; and by R. Howson, of Middlesborough-on-Tees, on blast-furnace economy in relation to design. This section requires no comment. The papers, which we referred to at length at the time they were brought forward, are fully up to the average of the contributions that have long ago carried the Institute to the leading place it now occupies among technical societies. The second section, which Mr. J. S. Jeans, the secretary, entitles "a report on the figures of the iron and steel industries in 1883," is a repetition of similar work of former years, with this difference, that it has been greatly improved. Formerly Mr. Jeans's technical abstracts were decidedly poor; they bristled with errors, and showed a lack of judgment and of familiarity with technical questions that was distressing. We are glad, therefore, to be able to state that Mr. Jeans is doing much better, and we are pleased to notice that he is now doing some original work, and is doing it well, and is giving proof of some discrimination in the use of his scissors. The report is also more carefully edited, although occasionally minor errors will crop up; thus, on page 744, in summarizing the paper on "blast-furnace chills," he has Mr. Howe's name H. M. Home, and on page 761 he puts down the Midvale Steel-Works as being at Ricetown, instead of Nicetown, Pa. On the whole, the report is creditable, and gives promise that in the early future it will reach the high standard that it should attain in the publications of so great a society as the Iron and Steel Institute.

THE HOME AND FOREIGN IRON AND STEEL INDUSTRIES IN 1883. Annual Statistical Report of the Secretary to the Members of the British Iron Trade Association. By J. S. JEANS, Secretary. London: E. & F. N. Spon, and British Iron Trade Association. 1884. 8vo, pages iv + 157.

Mr. J. S. Jeans, who is at the same time Secretary of the British Iron Trade Association and of the Iron and Steel Institute of Great Britain, is certainly a very industrious person; but his work, we regret to say, bears the stamp of having been compiled in a hurry. He does not command that implicit confidence in the accuracy of his data that gives a statistician standing and causes his figures to be accepted without a doubt. The impossibility of going behind the returns, in which a vast amount of detail work is represented by one figure the correctness of which no one is able to check, makes any obvious errors fatal. The book before us gives evidence of incompleteness and inaccuracy that do not speak well for the data which the general public can not verify. Professor Schaeffer has pointed out the gross error in Mr. Jeans's table of the world's production of Bessemer steel, which is given a place in the volume before us; and in his table of the production of pig-iron in the principal producing countries from 1854 to 1883, we note with surprise that Mr. Jeans has not even reduced the figures to a common standard; the English production is given in gross tons, the output of the United States in net tons, and the yield of Prussia, France, Belgium, Sweden, and Austria in metric tons. Does Mr. Jeans expect those of his readers who are sufficiently interested to do the work of converting his returns into gross, net, or metric tons uniformly, when they want to institute a comparison? So much for Mr. Jeans's methods, which, to say the least, reflect unfavorably on his standing as a statistician.

In the first 125 pages of his book Mr. Jeans gives the statistics of the production and imports of iron ore, the output and stocks of pig-iron, the statistics of the manufactured iron, Bessemer, and open-hearth steel, and tin-plate industries. He presents returns of the exports and imports of iron and steel, and gives the statistics of iron and steel shipbuilding. He presents a review of the progress in railroad building, reproduces the official returns of the output of the collieries, and then gives a summary of the iron statistics of foreign countries. In a separate chapter, he reviews the returns of the English census on labor in iron and steel-works, justly deploring the fact that the classification upon which it is based is vague and incomplete.

OIL-GAS FROM LIGNITE.—At a recent meeting of the Rheinlands and Westphalian gas and water engineers in Cologne, Herr Krakow, of Coblenz, contributed an interesting paper on the production of oil-gas from lignite, an industry which has sprung up in Germany within the last ten years. Oil so produced is said to have an advantage over that obtained from petroleum residuals, inasmuch as it remains in a fluid condition at a much lower temperature, and is, moreover, less variable in price. If the best quality of lignite is used, from 1836 to 1907 cubic feet of oil-gas can be obtained per 220 pounds of coal, at a retort temperature of from 900 to 1000 degrees, and, as Herr Krakow maintained, the lighting power of the new agent is four or five times greater than that of ordinary bituminous coal-gas.

* Whitney, Contributions to American Geology, 1880, vol. 1., the Auriferous Gravels of the Sierra Nevada of California, pp. 310, 331, 350-356.

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

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

By C. A. Stetefeldt, New York City.†

§ 17. The Effect of Extra-Solution on Roasted Silver Ores.

We now arrive at the most important part of the experiments, so far as their practical value is concerned, namely, the effect of the extra-solution in extracting silver from roasted ores. Since March, 1882, Mr. Russell has made daily all chlorination tests (they should be more properly called lixiviation tests) of the Ontario mill-samples both with the ordinary and the extra-solution, and compared the results with those obtained by amalgamation.

The Method used in Making the Lixiviation Tests.—Mr. Russell states: "The amount of ore used is $\frac{1}{2}$ assay ton. To this, in a beaker-glass, are added 25 gm. $\text{Na}_2\text{S}_2\text{O}_8 + 5\text{aq.}$, and 5 gm. $\text{CuSO}_4 + 5\text{aq.}$, previously dissolved in water. The whole is then diluted to 500 c.c. with cold water, and heated on a sand-bath to 50 degrees C. After one hour, the residue is filtered off, dried, assayed, and the percentage of silver lixiviated is calculated. This constitutes my new method of lixiviation assay. Along with these, I always make assays by the old method, that is, with ordinary hyposulphite solution. I have found that a longer time of exposure than one hour does not produce materially differing results.

It may be asked why the standard extra-solution is not used for these tests. The reason is, that silver chloride is more easily dissolved in ordinary solution, and that only a small percentage of silver is present in another form, and requires the cuprous hyposulphite for its solution.

Lixiviation Tests at the Ontario Mill.—The ore is roasted with salt, in two Stetefeldt furnaces, each having a capacity of 30 tons in twenty-four hours. After discharging the ore from the furnaces, it is piled up on the cooling-floor, and left for twelve hours undisturbed. It is then cooled with a spray of water, and loaded into cars for charging the pans. From these cars, the samples are taken to which reference is made below. The percentage of silver extracted from the roasted ore by amalgamation is calculated from the silver remaining in the tailings, by comparing their value with the value of the roasted ore after leaching out its soluble salts with water.

MONTHLY AVERAGES OF LIXIVIATION TESTS, AND PERCENTAGE OF SILVER EXTRACTED BY AMALGAMATION AT THE ONTARIO MILL.

Samples taken :	Lixiviation test with :		Silver extracted by amalgamation. Per cent.
	Ordinary solution. Per cent.	Extra-solution. Per cent.	
March, 1882.....	84.6	92.0	89.6
April, ".....	87.6	91.3	89.9
May, ".....	88.5	92.9	92.1
June, ".....	87.5	93.1	91.5
July, ".....	91.2	93.0	91.8
August, ".....	89.8	92.5	90.6
October, ".....	87.3	92.7	89.7
November, 1882.....	89.2	93.1	90.4
December, ".....	88.5	92.9	89.2
March, April, 1883.....	87.3	92.7	89.7
Averages.....	88.1	92.6	90.4
Differences.....		4.5	2.2

The Effect of the Extra-Solution on Ontario Ore, if not well Chloridized.

—Much more pronounced becomes the difference between the dissolving energy of the two solutions if ore is lixiviated which does not show a high chlorination by the ordinary method. Experience has established the fact that for Ontario ore, and all ores with a large percentage of sulphurets, especially zinc-blende, considerable time is required to complete the chlorination of the silver. This is effected by leaving the ore in a red-hot state for several hours. There are ores which do not necessarily require this treatment, but in all cases the effect is more or less beneficial. If samples of Ontario ore are taken immediately after a charge has been drawn from the furnace, the percentage of the silver chloridized is very low, especially if the ore has been roasted at a moderate temperature. The dust seems to make an exception to this rule, but, in fact, it does not, if we consider that it remains in the dust-chambers for a long time before it is discharged.

SAMPLES OF ONTARIO ORE LIXIVIATED IMMEDIATELY AFTER DISCHARGING FROM THE FURNACE.

From where discharged :	Lixiviation test with :		
	Ordinary solution. Per cent.	Extra solution. Per cent.	Differences. Per cent.
Shaft.....	60.7	86.1	25.4
Return-flue.....	61.8	84.2	22.4
Dust-chambers.....	90.7	93.3	2.6
Shaft.....	65.2	93.2	28.0
Return-flue.....	60.7	91.8	31.1
Dust-chambers.....	80.0	91.4	11.4
Shaft.....	60.5	90.0	29.5
Shaft.....	65.4	93.9	28.5

These results are very important. It is most likely that, by conducting the roasting process in a different manner from that now found most advantageous for amalgamation, still better results by lixiviation could be obtained than under present conditions.

Lixiviation Tests with Ore from the Bertrand Mine, Nevada.—The ore, which is not of high grade, is roasted in revolving cylinder-furnaces, a modification of the Bruckner furnace, for the purpose of lixiviation. The chlorinations, shortly after starting the mill, were very variable. For analysis of the ore, and working results, see Prof. T. Egleston's paper, "Leaching of Gold and Silver Ores in the West," Transactions of the Institute, 1883.

Ordinary solution. Per cent.	Lixiviation test made with :	
	Extra-solution. Per cent.	Difference. Per cent.
48.3	68.9	20.6
44.7	63.4	18.7
44.4	61.2	16.8
39.6	54.7	15.1
83.5	88.2	4.7
85.5	90.0	4.5
89.7	91.4	1.7

In 49 samples tested, the average difference was 10.1 per cent.

* Read at the Cincinnati Meeting of the American Institute of Mining Engineers, † in our issue of May 10th, page 350, first column, 23d line from bottom, read $\text{CuSO}_4 + 5\text{aq.} = 249.5$; and next line, read $\text{Na}_2\text{S}_2\text{O}_8 + 5\text{aq.} = 248$.

NAME OF MINE.	Process by which ores are worked at present.	Silver per ton of ore. Ounces.	Lixiviation-test with :		Difference.	Character of ore.
			Ordinary solution.	Extra-solution.		
Lexington, Montana.....	Roasting and amalgamation.	54.0	26.0 p. ct.	68.5 p. ct.	42.5 p. ct.	Native silver, silver-bearing pyrites of iron, zinc-blende, galena, pyrites of copper.
Manhattan, Nevada.....	Roasting and amalgamation.	164.8	8.3 p. ct.	57.2 p. ct.	48.9 p. ct.	
Ontario, Utah.....	Roasting and amalgamation.	90.8	7.0 p. ct.	31.9 p. ct.	24.9 p. ct.	Group of antimonial and arsenical sulphurets of silver, fahl-ore, zinc-blende, galena, pyrites of iron and copper.
Mount Cory, Nevada.....	Roasting and lixiviation.....	54.0	39.6 p. ct.	63.0 p. ct.	23.4 p. ct.	
Custer, Idaho.....	Roasting and amalgamation.	42.5	16.0 p. ct.	40.0 p. ct.	24.0 p. ct.	Fahl-ore, native silver, zinc-blende, not much pyrites of iron and copper, galena.
Ramshorn, Idaho.....	Smelting.....	30.8	27.8 p. ct.	72.8 p. ct.	45.0 p. ct.	
Jesus Maria, Parral, Mexico.....	Roasting and amalgamation, or lixiviation.....	89.6	34.4 p. ct.	50.5 p. ct.	16.1 p. ct.	The same minerals as in Ontario ore, but less base and somewhat decomposed.
Mines near Durango, Mexico.....	Patio process.....	71.2	16.0 p. ct.	54.5 p. ct.	38.5 p. ct.	
Bertrand, Nevada.....	Roasting and lixiviation.....	58.0	2.0 p. ct.	39.8 p. ct.	37.8 p. ct.	Primarily stephanite, pyrites of iron, etc.
Tombstone, Arizona.....	Raw amalg'n. Battery sands	14.8	16.9 p. ct.	51.4 p. ct.	34.5 p. ct.	
	Sands from tailings beds.....	32.8	8.0 p. ct.	65.3 p. ct.	57.3 p. ct.	Primarily iron carbonate, some lead minerals, pyrites of copper, copper-silver glance.
	Slimes from tailings beds.....	19.2	34.9 p. ct.	70.4 p. ct.	35.5 p. ct.	
Sierra Grande, New Mexico.....	Tailings from raw amalgamation, concentrated.....	24.0	8.0 p. ct.	11.8 p. ct.	3.8 p. ct.	Primarily pyrites of iron, some galena and zinc-blende, no precious silver mineral visible.
		52.8	70.5 p. ct.	81.1 p. ct.	10.6 p. ct.	
		9.2	60.9 p. ct.	70.0 p. ct.	9.1 p. ct.	Completely oxidized, no sulphurets visible. Below water-level, the ore contains galena. The oxidized ore most likely contains lead, sulphate, and carbonate.
		17.2	81.4 p. ct.	81.4 p. ct.	none.	
Sombra, Sonora, Mexico.....	?	86.4	75.0 p. ct.	84.0 p. ct.	9.0 p. ct.	Oxidized or free-milling ores, with more or less silver chloride and lead sulphate and carbonate.
Ore from dump of Chrysolite, Leadville, Colorado.....		8.0	24.0 p. ct.	40.0 p. ct.	16.0 p. ct.	

LIXIVIATION TESTS MADE WITH ROASTED ORES FROM VARIOUS MILLS.

Furnace used.	Name of mill.	Ordinary solution.	Extra-solution.	Difference.
Howell.....	Alice, Montana.....	90.0 p. ct.	93.7 p. ct.	3.7 p. ct.
Bruckner.....	Custer, Idaho.....	88.3 "	91.5 "	3.2 "
Stetefeldt.....	Lexington, Montana.....	92.4 "	93.6 "	1.2 "
Stetefeldt.....	Manhattan, Austin.....	94.1 "	94.6 "	0.5 "
Howell.....	Black Warrior, Arizona.....	94.0 "	95.2 "	1.2 "
Bruckner.....	Bertrand, Nevada, Mount Cory ore.....	89.5 "	95.1 "	5.6 "

It remains to be stated that the difference in the percentage of silver extracted by ordinary and extra-solution is dependent on various circumstances, namely :

- 1st. On the character of the ore.
- 2d. On the fineness to which the ore has been pulverized. The difference decreases with the fineness of the ore.
- 3d. On the method of roasting. The difference decreases if the roasted ore, after discharging it from furnaces working on the continuous principle, is left red-hot for several hours on the cooling-floor.
- 4th. On the percentage of salt used in roasting. The difference decreases by increasing the percentage of salt. Whenever the chlorination of the silver has been carried to a very high percentage, it is but natural that the results of lixiviation with the two solutions can not differ very much. Hence, it will be necessary to investigate in every special case how much profit can be derived from the use of the extra-solution.

In the examples given above, it should be considered that in all cases, except the last one, the ore had been crushed by stamps through a No. 30 or No. 40 screen for the purpose of amalgamation. Only in the last case, the ore was crushed by rolls and sifted through a No. 20 screen, and here we find the greatest difference in results.

Results with Tailings.—In a former paper, "On the Lexington Mill," I have drawn attention to the fact that the tailings resulting from the amalgamation of roasted silver ores carry a large percentage of their silver in a form soluble in ordinary hyposulphite solution. From such tailings, a much larger percentage of silver is extracted by extra-solution. I consider this of great importance for many localities where tailings have accumulated, which, heretofore, could not be worked with a profit.

LIXIVIATION TESTS MADE WITH TAILINGS FROM VARIOUS MILLS.

Name of mill.	Silver extracted by :		
	Ordinary solution. Per cent.	Extra-solution. Per cent.	Difference. Per cent.
Sierra Grande, New Mexico.....	61.1	70.2	9.1
Black Warrior, Arizona.....	57.5	62.5	5.0
Bertrand, Nevada.....	7.2	59.8	52.6
Raymond & Ely, Nevada.....	30.4	42.4	12.0
Custer, Idaho.....	17.0	31.0	14.0
Belmont, Nevada.....	22.8	28.0	5.2
Manhattan, Nevada.....	23.6	25.3	1.7

§ 18. The Reaction of Extra-Solution on Silver Minerals.

Most interesting are the results which Mr. Russell has obtained in lixiviating silver ores without previous roasting. Their importance can hardly be overestimated, since thereby an entirely new field is opened to the lixiviation process. It is most likely that in many cases, where raw amalgamation is practiced with profit, lixiviation can take its place. There is, however, one class of oxidized ores to which, it seems to me, the process can not be applied. If a considerable portion of the silver occurs with lead carbonate, the extra-solution will not extract this part of the silver on account of the insolubility of lead carbonate in hyposulphite solutions. This also seems to be the case with silver-bearing lead antimonate, judging from a sample from the Bertrand mine.

The ores in the tabulated statement below belong mostly to the so-called "base ores." Still the percentage of silver extracted is, in many cases, remarkably high.

From this table, it appears that, of the sulphurets ores, those are principally affected by extra-solution which carry the silver in the form of native silver, silver sulphuret, and the group of antimonial and arsenical sulphurets, like pyrrargyrite, stephanite, and polybasite. Being especially familiar with the ores from the Lexington, Manhattan, and Ontario mines, I think a comparison of results will be interesting. The Lexington ore is the basest of the three, and any one seeing this ore in bulk would not suppose that a lixiviation process could extract 68.5 per cent of its silver without roasting. Much of its silver occurs native and the principal portion of it is combined with iron pyrites as silver sulphide. Then comes the ore from the Manhattan mines. Native silver here is rare.

The principal silver-bearing minerals are ruby silver, stephanite, and polybasite. Ontario ore shows the lowest result. Native silver occurs, but to much less extent than at the Lexington. About 88 per cent of its silver is found as fahl-ore, and this mineral seems to be more refractory in contact with extra-solution.

The battery sample from Tombstone is of interest, because it shows that Russell's process will extract from such ores a higher percentage than raw amalgamation. In the last annual report of the Tombstone Mill and Mining Company, the yield of silver by raw amalgamation is given as 76 per cent of the assay value. From tests made with Tombstone and Sierra Grande tailings, it appears that most of the silver that escaped amalgamation can be extracted by lixiviation. Hence, a combination of both processes may be advantageous in some cases.

The ore-samples in the preceding table were all pulverized so as to pass either through a No. 30 or a No. 40 screen. The following figures show the influence of finer crushing :

SAMPLE OF OXIDIZED ORE FROM THE 200-FOOT LEVEL OF THE ONTARIO MINE. VALUE, 48.8 OUNCES SILVER PER TON.

Pulverized so as to pass. No. screen.	Lixiviation test with :	
	Ordinary solution. Per cent.	Extra-solution. Per cent.
20	50.0	60.0
30	50.0	65.2
40	52.0	65.6
50	52.5	68.4
60	53.3	67.0
70	54.0	74.8
80	55.0	75.5
90	55.0	75.5

Difference between No. 20 and No. 80 screens.... 5.0

SAMPLE OF OXIDIZED ORE FROM THE 400-FOOT LEVEL OF THE ONTARIO MINE. VALUE, 100 OUNCES SILVER PER TON.

Pulverized so as to pass. No. screen.	Lixiviation test with :	
	Ordinary solution. Per cent.	Extra-solution. Per cent.
40	48.4	72.4
50	46.6	74.6
60	48.0	75.4
70	55.0	78.0
80	55.2	78.4
90	55.2	79.8

Difference between No. 40 and No. 90 screens.... 8.8

SAMPLE OF ORE FROM THE YEDRAS MINE, MEXICO. VALUE, 33.6 OUNCES SILVER PER TON.

Pulverized so as to pass. No. screen.	Lixiviation test with :	
	Ordinary solution. Per cent.	Extra-solution. Per cent.
40	45.3	50.6
60	45.3	58.4
90	45.3	64.3

Difference between No. 40 and No. 90 screens.... none

These results show that very fine crushing is essential to extract a high percentage of the silver. The same is necessary in raw amalgamation with chemicals, where the ore is finely ground in the pan after a more or less coarse crushing in the battery. In both cases, the particles of the silver minerals, on account of their density, are not penetrated by the solution, and the reaction takes place on the surface only. It is quite different with roasted ores. Crushing through a No. 20 or No. 30 screen is, in most cases, sufficient for good roasting, whereby the particles of ore are left in a porous condition. It is well known that the expense and difficulty of crushing increase materially with the fineness. The same is the case with lixiviation considered from a mechanical stand-point. Hence, it may be, in most cases, more profitable to crush the ore as coarse as possible, and first roast it before extracting the silver by lixiviation. With well-appointed mechanical furnaces, of large capacity, the expense of roasting, so far as labor and fuel are concerned, is slight. The cost of the salt is, in chloridizing-roasting, generally the principal item of expense. That it is possible in some cases to save this, will be shown in the following paragraph.

§ 19. The Treatment of Silver Ores by Lixiviation after they have been Subjected to an "Oxidizing" Roasting.

Many of the Western silver mines in the United States carry oxidized or so-called "free ores," in their upper levels, which change, in depth, to sulphuret or "base ores." The free ores are, in most cases, reduced by raw amalgamation, while the base ores require chloridizing-roasting. One of the most notable examples—showing a very marked difference between the two classes of ore—was observed at the Ontario mine. In its upper levels, an exceedingly free-milling ore was found, which changed, in depth, to an unusually base ore. Before the mine had a mill of its own, the free ores were reduced at the McHenry and Marsac mills. In both cases, the ore was crushed wet by stamps, and amalgamated in pans by the Washoe process. From 13 to 18 per cent of the silver remained in the tailings, and besides, a considerable percentage of the silver accumulated in slimes. When the Ontario mill

was built, the mine still contained a considerable reserve of free-milling ore. But it was considered expedient to construct at once the whole battery of 40 stamps for dry crushing, and to connect 20 stamps only with a Stetefeldt furnace, for the reduction of the base ores, leaving the other 20 stamps for crushing the free ores, without roasting, so long as the supply should last. The crushing was done through a No. 40 screen. In panning a pulp-sample of the free ore, no sulphurets could be seen. It contained native silver, silver chloride, and silver-bearing lead sulphate and carbonate. A chlorination test with ordinary hypsulphite solution would not extract more than from 25 to 50 per cent of the silver. The results of amalgamation were somewhat better than those obtained previously by wet crushing, and loss of silver in slimes was avoided.

At that time, the "Kroencke" process attracted some attention on the Pacific coast, and I concluded to try it, in a modified form, in pan amalgamation, adopting the following *modus operandi* :

The pans were charged with so much salt that its weight amounted to 8 per cent of the ore, and the quantity of water reduced to a minimum, in order to get as concentrated a brine as possible. The addition of the quicksilver took place immediately after charging, together with so much granulated zinc (which had been previously amalgamated by bringing it in contact with quicksilver and dilute sulphuric acid) that its weight represented somewhat less than three tenths of the quantity of silver in a charge of 3000 pounds of ore. In this way, the pans were kept running, without grinding, for two hours, at a temperature of about from 70 to 80 degrees C. Then we added 4 pounds of copper sulphate to the charge, and amalgamated six hours longer. The results were most surprising, as will be seen below. We obtained bullion 980 fine, proving that only a part of the copper from the copper sulphate entered the amalgam. Another great advantage was shown, namely, that no solid amalgam adhered to the muller, or any part of the pan, but that it was completely discharged into the settler, thus doing away with the unhealthy cleaning of the pans from solid amalgam. Besides, the time of running the pans was reduced from twelve hours to eight hours.

RESULTS OF WORKING "FREE ORES" BY THE "KROENCKE" PROCESS AT THE ONTARIO MILL.

Month.	Ore. Ounces.	Tailings. Ounces.	Silver left in tail. Ings.	Per cent.
April, 1877.....	64.75	4.76	7.3	
May, 1877.....	74.32	5.65	7.6	
June, 1877.....	78.23	6.03	7.7	

The brilliant results so obtained induced me to make the following experiment: I roasted the base ore from the Ontario mine (its character is described in § 18) by simply oxidizing it, and then treated it by amalgamation in the same manner as the free ore. The results, however, did not show a higher yield of the silver than from 70 to 80 per cent, and as no saving in the cost of reduction could be effected by this process, further experiments were abandoned.

In view of the energetic reactions of Mr. Russell's extra-solution, I considered it of interest to carry out some experiments in the same direction, namely, to roast without salt, and then extract the silver by Russell's process. These experiments were, at first, made on a small scale only, that is, by roasting samples in a muffle.

The following table contains the results of Mr. Russell's whole series of experiments. In each case, a sample of 500 gm. was roasted :

Ore from	Temperature.	Time. Hours.	Per cent of silver extracted with :		Per cent of silver lost in roasting.
			Ordinary solution.	Extra-solution.	
Ontario mine.	Cherry-red.	1/2	31.1	55.8	2.2
		1	28.6	40.0	8.8
		1 1/2	19.3	28.9	10.4
		2	17.0	26.9	11.0
		2 1/2	17.3	23.0	13.4
Ontario mine.	Dark red.	1/2	44.2	64.5	0.7
		1	35.1	44.5	7.0
		1 1/2	31.0	34.8	7.1
		2	24.6	26.4	8.7
		2 1/2	23.8	26.8	8.3
Ramshorn mine.	Dark red.	1/2	13.4	17.4	2.3
		1	7.7	11.6	5.0
		1 1/2	7.0	7.6	5.3
		2	6.6	7.7	5.4
		2 1/2	3.9	5.5	5.8
Manhattan mine.	Dark red.	1/2	10.0	22.2	4.8
		1	5.0	18.1	6.5
		1 1/2	8.0	13.0	12.4
		2	2.6	...	13.0
		2 1/2	1.0	2.0	14.0
Lexington mine.	Dark red.	1/2	17.6	32.5	3.2
		1	6.2	12.0	3.7
		1 1/2	6.6	6.6	4.0
		2	1.2	4.7	4.3
		2 1/2	2.0	5.5	4.6
Bertrand mine.	Dark red.	1/2	1.0	6.0	From 4.3 to 5.7 per cent.
		1	...	3.7	
		1 1/2	...	...
		2	1.3	2.0	
		2 1/2	2.4	1.7	
Custer mine.	Dark red.	1/2	27.0	31.5	From 1 to 2.1 per cent.
		1	22.5	29.8	
		1 1/2	26.0	30.0	
		2	21.0	29.8	
		2 1/2	29.0	28.4	

(A description of the ores is given in § 18.)

In reviewing this table, it is, in the first place, evident that the ores become less fit for the lixiviation process the longer they have been roasted. The two Ontario samples, roasted at different temperatures, further show the injurious effect of high heat. If we compare the lixiviation tests in the above table with those in § 18, made with raw ore and extra-solution, we find that in all cases, excepting the Ontario ore, the roasting proved to be decidedly detrimental. Concerning the loss of silver experienced in muffle-roasting, Mr. Russell's figures are entirely in accordance with Plattner's observations on this subject. The loss of silver, other conditions being equal, is a function of temperature, time, and character of the ore. How very marked the influence of time is, these experiments plainly indicate. Hence, the instantaneous roasting, as it is done in a Stetefeldt furnace, must reduce that influence to a minimum.

In another series of experiments, Mr. Russell discovered a fact that is not stated by Plattner, namely, that in chloridizing-roasting the loss of silver is materially diminished by an increase of the percentage of salt mixed with the ore.

The curious fact, that in the oxidizing-roasting of silver ores, the percentage of silver extracted by hyposulphite solutions decreases the more the roasting is prolonged, led to the question: What will be the result if the roasting is done in the shortest possible time, namely, in a Stetefeldt furnace? This experiment was carried out by Mr. Russell at the Ontario mill. After cleaning out the chloridized ore from the hoppers of the shaft and flue, the feeding of the salt was suspended for two hours. Samples of raw ore, taken every half-hour from the feeder, showed the pulp to contain only a fraction of 1 per cent in salt, the latter being derived from pulp lodged in the troughs of the conveyor-screws. The roasting was conducted at a very high temperature, and with an abundant supply of air for oxidation. Samples of roasted ore were taken from the top of the pile in the shaft and flue, and lixiviated :

Sample from.	Silver extracted with :	
	Ordinary solution. Per cent.	Extra solution. Per cent.
Shaft.....	12.8	55.9
Shaft.....	19.0	58.6
Shaft.....	28.8	55.6
Flue.....	14.4	45.5
Flue.....	39.9	67.3
Flue.....	25.0	37.0

At the expiration of two hours, the ore was discharged from the shaft and flue, allowed to remain in a pile on the cooling-floor for twelve hours, and carefully sampled. Below are the results of lixiviation :

Silver extracted by lixiviation with :	Ore from :	
	Shaft. Per cent.	Flue. Per cent.
Water.....	17.5	4.9
Water and H ₂ SO ₄	16.3	5.2
Ordinary solution.....	86.0	62.4
Extra-solution.....	89.7	69.2

These results are so interesting and important, and so contrary to accepted metallurgical principles, that it was considered expedient to repeat the experiments.

(TO BE CONTINUED.)

SUMMARY OF IRON TRADE STATISTICS OF THE UNITED KINGDOM, ETC.

Mr. J. S. Jeans, Secretary of the British Iron Trade Association, has compiled the following summary for 1882 and 1883, with increase and decrease in the later year :

Description.	1882. Tons.	1883. Tons.	Increase or decrease. Tons.
Production of pig-iron.....	8,493,287	8,490,224	- 3,063
Stocks of pig-iron on December 31st.....	1,658,120	1,698,976	+ 40,856
Home consumption of pig-iron.....	8,632,655	8,449,368	- 203,287
Production of hematite iron.....	3,425,000	3,387,000	- 38,000
Spiegeleisen.....	194,125	208,445	+ 14,320
Puddled bar.....	2,841,534	2,730,504	- 111,030
Bessemer steel ingots.....	1,673,649	1,553,380	- 120,269
Bessemer steel rails.....	1,235,785	1,097,174	- 138,611
Open-hearth steel.....	436,000	455,500	+ 19,500
Coal in United Kingdom ..	156,499,977	163,737,327	+ 7,237,350
Ironstone returned to mine inspectors.....	11,505,447	11,495,401	- 10,046
Ship-building, tonnage constructed.....	1,240,824	1,329,604	+ 88,780
In course of construction at end of year.....	1,075,259	729,446	- 345,813
Exports of pig-iron from United Kingdom.....	1,758,072	1,564,137	- 193,935
Railroad iron.....	936,949	971,662	+ 34,713
Hoops, sheets, and plates.....	342,599	348,304	+ 5,805
Bars, angles, rods, etc.....	313,155	287,900	- 25,255
Tin-plates.....	262,039	269,367	+ 7,328
Wire.....	86,653	62,784	- 23,869
Steel, unwrought.....	172,329	73,056	- 99,273
Old iron.....	132,033	97,579	- 34,454
All other iron.....	328,262	355,868	+ 27,606
Total exports of iron and steel.....	4,353,552	4,044,273	- 309,279

A LARGE DIAMOND.—From the Cape diamond-fields, comes the report of the discovery of a very large diamond in the Debeers mine, belonging to the Victoria Diamond Mining Company. It was found at a depth of 300 feet, and weighs 301 1/4 carats, its size being that of an egg. When cut, it is estimated to weigh 160 carats. The Kohinor, which was cut twice, weighed 672 carats in the rough, and now weighs 106 carats. The color of the Debeers diamond is a pale yellow, and its value is placed at \$15,000.

THE WOOTTEN LOCOMOTIVE PATENT.—General Manager John E. Wootten, of the Philadelphia & Reading Railroad Company, who is the patentee of the Wootten dirt-burning locomotive, has sold his rights, says the Philadelphia Record, in the patent for a sum estimated between \$250,000 and \$300,000. The purchase was made by an association of railroad capitalists, who have formed a company, of which Mr. Joseph Wharton, President of the Wharton Switch Company, is the leading man. The purchasers will continue the manufacture of the locomotives under the title of the Wootten Locomotive Company. It is understood that Mr. Wootten will be represented in the company to the extent of about \$75,000 of its stock.

THE WALKER PULVERIZER.

In designing the pulverizer here illustrated, Messrs. Walker Brothers & Co., of Philadelphia, have kept in view simplicity, strength, and ease of renewal. How well these have been attained, may best be judged by a consideration of its construction. It is driven by two pulleys 8 inches diameter for a 6-inch belt. The shaft or spindle *S* is of cast-steel turned as nearly absolutely true as possible, and is gradually increased in diameter from the journals to the center, the object being to secure the greatest stiffness with the least friction in the journals. The arm *A*, which is tightly fitted and keyed on the shaft *S*, is of forged iron, turned and planed true all over, making both ends precisely alike in shape and size, thus securing a perfect running balance. The beaters *B*, *C*, on which nearly all the wear comes, are made of hardened cast-steel, and are bolted to the arm with countersunk bolts. When one end is worn, they are turned end for end, and worn again. The perforated linings or segments *C* are cast in white iron, and drop into place without fitting, being held in by the side-linings *D*, also of white iron, which are bolted to the case by countersunk bolts. This construction of the wearing parts makes them easily and cheaply renewable. The base and journal-boxes are cast in one piece, and made heavy to secure and maintain the alignment of the bearings. The journal-boxes are lined with babbitt-metal scraped to a true bearing, and have two modes of oiling—the one automatic, and the other positive, for use in case of the stoppage of the first.

The joint between the cap *E* and the base *J* is planed true, making a dust-tight joint. In opening the case, it is only necessary to slack four nuts and push the bolts to one side in the holes, which are slotted, when the cap may be easily raised, being hinged at *F* and counterweighted.

The action of the pulverizer is as follows: The ore is fed into the spout, shown by dotted lines near the middle of one side of the cap, and enters the case through the opening *O*, and falls to the bottom of the case, where it is struck by the rapidly moving beaters, and is, by reason of its own inertia, broken into powder. Any fragments that may escape the first blow strike against the linings only to fall and be again struck by the beaters. As fast as pulverized, the ore is carried by the current of air, generated by the motion of the arm, through the fine holes in the segments, and thence, by an annular space back of them, to the discharges *G* and the spout *H*, which is continued to an elevator, storage-bin, or what may best suit circumstances.

Being self-contained and well balanced, it does not need expensive foundations, but may be set on a wooden trestle simply rammed in the ground, or be bolted to a floor, according to convenience.

Its capacity and wear and tear will vary with the hardness and cleavage of the material. We are informed that on limestone it will pulverize 15 tons a day of ten hours, at an expense for wear of not over 15 cents a ton, this being an average for several months. On average quartz, it is claimed that it will do 12½ tons a day, at a cost of from 20 cents to 30 cents a ton, making the ore 60-mesh fine. It is stated that in pushing it, it may be made to exceed this rate, over two tons having been frequently pulverized in an hour in special test-runs. Its use is not confined to ores, but it may be advantageously used on phosphates, bones, hoof and horn, fire-brick, manganese, corundum, alum, saltpeter, charcoal, and all substances requiring fine pulverization.

ON PRECAUTIONARY MEASURES AGAINST EXPLOSIONS OF FIRE-DAMP.—V.*

By M. Hoerneck, Halle, Germany.

Ventilation in General.—The object of ventilation is to supply the mines with fresh air, the quantity being dependent on the losses of oxygen due to the breathing of men and animals and the burning of lamps, and on the vitiation by the escape of noxious gases in the mine, powder-gas, fire-damp, carbonic acid, etc. It is not, however, possible to determine beforehand the quantity of fire-damp that will be developed, and it is therefore impossible, as a rule, to judge of the quantity of air above the usual requirements that a fiery mine demands. It must be judged from local conditions and from the larger or smaller quantities of fire-damp that escape. In spite of this, it is customary in France to use the output as the basis of an estimate of the volumes of carburated hydrogen escaping, and to determine from this the volume of air required, per second, placing it at one cubic meter for from one tenth to one twentieth of the quantity in tons of coal hoisted per twenty-four hours. Such a system would be without practical value in Germany, where the thickness of the beds varies considerably, and the production varies largely according to the local conditions.

Schondorff's so-called "chemical temperament" of a mine does, however, furnish a basis for the quantity of air required by a mine. That term has been given to the average vitiation of the air-current, through the loss of oxygen and the addition to it of carbonic acid and marsh-gas, in per cent, referred to 1000 running meters of workings, and the measured quantity of the air supplied. But this calls for a chemical analysis of the air, while the question to be determined in opening up a mine is, to ascertain beforehand how large a volume will be needed. The opinions of engineers differ widely on this point. According to Schondorff, a miner with his lamp consumes 50.5 liters of oxygen per hour, and a horse 100 liters; according to Callon, the former requires 13 liters of air per minute, and a horse treble that amount; Willis calls for 2.8 cubic meters of air per minute per man, 0.13 of it being needed or breathing; Demanet places the requirements of fresh air at 24 cubic meters per man per hour, of which 13 are required for the man, 7 for the lamp, and 4 for gas; the Belgian engineers demand from 1.8 to 3.3, and on an average 2.5 cubic meters; the Pennsylvania law insists upon 1.87 cubic meters; and the Ohio law 2.83 cubic meters; the Dortmund mining department holds 2 cubic meters per man per minute to be necessary, but demands usually a minimum volume of air, independent of the force of men employed, the quantity being specially determined for every single case, taking into account the characteristics of the bed, its position, the system of mining used, and the distribution of the air to the working faces. For a section of ordinary dimensions, when pillar-work is employed, it calls for from 20 to 80 cubic meters.

Depression.—The distribution of the necessary volume of air through

the workings is opposed by a resistance dependent upon the length of the drifts to be passed through *L*, their circumference *P*, their area *S*, and the average velocity *v* of the current of air. The depression *h* may be generally expressed by the following formula:

$$h = \frac{n \times L \times P \times v^2}{S}$$

in which *n* is a coefficient, determined by experience to be 0.0018 for the case that *h* is calculated in millimeters of a water column.

But as the section of the drifts varies widely, it is customary to divide the path traveled by the air into sections, in which the values of *S* and *P* are approximately uniform, and to compute the depression and add the values of *h* thus found. In order to compare this total resistance that is due to the workings of a mine with that of another mine, Murgue invented the term, frequently quoted recently, "orifice equivalent," or equivalent orifice, designating *a* as the area of an orifice through which the depression *h* stated in millimeters of a water column permits the flow of a volume of air *v* per second. He then uses the formula:

$$a = \frac{v}{k \sqrt{2g h \frac{d_0}{d}}}$$

in which *g* = 9.81 meters, *d*₀ is the density of water = 1, *d* the density of air = 0.0012, and *k* the coefficient of contraction = 0.65.

According to the value of *a* thus found, collieries are divided into three classes—narrow, medium, and wide, as their "orifice" calculated *d* is below, equal to, or above one square meter. The lowest value thus found was 0.166 square meter for the Grand Hornu colliery, Belgium, while the maximum was 4.8 square meters for the Hetton colliery, in England. According to Pernolet and Aguilon, the Brückenberg colliery (0.55 square meter) and the Burgk colliery, in Saxony, are "narrow;" most of the Westphalian and Saarbrücken collieries are "medium;" while some of them approach the "narrow" and others the "wide" class.

However original the idea of the "equivalent orifice" may be, the point in ventilating collieries is not to ascertain the flow of air from an orifice in a thin wall, but its flow through long tubes, and a formula comparing it with the latter would meet the case better than any practical value which the "equivalent orifice" may have.

The work of the ventilation is to overcome the sum of the resistance to the air-current in the working, or to overcome the difference in the pressure at the two ends of the current, and to impart to the air the required velocity.

Guibal calls the ratio that gives expression to the efficiency of the ventilation of a mine its "mechanical temperament," and computes this figure *a* as follows:

$$a = \frac{V^2}{h}$$

in which *V* is the volume of air in cubic meters per second; and *h* the depression in millimeters of a water column. Therefore the ventilation of a mine becomes more difficult, the lower its "mechanical temperament" falls. A ventilating current may be created:

1. By exhausting at the uptake. 2. By elevating the temperature of the air coming from the mine. 3. By increasing the pressure of the intake or cooling it.

In the first case, the theoretical energy required to move the volume of air *V* and create the depression *h* is found by the formula $T = V \times h$, while the effective work is from one quarter to one half greater. Therefore, $T' = 1.25 V \times h$ to $T'' = 1.50 V \times h$. Now as *h* in millimeters of a column of water expresses a pressure of *h* kilograms per square meter, the energy required is $V \times h$ kilogrammetres, and the power of the engine (*F*) is found as follows:

$$F = \frac{1 \times V \times h}{e \times 75}$$

in which *e* is the coefficient of useful effect of the ventilating machine chosen.

The increase of the temperature of the uptake is brought about by furnaces, and in calculating their efficiency the general laws relating to temperature and pressure must be considered. According to the Gay-Lussac law, $v = v' (1 + a \times t)$, in which *v'* is the volume of *t* degrees, and *a* is the value found for the expansion per degree, or $\frac{1}{273}$, or 0.003665. According to the Mariotte law, the volumes at equal temperatures are inversely proportioned to the pressure, or $v : v' = p' : p$. Combining both laws, we have:

$$p : p' = 1 + a \times t' : 1 + a \times t$$

If *H* is the height of the two columns of air, the difference in the temperature of which causes the current of air in a mine, or, what is the same thing, the depth of the shaft, and *t* is the temperature of the air flowing into the mine and *t'* that of the current coming from it, then the work of the ventilating furnace will be expressed by the following formula:

$$h' = \frac{H \times a (t' - t)}{1 + a \times t}$$

It is therefore principally dependent upon the depth of the uptake shaft. In order to express this in millimeters of water column, *H* must be multiplied with the weight of one cubic meter of air having a temperature of *t'*, or with *p*, and we have:

$$h = \frac{p \times H \times a (t' - t)}{1 + a \times t}$$

Comparing the efficiency of ventilators and furnaces, it is found that the first cost of the former is much higher than that of the latter, while, on the other hand, the furnaces require a greater consumption of fuel. The furnaces do more work, with deep shafts and workings easily ventilated, for which a slight depression, or a temperature not exceeding from 40 to 50 degrees Celsius, suffices. In all other cases, mechanical ventilators should be preferred, particularly in fiery mines, because they never give rise to the danger of explosions, which can not always be avoided in the case of furnaces, even by exercising the greatest care.

The expedient of cooling the air by injecting water into the intake is

* Verhandlungen des Vereins für Beförderung des Gewerbessees.

not a good one, and is only temporarily used when the temperature of the air is very high and no other means of ventilating is available.

According to Devilly, it is only the gravity that causes the movement of the air, when compressed air is carried into the intake. Its action is dependent upon the difference in density of the air flowing into and out of the mine, and in this case the difference may be expressed by the height of a column of air having the same density as the outflowing current. Designating the height of this column by H , calling P the weight of the volume of air escaping per second, and V its theoretical velocity, we have :

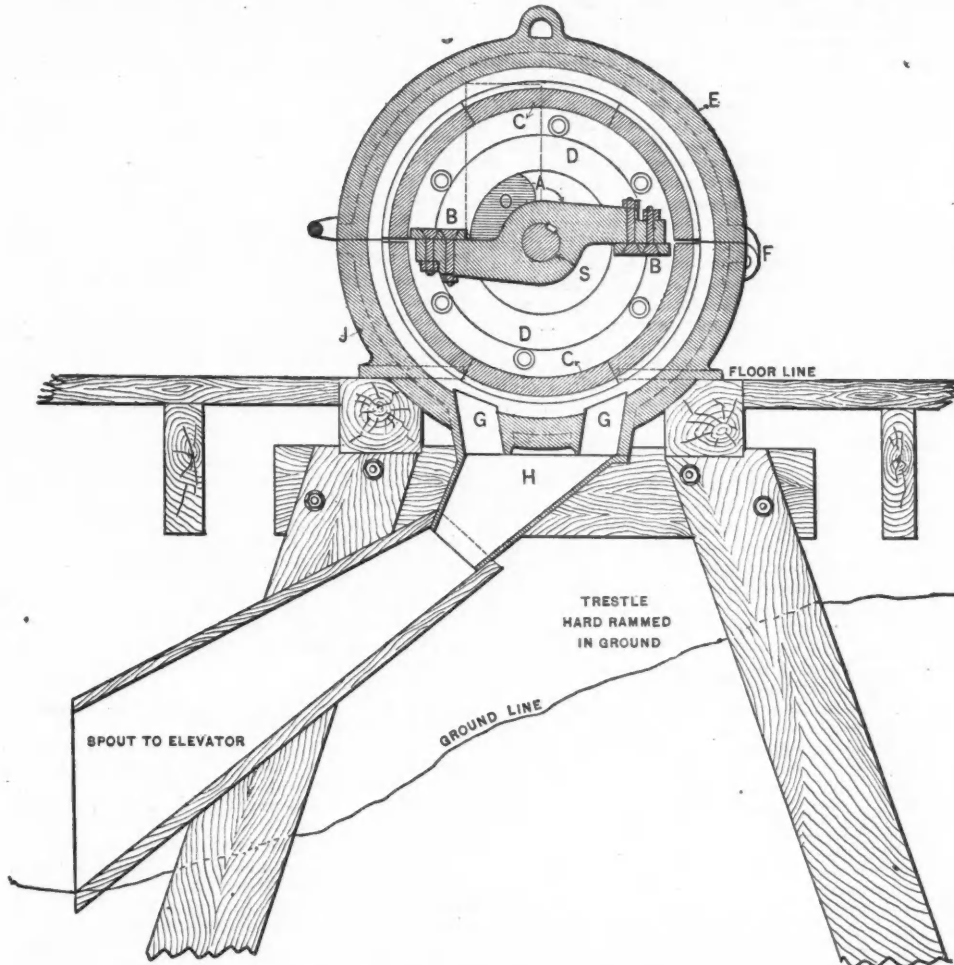
$$PH = \frac{P \times V^2}{2g}$$

If it be assumed that the air flows with a velocity V from a reservoir in which it is kept at a constant pressure H by a compressor, the pressure being greater than that of the air, and that as much air is supplied as escapes, then the work done by the compressor (leaving out of account the actual work of compression) is $S \times p \times H \times v$, or $S \times p \times H \times V \times \frac{s}{S}$, in which expression S is the section of the compressor cylinder, s is the section of the orifice from which the air flows, p is the weight of

The foregoing theoretical considerations lead to the conclusion that it is best for practical ventilation, and particularly in fiery mines, to conduct the air-current so that it ascends constantly, to carry the fresh air to the deepest point in the mine, and to allow it to flow upward, particularly after it has passed working faces showing fire-damp, and to so arrange it that any contrary direction is avoided. The heating of the current in the mine, the mixture with it of fire-damp and steam, will cause its density to diminish, and will aid ventilation ; but at the same time will increase its volume and call for a larger section of the workings. As a general rule, it is customary in Westphalia, to assume the increase of volume to be from 10 to 15 per cent.

It may be concluded furthermore that it is not advantageous to carry the entire current through all the workings with varying section without dividing it, because the friction increases for the same quantity of air in proportion to the decrease in the section. It is better, therefore, to split the current, taking smaller ones to the different sections and uniting them in the uptake. This makes it possible to meet a possible increase in the development of fire-damp in one section, by delivering to it a larger quantity of air ; and when an explosion has taken place, the sections of the mine in which it has occurred may be cut off without being forced to change the entire ventilation of the mine.

The System of Opening Out by Levels.—The frequency of synclinals and



THE WALKER PULVERIZER.

a cubic meter of air in the reservoir, and v is the speed of the piston of the compressor. But as $V \times v : V = s : S$ and $V \times v = V \frac{s}{S}$, and therefore $V \times s \times p \times H \times v = p \times H \times V \times s$. Now as $V \times s$ is the quantity of air escaping per second, and $V \times s \times p$ is equal to the weight P of this air, therefore the expression for the work of forcing air into the reservoir is also $P \times H = \frac{P \times V^2}{2g}$.

The energy with which the air escapes is therefore only equal to the work which the introduction of the compressed air requires, after it has been brought to the pressure needed. It is necessary, therefore, in this system of ventilation, to do the extra work of compressing the air without its having any beneficial effect upon the ventilation. The work of compressing grows, however, in proportion to the quantity of air required and to the pressure ; it becomes greater the higher the velocity of the amount of air or the pressure with which it escapes. Furthermore, since the compressor must be driven by an engine, this method of ventilation would not be more reasonable than to pump water with an engine and use it to run a water-wheel. The work of compression is diminished, however, when the density of the air in the reservoir is as low as possible and the air from the compressor directly enters the air-current with a low pressure.

The compressing of air in this manner can be attained by the Guibal ventilator, but the aid of the centrifugal force chiefly coming into play with this ventilator is thus given up. In Saxony, several Guibal ventilators have recently been built, so arranged that they can blow as well as exhaust without reversing.

anticlinals, the large number of beds, and the frequency of faults in the German coal basins have led to the plan of dividing up the territory of a colliery into series of lifts. When there are a number of beds, the coal may be extracted in succession in accordance with well-matured plans, and the hoisting and pumping can be concentrated and better arranged for than it would be possible to do without such a system.

This system of having well-defined levels, besides its effect upon extraction, hoisting, and pumping, is of the greatest importance for the ventilation. It is only by using an upper level as air-drift for the lower working level that the fresh air can be carried first to the latter, and then, after being warmed and vitiated, can be carried off through the higher air-level. It is only thus that a rational system of ventilation can be carried out. Many accidents, and particularly their disastrous results to large numbers, following explosions of fire-damp in English collieries, are solely due to the working systems with our air-levels there used. The tendency of many German mining engineers to prefer the English methods on account of the cheapness and rapidity of the extraction of coal is therefore not warranted, for this single reason, in fiery mines.

Whether the levels succeed one another from above downward, or whether it is not more advantageous to develop them from below upward, is a question that need not be considered so far as fiery mines are concerned, because of the accumulation of fire-damp in the old workings in the deepest part of the mine (if the latter plan were contemplated), and its tendency to escape into the upper workings, in which, in that case, the work of removal of the coal would be going on.

The levels may be formed by inclines, where the beds crop out at surface and are thick enough to enable the inclines to be driven in them in dimensions meeting the requirements of the case. This method of

opening out, it is true, permits of the immediate mining of coal, but can only be advantageously used in upper levels, and besides, requires the expenditure of larger sums for maintenance, hoisting, and pumping, so that there is not, probably, a single instance of its use in Germany.

When possible, tunnels are driven to the coal, otherwise vertical shafts are sunk, from which the coal is reached by cross-cuts at right angles to their strike. The disadvantage of opening out by a series of levels is, that pillars must be left standing as long as the levels are kept open. The losses, however, are less if the cross-cuts are driven as straight as possible and as closely vertically below one another as possible. Deviations from this system occur in Germany only in those localities where work is confined to a single bed, or to only a small number of beds dipping at a low angle, and the cross-cuts would be out of all proportion long, as at Oernkirchen and in Saxony. In England, every mine has one level, and only short cross-cuts are driven to connect different beds, even if there are a number of them, one above the other, and their dip is steep. The ventilation for each seam is independent of that of the others.

At Oernkirchen, a 25 to 26-centimeter seam, dipping from 4 to 9 degrees, is mined by diagonal long-wall-working. There is in existence an old tunnel-level which must be kept open on account of drainage, and is reached by many old hoisting-shafts. Until now, the ventilation has been so conducted that the air is carried through the latter into the working sections from above, and which, contrary to the general theory, is aspirated by ventilators placed on lower levels in the present hoisting-shafts. The currents of air, which are rarely split, pass through the workings, flowing upward and downward irregularly, and the velocity in its entire course is therefore great. Thus in one section, where its entire course is 4784 meters, the initial velocity of the current is 123.25 meters, and its final velocity 143.75 meters, while in another case it is 131.25 and 135 meters per minute respectively. This is a velocity which in other collieries can only be reached by disadvantageously contracting the area, and which is considered dangerous because it might cause the passage of the flame through the wire-cloth of the safety-lamp. It may be interesting to state that the workings divided into six sections had a total extent of 10 kilometers on the strike of the seam, the production in the year 1880-1881 being 141,120 tons of coal. The cost of ventilation was 0.10 mark per ton of coal. Special circumstances that make any other system impracticable account for the method employed in this case, although contrary to all general principles. The arrangement can not be regarded as practicable for other conditions, nor is it worthy of being recommended for fiery mines. The system of ventilation is to be entirely changed at Oernkirchen. The air is to be conducted to the lowest level, and is to be carried upward with numerous splits, finally reaching the upper levels, which are connected with air-shafts equipped with ventilators.

In Saxony, a regular system of opening out by a series of levels is rendered difficult by the small number of beds, their nearly horizontal position, and particularly by the large number of faults. Therefore in almost all the collieries every seam has a level of its own connected with the level above or below it in another seam by winzes or short cross-cuts, in a manner similar to English practice. However, at the Burgk colliery, though there is only one seam dipping at an angle of from 8 to 10 degrees, a series of levels and cross-cuts has been employed for opening out, with the object of improving the ventilation, and therefore this colliery may be counted among the best ventilated Saxon mines.

The systematic opening out and the ventilation of Saxon collieries is rendered particularly difficult by the fact that no safety-pillars are left between the different collieries, so that only a few of the miners are independent of their neighbors, so far as ventilation is concerned. It is true that the mining code provides that mines the ventilation of which is connected with adjoining collieries, must at once notify the officers of the latter of accidental or purposely created changes in the ventilation, when they might presumably affect the ventilation of neighboring collieries, and that such changes shall not be brought about without due consultation. But such enactments have little value as affecting the accumulation of fire-damp, and have no effect whatever on sudden explosions. The gradual consolidation of the smaller mines can alone give relief, and this will probably be brought about naturally by the growing depth of the workings and the increased cost of mining.

With these exceptions, brought about by special circumstances, the opening out of a series of lifts by cross-cuts is generally regarded in German collieries as the first condition of good ventilation.

The different systems of working—whether long-wall or pillar and stall—can be made to conform to this general principle, and therefore the methods of opening out are identical in all collieries. How well this may be carried out in spite of differences in the system of extraction is proved by the fact that in the Consolidated Rudolph colliery, Glatz, the preparatory work is the same, although long-wall working and pillar and stall working are employed in the same seam.

SUBMARINE ELECTRIC LAMP.—Recently, some very interesting experiments in submarine electric lighting were conducted on the Clyde, at Greenock, Scotland. The Tilly, a vessel built by Messrs. Hanna, Donald & Wilson for the fisheries at Batavia, has been fitted with machinery to supply current for a 15,000 candle-power lamp, which it is intended to lower into the sea for a depth of ten fathoms or less, as the exigencies of the drift-net fishing require. The whole of the electrical apparatus, as well as the gearing for raising and lowering the lamp, have been supplied by Messrs. Paterson & Cooper, the current being supplied by one of their No. 4 dynamo machines, coupled directly to a Gwynne high-speed vertical engine, and running at 650 revolutions a minute. The lamp, which is inclosed in a flint-glass cylinder 9½ inches diameter, is suspended from a davit over the vessel's side, and the two conductors consist of finely stranded copper cord inclosed in India-rubber hose. These conductors pass over pulleys on the end of the davit, and the lamp is raised or lowered by a winch fitted to the bottom of the davit. The trial lasted for four hours, during which time the lamp was submerged, and kept alight with the full current of 60 amperes through it. The appearance on the surface of the water caused by the submerged lamp was very remarkable and pretty. The whole installation was supplied on the suggestion of Mr. John Hayes, C.E., of Leadenhall street, E. C., and partly as the result of his experiments in this direction.

THE STRENGTH AND ELASTICITY OF STRUCTURAL STEEL.

At a recent meeting of the American Society of Civil Engineers, a paper was read by James Christie, M. Am. Soc. C.E., on the Strength and Elasticity of Structural Steel, and its Efficiency in the Form of Beams and Struts. He said that the various grades of steel possess such a range of physical properties that it is impossible to consider the metal as one might treat of iron. It is customary to denominate the grades of steel by the percentage of carbon they contain. The higher the carbon, the higher the tenacity of steel and the lower its ductility. Steel whose carbon is below fifteen hundredths per cent is conventionally known as mild or soft steel. The steels subjected to the tests described in this paper were of two distinct grades—mild and hard, both being products of the Bessemer converter, the hard steel having thirty-six hundredths per cent of carbon, and the mild steel twelve hundredths per cent. The tensile tests were made on strips about 24 inches long to which were clamped plates exactly 12 inches apart. The compression tests were made on specimens 12 inches long inserted in a tube, and the space between the specimens and the tube filled with fine sand. The tests on transverse resistance were made on bars of 3 or 4 inches diameter and on solid flanged beams from 3 to 12 inches deep, all being supported at the ends and loaded in the middle.

Extended tables were then presented of these various tests, and it was stated that the results showed that the elasticity of steel and iron is practically uniform; the steel may stretch less than the iron in tension, but the steel shortens most under compression. Transversely, if there is any practical difference, the advantage in stiffness probably belongs to steel; but the elasticity of both metals is so close and uncertain that further experiments may modify the average results here found. The specimens show that the elastic limits for tensile and compressive stress for the different grades of steel are practically equal per unit of section, and the transverse resistance is approximately proportionate to the longitudinal resistance, and that the strength of the material indicated on tensile stress will serve as a comparative measure of the absolute strength of iron or of either grade of steel; but as the transverse elasticity is practically alike, beams of iron or of either grade of steel of the same length and section will deflect alike under equal loads below the elastic limit of iron.

Tables were presented of experiments on flat-ended struts of both mild and hard steel. It was stated that the experiments on direct tension and compression prove that the elastic limits of steel of any particular grade are practically equal per unit of section for either direction of stress. A similar equality is known to obtain with iron. Therefore, for the short struts in which failure results from the effects of direct compression, the tensile resistance of the material will serve as a comparative measure of strut resistance. As struts increase in length, the lateral stiffness becomes a factor of increasing importance. The transverse elasticity of steel and iron does not vary much. The tendency will be for struts of steel and iron to approach equality of resistance as the lengths are increased. Mild steel will fall to equality with iron when the ratio of length to least radius of gyration is about 200 to 1. Hard steel would fall to practical equality at the point beyond the bounds of practice.

This paper, and the paper previously presented by Mr. Christie, giving experiments on the strength of wrought-iron struts, were then discussed. Mr. A. P. Boller expressed the opinion that the variations in the compressive resistance of iron, shown by these very careful experiments, were so great that it was impracticable, from them or from any other experiments so far as had yet been made, to prepare a formula which would ever give satisfactory results, and that dependence must be placed upon experimental charts which will express extreme values for all sections progressively determined.

Mr. Onward Bates considered that the experiments developed the great importance of placing the center line of pressure coincident with the center of the struts. If this could be done perfectly, a round-ended strut would be as good as a flat-ended one. In actual practice in the construction of bridges, the methods of securing the ends of such struts are so various that it is impracticable to make from such experiments a table of safe loads. The only safe practice is that of low unit strains corresponding with the lowest results of recorded tests.

Prof. E. A. Fuertes considered that the areas of cross-sections should be obtained by direct measurement instead of deriving them from the weight and length of the bars, particularly when the specific gravity of the material is not determined. The reason why an accurately centered straight bar behaved as a flat-ended strut when hinged, is due to the friction developed by pressure on the bearing of the hinge, and the early failure of flat-ended struts was probably due to the want of parallelism between the planes and the extremities, or the one or both of these planes being warped surfaces. Since a bar very long in proportion to its radius of gyration fails with a comparatively light load without permanent injury, it would seem proper that such load should be given a name other than ultimate load, the latter being restricted to its bearing on the elastic limit.

Mr. Theodore Cooper considered the experiments of Mr. Christie most valuable, particularly in carrying out a complete series with different end connections upon the same class of materials. The paper shows that slight changes in the direction of the lines of applied forces produce great changes in the results. By interchanging different sizes of ball-and-socket joints, it shows the influence of the size upon compressive resistance of the struts. It gives a more complete knowledge of the action of struts of high ratios of length to transverse dimensions than before existed. The method of using the least radius of gyration instead of the least dimension gives a fair comparison between the various forms. Attention was called to the relation of the ball and socket to the transverse dimensions of the struts, and diagrams were presented by Mr. Cooper showing the influence of the size of pins relative to the width of the struts. From the great effect of non-centering the line of applied force upon columns and of initial though minute bends in the materials, and the increased influence of possible side-blows, it is very important not only to keep the working strains within proper limits, but also to specify a limit to the number of diameters to be used in all columns. In recent specifications, this limit has been about at 45 diameters, corresponding approximately to about 120 radii of gyration

for the usual forms of bridge columns. With this proviso, a practical formula may be reduced to very simple forms.

Mr. E. B. Dorsey presented some comparative tests of iron and steel. The subject was further discussed by Messrs. Bouscaren, Charles E. Emery, Pegram, P. Roberts, Jr., Towns, and Christie.

NATURAL GAS.—The Gillespie Tool Company is putting down natural gas-wells. The one under its supervision for Mr. George Westinghouse, at Homewood, Pennsylvania, has reached the depth of 1000 feet. The company is drilling one well at New Castle, two at Wheeling, and one up the Monongahela River eight miles above Pittsburg. The gas brought from Murraysville is not introduced very rapidly among the iron mills. The Union Mills of Carnegie Brothers & Co. have only 18 puddling-furnaces out of 38 in the forge in which the gas is tried. In the heating-furnaces in this mill, and also in a great many other mills, manufactured gas is used, which is greatly preferred by the men to either coal or the natural gas. There are parties still adapting furnaces to the use of it. The last introduction in the Alleghany River mill district was at the Black Diamond Steel-Works.

MINERAL STATISTICS OF THE GERMAN EMPIRE.—The following are the results of a preliminary return of the production of the mines and works of the German Empire (including Luxemburg) in 1883, as compared with 1882:

	1883.		1882.	
	Tons.	Value in marks.	Tons.	Value in marks.
Iron ores.....	8,736,426	38,994,135	8,248,869	39,067,020
Copper ores.....	613,325	16,073,484	566,509	14,720,603
Pig-iron made from charcoal.....	42,622	4,865,887	42,231	4,914,539
Pig-iron made from coles and mixed fuel.....	3,377,013	167,061,502	3,298,319	187,676,360
Total of pig-iron.....	3,419,635	180,927,389	3,340,550	192,590,899
Bars.....	115,608	10,519,843	85,925	8,041,168
Finished products.....	1,295,209	197,750,373	1,337,318	208,828,462
Steel ingots and finished products.....	1,009,505	161,989,520	1,033,898	203,676,930
Steel (welded).....	427	103,100	386	72,636
Raw copper.....	17,931	24,376,808	16,285	22,618,252
Copper matte.....	526	183,483	736	275,035

FURNACE, MILL, AND FACTORY.

The Holly Manufacturing Company, of Lockport, New York, has just issued a very handsomely illustrated catalogue, showing its variety of Gaskill direct-acting pumps for high lifts, for pumping into tanks, for factory fire service, for pumping from mines, etc. We notice also a pump operated by water from the street pipes for supplying tanks with cistern water in those cases where the public water supply is not suitable for domestic purposes.

We have received from the Iron Bay Manufacturing Company, of Marquette, Mich., its handsomely illustrated catalogue of mining machinery, large quantities of which it has supplied to Lake Superior iron and copper mines. Judging from the great variety of designs for hoisters, that is apparently the leading specialty. They include internally geared, clutch-friction, and V-friction drums driven by single and double, horizontal or vertical engines. Among others, we notice an engraving made from a photograph of a plant of four six-foot drums, driven by an 18 by 24-inch engine, and a second plant of four twelve-foot drums, each holding 2000 feet of rope. The catalogue shows also a well-designed plunger-pump, a Cornish balance bob, pumping-engines, duplex compressor engines, upright, and horizontal tubular boilers, sheaves, skips, cages, center and dump-cars, etc. The Iron Bay Manufacturing Company is the representative also of the Ingersoll compressors and rock-drills, the Wilder turbines, Knowles's pumps, and Waters's governor.

It is announced that the Huntingdon Car and Car-Wheel Works will resume operations, arrangements having been perfected with the creditors whereby the business will be conducted as before.

An order has been made to wind up the Toronto Bolt and Iron Company under the Dominion act of 1882, on the ground that the company is insolvent. The applicant was the Exchange Bank, Toronto, which is also in liquidation, and is also a creditor of the company for \$105,000.

The Northwestern Manufacturing and Car Company, of Stillwater, Minn., has failed.

A meeting of barbed wire fence manufacturers will be held in Chicago, the 28th to increase the price in that article. The manufacturers have put up the price of low-grade steel rods of which the wire is made 15 per cent, making an increase, since February 1st, of fully 12 per cent in that article. The present value of the fence is \$3.90, and efforts will shortly be made to shove it up to \$5.25 for painted and \$6.25 for galvanized.

The Union Iron Mills of Carnegie Brothers, Pittsburg, Pa., will furnish nearly all the material used by the Keystone Bridge Company for the new bridge of the Baltimore & Ohio Railroad Company, over the Susquehanna River at Port Deposit, Maryland, and the bridge of the Louisville & Nashville Railroad Company, over the Ohio River at Hemlock, Kentucky.

Murray, Douglass & Co., at Milton, Pa., are building 250 coal-cars for the Baltimore & Ohio, 250 coal-cars for the Beech Creek, Clearfield & Southwestern, and 100 fruit-cars for the Florida Railroad and Navigation Company.

The Anniston Car-Works, at Anniston, Ala., are building 90 box-cars for the Georgia Pacific road, 100 for the Florida Railroad and Navigation Company, and 200 for the East Tennessee, Virginia & Georgia road.

The Weimer Machine-Works have received the contract for enlarging the furnace of Ferguson, White & Co., at Robeson, Pa. The stack recently erected, at a cost of \$60,000, is to be torn down and rebuilt to a height of 100 feet.

The company that proposes to enlarge and improve the steel-works at Cumberland, Md., will be incorporated soon, and the work of enlarging the establishment will then begin.

Messrs. Harbison & Walker, of the Star Fire-Brick Works, corner Twenty-second and Railroad streets, Pittsburg, Pa., have purchased the Woodland Fire-Brick Company's works, situated at Woodland, Clearfield County, Pa. The old firm-name (Woodland Fire-Brick Company, Limited) will be retained. At these works, the Penn Fuel Company's natural gas has been introduced.

J. C. Kirkpatrick & Co., of Leechburg, Pa., have just finished their Siemens steel furnace, and as soon as set and properly dried out, it will be put in blast.

Thirteen car-loads of steel-tired car-wheels manufactured at Essen, Germany, by the celebrated gunmaker Krupp, were recently received at Philadelphia.

It is said that the Crafts Furnace, Greendale, Ohio, Bessie Furnace, New Straitsville, and Winona Furnace will all be removed to Buchtel, Ohio, making that town the Hocking iron center. Of the fifteen coke-furnaces in the Hocking Valley, but two are in blast—Baird Furnace and one stack of the Fannie Furnace at Shawnee, Perry County.

Messrs. Evens & Howard, of St. Louis, Mo., have been awarded a contract for furnishing the Philadelphia Gas-Works with 360 retorts, together with the

necessary fittings, the whole amounting to about sixty car-loads of clay products.

The Machinery and Foundry Company, Cape Girardeau, Mo., has increased its capital from \$10,000 to \$20,000.

The Pratt & Whitney Company, of Hartford, Conn., has recently shipped to the Calumet & Hecla mine, Calumet, Mich., three engine-lathes, 21 inches swing, 12-foot bed, with best modern attachments. Previous shipments by the same company to this and other mines in Michigan within five years have included three 21-inch lathes, two 14-inch shaping-machines, one 10-inch pillar-shaper, combination lathe-chucks, Renshaw ratchet-drills, screw-plates, etc.

The M. C. Bullock Manufacturing Company has changed its headquarters in Chicago to No. 199 Lake street.

Thomas Binns, metallurgist, assayer, and gold and silver refiner, has removed his works to No. 279 Front street, this city.

The Martel furnace, at St. Ignace, Mich., went into blast May 5th.

The Vulcan furnace, at Newberry, Mich., went into blast May 12th.

The National furnace, at De Pere, is again in blast, the repairs having been completed.

RAILROAD NEWS.

The Lehigh Valley Railroad Company is negotiating for the purchase of 65,000 acres of bituminous coal lands in the Snowshoe region. The contract has not yet been signed, but there is no doubt that the purchase will be consummated. This will give large additional tonnage to the Pennsylvania Railroad Company, over whose lines it will pass to Mount Carmel.

The stockholders of the Central Railroad of New Jersey have elected the following directors for the ensuing year: H. S. Little, John Kean, D. B. Keim, E. C. Knight, Robert Garrett, Sidney Shepard, H. C. Kelsey, Samuel Sloan, and J. Kennedy Tod. The only change is Mr. Keim in place of Mr. Gowen.

The receivers of the Philadelphia & Reading Railroad Company were formally discharged by the United States Circuit Court at Philadelphia May 10th.

The board of directors of the Norfolk & Western Railroad have decided to build a road from Pocahontas to Blue Stone, Va., a distance of eight miles, at which point important coal mines are opening and from which a large output of coal is expected.

The stockholders of the Delaware & Hudson Canal Company have elected the following managers for the ensuing year: A. A. Low, James M. Halstead, Le Grand B. Cannon, James R. Taylor, Thomas Dickson, John Jacob Astor, Thomas Cornell, Robert S. Hons, James Roosevelt, Abraham R. Van Nest, Hugh J. Jewett, David Dows, and Robert M. Olyphant. The annual report shows: Coal produced, 3,512,972.09 tons; transported for others, 584,246.08 tons; total, 4,097,218.17 tons. The gross receipts were \$67,842,499.38; the expenses, \$12,456,174.42; less taxes, interest, and rentals, \$6,390,482.42, leaving net earnings of \$1,995,842.54, or a fraction less than 10 per cent on the capital stock.

LABOR AND WAGES.

The Brooklyn boiler-makers met May 11th, and discussed the advisability of striking for an advance in wages. Final action was postponed until next Sunday.

The Association of State Engineers met in this city May 11th. It was stated that the Police Inspector of Boilers was demanding \$2 each from engineers for licenses, without warrant of law, and it was resolved to fight the matter in the courts.

The Knights of Labor want a law passed in Pennsylvania requiring the appointment of a factory and mill inspector, whose duty it will be to examine the sanitary condition of all shops and factories.

Mr. Alexander Blyth, Secretary of the Northumberland Durham Miners' Permanent Relief Fund, England, is visiting this country to compare the condition of the miners here with that of his own country. He has visited the Pittsburg District, and has now gone to the Illinois and Indiana mining regions.

President Grévy has pardoned most of the miners who were imprisoned for having participated in the labor riots at Denain, France.

The Coal Trade Tribunal met at Pittsburg, May 12th, to wind up its first year's business. The year of the tribunal method of settling differences between the coal operators of the railroad mines and the miners will close on the 19th inst.

Eight hundred miners employed in the Falls Creek, St. Mary's, and Hardscrabble mines at Du Bois, Pa., have struck against the introduction of the screen system. Both sides are firm, and a long struggle is anticipated. A strike of 1500 coal miners at Canton, Ohio, is considered inevitable.

COAL TRADE NOTES.

ALABAMA.

New York and Atlanta capitalists have bought 6000 acres of land in Colbert County, and laid out a town, to be called Sheffield. Though there is not a building on the land, 118 lots were recently sold at auction for \$130,000. The town is on the Tennessee River at the head of navigation, and the company says that it will spend \$1,000,000, if necessary, to make it an iron manufacturing center, and induce manufacturers to settle there. A railroad eighteen miles long to the coal and iron beds has just been completed, and contracts have been let for the erection of furnaces, gas and water-works, and a hotel.

The Gulf Coal and Coke Company has been organized at Mobile, and has purchased 8000 acres of land on Lost Creek, near Birmingham, and will engage in mining on an extensive scale.

COLORADO.

John McNeil, Inspector of Coal Mines, has returned from an extended visit to the coal mines of Fremont County, and reports that he has had some difficulty in the enforcement of the State laws in regard to ventilation.

ILLINOIS.

A four-foot vein of coal has been struck in a prospect-hole that was sinking at Raymond, a village some ten miles north of Litchfield, on the Wabash road.

MARYLAND.

The reports for the week ended May 9th state that Koontz, Detmold, and Jackson are working full-time. Coney, nearly full-time. Big Vein has been idle several days on account of bad air. Potomac, full-time. Swanton, as usual, except the little vein, which has ceased work. Hampshire, one-half and three-quarter time. Franklin, one-half and three-quarter time. Phoenix, doing very little. Midlothian, full-time. Ocean full-time. Blaen Avon, not doing so well, owing to a scarcity of cars. Midland, working very well. Miller, doing very little. All the mines around Frostburg are working well.

MISSOURI.

The wet weather of the past few weeks has so retarded work at the mines in the Rich Hill District that very little can now be done in the way of completing the improvements undertaken. It will be several weeks yet, owing to this cause, before the new shaft of the Keith & Perry Company will be ready for business, which would otherwise have been in operation now.

MONTANA.

The Great Falls Coal Company's tunnel has been driven 125 feet, and the vein is showing a better quality of coal the farther they get in. The property is in Lewis & Clarke County.

OHIO.

A vein of good coal, 5½ feet thick, has been struck a mile and a half south of Sharon Center, Medina County.

The Cleveland & Chicago Coal Company will develop the new coal-vein located in the Mahoning Valley, near Youngstown.

The York Coal Company has been organized at Cleveland, to operate a mine on the line of the Wheeling & Lake Erie Railroad.

The coal trade throughout the Sunday Creek Valley has taken a boom. For the week ended May 3d, 369 car-loads of coal were mined. This surpasses any thing ever known in the valley before.

Sacket, Smart & Co., at Carbon Hill, have closed their mine and discharged all their miners. Mine 13 is idle, to repair screen.

The sudden caving in of three acres of land in the central portion of Zanesville, May 11th, has created much anxiety. An old coal mine is directly under the sunken land. The ground has settled 150 feet into the earth, and several houses have been totally destroyed.

Coal mining continues to decrease in the neighborhood of Chapman. Both of the mines are running at present. The Mountain and Sippo mines are having the pillars taken out at a rapid rate. The former will soon be finished, and the latter will not run long at the present output. Willow mine No. 5 has not started.

PENNSYLVANIA.

ANTHRACITE.

Reese Brooks, general superintendent of the Lackawanna Iron and Coal Company, of Scranton, accompanied by William F. Mattes, mechanical engineer of the company, has just returned from a tour of inspection in the Hazleton coal region, where he went to inspect several of the principal collieries, in order to note any improvement in machinery and methods of preparing coal. He visited the works of Coxe Brothers & Co., at Drifton, the Tomhicken, Derringer, and Gowen collieries, and the Hollywood collieries of Calvin Fardee & Co.

The Pennsylvania & Reading Company is sinking a new slope at Lincoln colliery. It is to be 400 yards deep, 200 yards below the level of the present workings.

The turning of Mahanoy Creek from the water-tank to the Girard culm-banks, at Girardville, a distance of half a mile, is almost completed, the work having begun last fall. This became necessary on account of the danger of the bed of the creek sinking into the Girard mines, and carrying with it an immense amount of water.

The Mine Commission met at Pottsville on the 6th, and adjourned on the 7th. There were general discussions and the assignment of work to the executive committee, composed of Thomas H. Phillips, Samuel Gay, Robert Mauchlin, James Ryon, G. M. Williams, J. E. Roderic, James White, Philip Coyle, and L. A. Reilly. The topics discussed by the commission are formulated by the committee and submitted to the board for their consideration. This is found to be not only the most practicable but the most expeditious way of getting through with the work. The executive committee includes five mine inspectors, two operators, and one miner. The executive committee will continue the sessions.

About twenty cars per shift are now mined at the new Dorrance colliery of the Lehigh Valley Coal Company in the upper part of Wilkes-Barre.

The main shaft of the new Woodward colliery of the Delaware, Lackawanna & Western Coal Company is down about six hundred and fifty feet. Only two pumps are used.

BITUMINOUS.

The Barclay Coal company reports income from rent of railroad and royalty on coal for the month of April, \$7415; total for four months of 1884, \$29,750.

Messrs. Woodward and Whetford are opening mines on the Keys farm, at Du Bois. It is stated that the railroad is to be extended from No. 1, and the mines are to be called the Jefferson mines.

At Woodville, the Summer Hill mine has been doing well for some time past, with good prospects. One hundred men are employed, and the force may be increased to 150. The drift has a five-foot vein. Three cents a bushel are paid for mining over an inch and a half screen. Bower Hill mine is only making about two-thirds time. However, it expects a steady run this month, and has increased the force to ninety men. The price of mining is the same as at Summer Hill.

The P. & K. and Leeburg coal companies are running full-time, and scarcely keep up with their orders. Extensive improvements are going on at three mines of the latter company, where it is building a battery of pockets for coaling engines, with all the late improvements. It is thought that ten engines can be coaled in as many minutes.

The Irvona Coal Company, owning and operating extensive bituminous mines at Irvona, Clearfield County, has contracted for the erection of about thirty coke ovens in connection with its works. It is mining from the Moshannon vein, which is six and a half feet in thickness, and two other veins that are respectively seven and a half and four feet thick. The Pennsylvania Railroad Company has contracted with it for the full product of its works.

L. C. Wynkoop filed a bill in equity at Pittsburg against the Chartiers Valley Coal Company, asking that it be dissolved and that a receiver be appointed to take charge of the effects and manage its affairs during the settlement of the company's matters. The reasons assigned for the proceedings were, that the partnership has expired, and that there has been no formal dissolution or settlement between plaintiff and defendants.

COKE.

W. J. Rainey & Co. have commenced the erection of 200 additional ovens at Moyer. The company will also erect fifty new tenement-houses at once.

The coke syndicate has not agreed to put its ovens in operation on Thursdays, but it is probable the order will shortly be issued to run the ovens on full-time. During the past month, the demand has been such as to take the output, and nearly all the surplus coke in yards.

At Latrobe, out of 250 ovens owned by the H. C. Frick Company, but sixty are in operation. Some idle ovens at the Loyalhanna works have been recently fired up. It is said the smaller works are doing a thriving trade.

The Mount Braddock coke-works are idle and in litigation.

Col. J. M. Schoonmaker has filed a bill in equity against J. W. & P. H. Moore, to compel them to allow him to enter into possession of his interest in the Red-stone coke-works.

UTAH.

The Committee of the Board of Trade of Salt Lake City is examining into the coal and iron interests in the southern part of Utah. The reports made state that up Cedar Cañon two openings have been made on the left as one ascends, showing good bodies of coal; but the best prospects are on the right, where two openings have been made, at points some distance apart. These latter seams are said to be eight or nine feet thick. Up Kanarrh Cañon, several coal mines have been opened, some of which Professor Newberry examined last year, and made favorable reports on, in which he stated that one measure was eighteen feet thick. The quality is said to be different from the Pleasant Valley or Wyoming coals. These coal-fields are very extensive. The iron deposits will form a prominent feature in the report of this committee. Should the result prove as satisfactory as is anticipated, it will probably cause an extension of the Utah Central from Milford to the mines.

MINERAL PATENTS GRANTED BY THE UNITED STATES LAND-OFFICE.

The following mineral patents have been issued from the General Land-Office, since our last record:

ARIZONA.

TUCSON DISTRICT.

Santa Rita Land and Mining Company, San Xavier, Arizona Queen, and Patterson lodes, and Democratic lode and mill-site. Henry W. Lovejoy *et al.*, Monarch of the Sea lode. Fort Wayne Mining Company, Buena Vista, McClellan, and Richmond lodes. T. D. Crocker *et al.*, Grand Portage lode. Dragoon Gold and Silver Mining Company, Psyche and Southern lodes. Rex Gold and Silver Mining Company, Chicora and Republic lodes.

CALIFORNIA.

LOS ANGELES DISTRICT.

J. B. Osborne *et al.*, Coupon, Last Chance, and Josephine quartz mines.

SACRAMENTO DISTRICT.

Booth Gold Mining Company, Booth quartz mine. Milton Slocum *et al.*, placer. Henry H. Hartley, Union No. 2 and Excelsior No. 2 quartz mines.

STOCKTON DISTRICT.

J. Batten and the heirs of A. M. Mitchell, deceased, Dashaway placer.

COLORADO.

CENTRAL CITY DISTRICT.

George Wirtz *et al.*, Ready Cash and Helping Hand lodes. H. P. Richmond *et al.*, Ida Belle lode and mill-site. Russell F. Lord, Guatemala lode. George Hepper *et al.*, Doss lode. J. S. Harris *et al.*, Marshall City lode. J. F. Pursel, Iowa lode. H. J. Hawley, West Chester lode. Thomas McAllister, Tol Cairn lode. W. Wilson, Sunshine lode. Heneage M. Griffin, Silver Cliff, Brand Hall, Canned Fruit, Exposition, Lady Gunning, and Buckskin Griffin lodes. William B. Stone, Mercer lode. Charles C. Walsh, Little Ella lode. M. V. B. Gillette *et al.*, Colfax lode and mill-site. Mann T. Rodman, Sedalia lode. University Gold Mining Company, Kansas lode. William F. Burr, Trustee for the Mark Twain Mining Company, Mark Twain lode. Edward H. Moran *et al.*, Vermont and Iron Brigade lodes. Russell F. Lord, Guatemala Extension N. E. lode. Joseph B. Keeler, Jay Gould lode. George Hansbrough *et al.*, Golden Gem lode. Charles F. Walls *et al.*, Albatross lode. Henry J. Hawley, Bald Eagle lode. Herman S. Alexander, Chicago lode. George E. Fuhrman *et al.*, Gold Medal lode.

DEL NORTE DISTRICT.

James G. Hazard *et al.*, Rainbow lode.

DURANGO DISTRICT.

Lizzie Gibbons *et al.*, Ada lode. William Weston *et al.*, Riverside lode. Joseph Wilkinson, Major D. L. lode. W. E. Webb *et al.*, Plow Boy and Kaffir lodes. Devan Mining Company, Lorillard No. 1, Little Mark, Bay City, Parole No. 2, and Sylvan No. 2 lodes. Jesse J. Crossway *et al.*, Queen City lode. D. O. Desantel, Dives lode. N. S. Simpkins, Jr., Crown Jewel lode. E. J. Warner, Picturus placer. George Butterbaugh *et al.*, Wabash, Lucky Boy, Lincoln, and Lincoln Nos. 2, 3, and 4 lodes.

LAKE CITY DISTRICT.

Henry M. Hoyt *et al.*, Grand Trunk lode. Brooklyn & San Miguel Mining and Reduction Company, N. W. H., Jr., lode and mill-site. Thomas Lothian *et al.*, Boomerang lode. A. R. Bushnell *et al.*, Ottawa lode. Charles R. Hardy *et al.*, Lucille lode. Ebenezer Rich *et al.*, Idoline lode. Francis Crawford, Letcher and Honolulu lodes. L. W. Balch, Meno lode. John S. Hough *et al.*, Shiloe, Gladiator, and Corinth lodes. Christopher Cogan *et al.*, Snow Bird lode. Frank Hiscock *et al.*, Gold and Silver Chief lode and mill-site. Charles H. Toll, Hyacinthe lode and mill-site. Pine Bluff Mining Company, Rob the Ranter lode. Joseph P. Merrill *et al.*, Mountain Queen lode. A. M. Phelps *et al.*, Government and Charles Phelps lodes. James F. Steinbeck, Duke of Bull Run and Little Rose lodes. John G. Schlotter *et al.*, Lincoln Boy lode. Eugene McCarthy, Angelina lode. David Geiger *et al.*, Fortune lode.

LEADVILLE DISTRICT.

E. B. Stark *et al.*, Legal Tender and Mammoth lodes. J. H. Smith *et al.*, Green Meadow lode. Alps Consolidated Mining Company, Alps No. 1 and Helvetia lodes. Hermann Hibschie, S. Small lode and mill-site. William Hilcox, Privation lode. James A. McCune *et al.*, Storm King lode. L. D. Beach *et al.*, Plutarch lode. Central Mining and Milling Company, Laura lode. Walter C. Reid *et al.*, Lonsanette lode. R. Morrison *et al.*, Snow Flake lode. M. Douglass *et al.*, Stockholm lode. H. A. W. Tabor *et al.*, Maid of Erin lode. John J. Page *et al.*, William Wallace lode. Thunderbolt Consolidated Mining Company, H. M. lode. Crystal Lake Gold and Silver Mining and Milling Company, Little Emma lode. Edward E. Floyd *et al.*, Thespian lode. Roxabell Consolidated Mining Company, Banning Fissure lode. David M. Hyman, 1000 and Mose lodes. Antelope Mining Company, Deer lode. J. L. Graver *et al.*, Mocking Bird and Missouri Boy lodes. Finia McClure *et al.*, Star of the West lode. S. M. Logan *et al.*, Logan lodes. W. H. Kingsbury *et al.*, Topliff, Lincoln, and Mountain Elk lodes. Joseph B. Keeler *et al.*, Amity lode. Richard H. Parmele, Rock Island lode. Mary J. Stewart *et al.*, Eclipse lode. Ready Pay Gold and Silver Mining Company, Ready Pay lode. Fulton Mining Company, J. C. Johnson lode. A. P. Curry *et al.*, Curry and Golden Ledge lodes. D. D. Bivlin *et al.*, Little Hattie lode. A. H. Estes *et al.*, Ketsbv lode. Edward B. Weare *et al.*, Birthday lode. F. R. Miller *et al.*, Lake View lode. F. Meredith Jones, placer. Joseph M. Knapp, French Gulch placer. Joseph H. Freeman, Jr., *et al.*, Blue Belle lode. William Mendenhall, Altoona lode. Stephen H. Pease *et al.*, Willow Creek placer. John Dohany *et al.*, Pine Bluff lode. Thomas J. McKenna, Andrew Jackson lode. D. F. Eicher *et al.*, Pine Forest lode. Scottish American Mining Company, West Side and Blue Float lodes. Antoine Libby, Peoria lode. David D. Belden, Rob Roy lode and mill-site. Samuel J. Glover *et al.*, Detroit lode. W. T. Swift *et al.*, Little Ella lode. D. R. C. Brown *et al.*, Grand Prize lode. Charles Mater *et al.*, Slidel lode. Thomas Owen *et al.*, Elk lode.

PUEBLO DISTRICT.

Saranac Mining Company, Julian and Moose lodes. Lorenzo G. Coombs *et al.*, Orion lode. Gunnison Exchange Silver Mining Company, Eureka, Hancock, and Garfield lodes.

DAKOTA.

DEADWOOD DISTRICT.

S. P. Romans, Perseverance, Indispensable, and Olive lodes. Daniel McLaughlin, El Refugio lode.

IDAHO.

BOISE CITY DISTRICT.

J. V. Farwell, Bannock lode. M. T. Richardson, Queen Fraction and Red Elephant lodes. Robert C. Chambers, Oneida lode.

HAILEY DISTRICT.

Robert C. Chambers *et al.*, Spotted Tail and Kitty lodes. Vienna Mining Company, Mammoth lode.

MONTANA.

BOZEMAN DISTRICT.

Charles H. Peck *et al.*, May Queen lode.

HELENA DISTRICT.

C. Kleinschmidt *et al.*, Mount Pleasant lode. Frank Shoolin *et al.*, Mill Side lode. John Downs *et al.*, Centerville lode. Charles D. McLure *et al.*, Goldsmith No. 2 lode. Daniel D. Budd *et al.*, Fourth of July and Fifth of July lodes. Junius G. Sanders *et al.*, Lord Byron lode.

MILES CITY DISTRICT.

Hugh James Linn, coal.

NEVADA.

CARSON CITY DISTRICT.

Philippe Martin, Good Faith lode.

EUREKA DISTRICT.

Canton Mining Company, Elijah, Isaacs, Blackstone, Minnie Manora, Cunningham, and Yellowstone lodes.

NEW MEXICO.

LAS CRUCES DISTRICT.

Robert Swan, North Extension Volcano lode.

OREGON.

LE GRAND DISTRICT.

Ira Sproul *et al.*, Humboldt placer.

UTAH.

SALT LAKE CITY DISTRICT.

Wahsatch Marble Company of Utah, Wahsatch Quarry lode. Michael Hegarty *et al.*, Hope lode. John M. Fallon *et al.*, Wild Bob lode. David C. McLaughlin *et al.*, Nettie lode. John Sharp, Jr., Granite lode. Charles W. Bennett, Trustee Silver Mountain Mining Company, Silver Mountain No. 2 lode. Robert C. Chambers, Boston lode. Robert Howarth, General Mark lode.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

Hudson & Co., bankers, at Tombstone, made an assignment May 9th, to T. L. Stiles. The failure is attributed to the depression of business and stoppage of the mines at Tombstone, the bank at that place having drawn from the firm \$120,000 a day on account of the miners withdrawing deposits. Assets, \$360,000; liabilities, \$300,000. If the mortgages held by the firm can be realized on, there will be surplus assets.

The reduction in wages of the miners at Tombstone from four to three dollars a day has caused great excitement. Several interviews between the Miners' Union and the superintendents of the different mines have been held. The miners will listen to no compromise, and the mines shut down May 5th. A meeting has been called by the citizens for the purpose of raising subscriptions for the Miners' Union.

TOMBSTONE.—The company has issued an attachment against the Central National Bank as garnishee of the banking firm of Hudson & Co., of Denver and Tucson, whose failure has been announced. The Central Bank was their Philadelphia correspondent. The mining company banked with the firm, and had on deposit at the time of the failure about \$15,000.

GRAHAM COUNTY.

DETROIT COPPER.—This company's aim at present is to keep up a sufficient supply of ore for the capacity of the furnaces. When the new stacks are ready to be blown in, the force of miners will be increased, and the present output doubled. A good body of ore is opening up on the Middle Arizona Central. At a depth of 30 feet, the ore is much richer than on top, and, as greater depth is attained, is constantly increasing.

PIMA COUNTY.

The mines now worked at Washington camp, six miles from La Noria, are rich in carbonate ore, carrying lead and iron. They require no dead expenditure of money, as the bodies of ore are near the surface and easily mined. The ore is delivered to the smelting-works at La Noria at \$2.50 per ton. There is plenty of iron ore within a radius of from three to six miles; limestone in abundance; wood, \$4 per cord, and charcoal 20 cents per bushel. Coke is delivered at \$7 per ton, brought from Crittenden on the railroad.

OMEGA.—Operations at the mine and mill will be resumed, the legal difficulties in Philadelphia having been settled.

PINAL COUNTY.

CASA GRANDE.—This copper company has purchased the Captain Luce, the Copper Elephant, and the Copper Reef mines. For the former, it is stated, \$60,000 were paid, and for the latter two \$20,000 each. The company is composed of Cleveland capitalists.

QUIJOTOA DISTRICT.

J. W. Mackey, who has invested largely in the Quijotoa mines, is at present inspecting them.

CALIFORNIA.

INYO COUNTY.

CONFIDENCE.—This group, which was formerly called the San Carlos, is producing ore that carries thirty ounces of silver, thirty per cent. of lead, and \$12 in gold per ton. The tunnel is in 80 feet, and 30 feet more will tap the ledge at the bottom of the shaft.

IBEX.—This mine, owned by a Chicago company, has a shaft 80 feet deep. The pay-streak is fifteen inches wide of ore that pays \$300 per ton. The ore is principally silver, with some copper and zinc. The ore is worked by the company's stamp-mill.

MAXIM.—The machinery for the five-stamp mill is on the way. It is furnished by the Pacific Iron-Works.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—During the week ended May 3d, there were crushed at the Bodie Consolidated mill 72 tons of ore, and at the Bodie Tunnel mill 292 tons. The average assay of the pulp was \$44.45, and of the tailings \$5.89. The greater part of this ore has been taken from the Vulcan vein, which continues to furnish good ore.

MONO.—The ore produced is of a fair quality. The development-work continues, showing no important features.

STANDARD CONSOLIDATED.—The Bodie Press says that the miners, surface hands, and mill-men employed by this company were all discharged May 1st, and the mine and mill closed down. In regard to this action, there are various rumors. One states that the water has lately been so troublesome as to make the extraction of ore difficult and expensive, and, until the flow of water subsides, the mine can not be properly worked, as it is almost impossible to get out ore sufficient to keep the mill running. Another states that New York stockholders have been very much dissatisfied because of the recent break in the stock, and have resolved to have the mine examined and reported upon by experts of their

own choosing, and until this is done, it will remain idle. The mine has produced over \$11,000,000, and paid over \$4,450,000 in dividends.

SYNDICATE.—There were necessary repairs to be made at the mill, and because of the stoppage, the monthly dividend was passed.

NEVADA COUNTY.

IMPERIAL.—The hoisting-works belonging to this company have been burned. Loss, \$2500; insured for \$500.

COLORADO.

CHAFFEE COUNTY.

BUENA VISTA MINING AND REDUCTION COMPANY.—A large pocket of fine ore has been encountered in the Dundena mine, which promises to turn out enormously rich. The body of ore so far as uncovered is four feet wide, sixty feet long, and has been sunk on to a depth of over fifty feet. The average value of the ore so far as tested is about eighty dollars a ton. The ten-stamp mill ordered some time ago will be erected at once at the Friendship mine, also controlled by this company. The output of the two mills, when all the facilities for getting out ore are complete, will be not far from \$400 a day.

COLORADO MOUNTAIN CHIEF.—Work is pushed by this company on its different properties, the Mountain Chief, Denver, Rainbow, Ben Hill, Bonnie Bell, Zephyr, and Yellow Jacket. The company has spent over \$30,000. The shafts and drifts on the Mountain Chief amount to 500 feet of work, out of which \$20,000 worth of mineral has been taken and shipped to Denver. Owing to the expense of getting the ore out of the shafts, the company has started a tunnel to cut the Ben Hill and Bonnie Belle vein, where they have been working all winter.

COLUMBUS.—The mill is idle.

TIP TOP.—The mine is shipping steadily to the arrastra, which is regularly run night and day with satisfactory results. The ore is hauled from the mine to the arrastra for \$1.50 a ton, and the estimated cost of treatment is about five dollars, while it is very cheaply mined, owing to the width of vein; the ore is high grade. The owners are encouraged by the showing, and intend to erect a pony stamp-mill in the near future.

CLEAR CREEK COUNTY.

During April, the sampling-works at Georgetown shipped 674 tons, valued at \$92,708.

PAY ROCK.—Three tons of ore from No. 4 in the Pay Rock mine were milled at the Rocky Mountain mill with the following results: First class, 700 ounces; second class, 450 ounces; third class, 100 ounces.

SUMMIT.—The lessees have made a rich strike in this mine on Saxon Mountain.

GILPIN COUNTY.

CENTRAL.—The improvements in and around the shaft building at the Galena mine are completed, and sinking another lift in the main shaft will soon commence. The Bugher and Cora H. veins will also be worked through this shaft.

REPUBLIC.—Sinking at the Pewabic mine has been resumed.

GUNNISON COUNTY.

RUBY CHIEF.—A lease has been given on the mine. The tunnel will be run on the vein a distance of over 300 feet, in order to strike the shaft. This will drain and develop the mine.

HINSDALE COUNTY.

CROOKES MINING AND SMELTING COMPANY.—The rich ore-chute heretofore exposed in the seventh level and shaft in the Ulé was struck a week ago in extending the sixth level east—a body of ore filling the entire breast of the level, and rich in gray copper of very high grade. This furnishes a large area of stopping ground in the richest ore found in the mine. Another ore-chute of equal richness is just ahead in the seventh level. The shaft is down nearly far enough for the beginning of an eighth level.

LAKE COUNTY.

The Leadville Herald reports the following:

CHRYSOLITE.—During April, there were shipped 409 tons and 1605 pounds of ore, for which were received \$17,368.96. From this shipment, 111 tons and 1020 pounds were the product of leases, and netted \$3824.77. The experimental run of 1000 tons at the Leadville gold and silver mill is drawing to a conclusion. The results, it is calculated, will show a saving of about six and a half ounces in silver to the ton of material treated. The ore run through the mill averages about ten ounces.

COLORADO No. 2.—The hoisting of ore has begun. The developments of the mine disclose about three and a half feet of fine carbonate ore, containing about fifty per cent. of lead and eighteen ounces in silver.

ESTY & HILL.—This concentrating mill has started up.

FLORENCE.—About twenty tons of ore are produced daily.

FOREPAUGH.—At this mine, on East Fryer Hill, a body of ore has been opened of considerable strength, consisting of iron pyrites and zinc-blende, from which some fair returns in silver have been obtained.

IRON SILVER.—Exploration-work from the Moyer shaft is energetically pushed.

LEADVILLE CONSOLIDATED.—There were produced in April 225 tons of ore, averaging about sixty dollars to the ton.

MIKE & STARR.—The recent business failure of some of the principal stockholders is said to be the cause of the delay in the resumption of work.

MINNIE.—The latest acquisition to the list of ore-producers is the Minnie mine, now shipping to the Leadville smelters sulphide ores that range in value from \$25 to \$250 a ton. The property is located on the south slope of Iron Hill, between the A. Y. and Colonel Sellers mines. At a depth of 240 feet, the first ore was encountered.

SILVER CORD.—Concerning the reduced output, Manager Wood states that such an appreciable portion of the value of ore is in the lead that he is not justified in shipping it during the present depression in the lead market. The mine will resume its shipments as soon as the price of lead advances to reasonable figures.

SMALL HOPES.—Over \$70,000 worth of ore from the Forest City mine was sold during April.

SMUGGLER CONSOLIDATION.—The southern half of the territory is worked by lessees. After doing considerable exploration-work, they discovered a large body of ore below the old stopes in the mine. This deposit has been thoroughly developed, and is yielding about twenty-five tons of ore a day. The producing capacity of the mine could easily be increased, but it is impossible to get the ore hauled away. The silver contents of the mineral is light, but it carries a great deal of lead, making it a fairly profitable ore.

OURAY COUNTY.

A movement is on foot looking to the opening of a road to Marshall Basin. It will insure a large shipment of rich ore this season from Mount Sneffels and Marshall Basin. Such mines as the Virginus, Monongahela, Sydney, and Atlas, on Mount Sneffels; the Sheridan, Smuggler, Mendota, Cincinnati, Cimarron, and others, in Marshall Basin, will obtain an outlet by this road.

SUMMIT COUNTY.

The Taylor Hill mines, the Dawson, El Capitan, New Era, Josephine, and the whole group are all worked, and show more or less good mineral. It is the intention to double the present plant of the McClelland mill early in the summer, and there are authentic reports that two more mills are to be put up this year. Three fourths of the shipments of the Battle Mountain mines are from the Little Chief

The Eagle Consolidated has been idle since November, owing to an unfortunate litigation between the owners.

DAKOTA.

ALTA.—The starting up of the mill and mine is expected at an early date.
ETTA.—The latest reports state that this tin mine has not been sold, as mentioned in last week's JOURNAL, but has been bonded to the American Tin Mining, Milling, and Manufacturing Company, of New York, for \$17,000. The company will begin work on the mine in a short time.
FATHER DE SMET.—Report for the week ended May 1st, shows ore extracted from the first, second, and third levels 2760 tons. Ore milled, 2700 tons. The report for the week ended May 8th shows ore extracted from first, second, and third levels, 2000 tons. Ore milled, 2000 tons.
GREAT WEST.—The mill has been finished, and will begin operations.

MAINE.

DEER ISLE.—The company has been reorganized and work will be resumed.
WEST LUBEC.—Twenty thousand dollars, it is said, will be expended in putting these silver mines in working order.

MEXICO.

QUINTERA & ROSARIO.—Judge Donohue, in Supreme Court Chambers, May 14th, granted an order making Adolphe Hegewisch permanent receiver of the property of the Quintera & Rosario Mining Company in a suit which was recently begun by Mr. William W. MacFarland against the Banque Franco Egyptienne and the Quintera Company. Mr. MacFarland, in this suit, has a claim \$500,000 that he seeks to recover from the defendants, and he charges the banque with fraudulent transactions in regard to the mines.

MICHIGAN.

COPPER MINES.

The April output of the mines mentioned is as follows :

	Tons.		Tons.
Calumet & Hecla	2135	Peninsula	86
Quincy	251	Huron	66
Atlantic	188	Wolverine	46
Franklin	175	Hancock	42
Alouez	102	Portage	34

GOLD MINES.

ROPES.—The shaft has now attained a depth of 65 feet. The vein is looking well, being unchanged in the characteristics which appear at all points above. Every foot sunk goes to more firmly establish the fact that the vein is a continuous one. It is the intention to sink to a depth of about 200 feet, when drifting and stopping will be commenced. The stamp-mill is to be started up June 1st.
DEER LAKE.—This property, which adjoins the Ropes on the west, is worked, and the showing already made is very satisfactory.

IRON MINES.

Statement of iron ore shipped from the port of Escanaba for the season, up to and including May 7th, 1884 :

Marquette County Mines.

Mines.	Gross tons.	Mines.	Gross tons.
Angeline hematite	1,114	New York	1,422
Barnum	2,858	Palmer	1,877
Cambria	2,325	Quartz	236
Cleveland	6,059	Salisbury	1,380
Cleveland hematite	5,329	Superior	2,250
Jackson	5,040	Superior hematite	555
Jackson South	948		
Total			31,183

Menominee Range Mines.

Mines.	Gross tons.	Mines.	Gross tons.
Calumet	1,201	Norway	5,484
Chapin	15,327	Quinnesec	190
Curry	1,353	Vulcan	5,405
Cyclops	2,503	Nanaimo	537
Ludington	4,496	Great Western	350
Metropolitan	3,620		
Total			40,466

Grand total.....71,659

NANAIMO.—A recent fire destroyed the engine-house and damaged the machinery considerably.

PITTSBURG & LAKE SUPERIOR.—A stand-pipe for sinking another diamond drill hole on the property near the Palmer mine is going down. A fine vein of hard ore has already been found.

MISSOURI.

New metallurgical works are in course of erection at St. Louis, for the treatment of the various sulphide ores produced by the mines of the Rocky Mountain region, and the utilization of all the by-products of these minerals.

MONTANA.

DEER LODGE COUNTY.

GRANITE MOUNTAIN.—The work of development continues daily and uninterruptedly in tunnels Nos. 2 and 3. No ore is stoped. In fact, it is solely a matter of conjecture what will be done with the immense amount now on the dump. Enough milling rock is in sight to run a 20-stamp mill for a long time, and the vein is constantly improving. Work will be commenced on the Little Tom soon. This claim adjoins the San Francisco on the east, and has a large body of extremely rich ore in sight on the 50-foot level.

HOPE.—The repairs at the mill are almost finished.

JEFFERSON COUNTY.

HELENA MINING AND REDUCTION COMPANY.—A correspondent of the *New Northwest* writes that the new forty-ton water-jacket smelter at Wickes is finished and was to start up about the first of May. The old smelter, of nearly the same size, has been running continuously for forty-five days, and there is said to be enough ore on hand at the Alta and Comet mines to keep both smelters running three months. The company is adding ten more stamps to the fifteen stamps previously used, and will be ready to start up soon. There are six revolving cylinders and six roasters. Experiments have been going on for condensing the smoke, the same as used at the lead mines at Joplin, Missouri; but from about 1000 pounds of residue collected in two or three days' run, it contained principally arsenic, while those at Joplin produced a wagon-load of white lead every twenty-four hours. The contrivance is rather novel, the smoke being carried through a large iron pipe with a fan draught about the center, to force the smoke up into fifty sacks suspended from the ceiling; the sacks are about twenty feet long and eighteen inches wide at the bottom, and sufficient thickness in canvas to allow the gas to pass through. A man shakes the bags twice a day, and the residue is drawn off at the bottom.

The new concentrators at Corbin, for concentrating the Alta ores, are working satisfactorily.

LEWIS & CLARKE COUNTY.

The Northern Pacific Railroad now carries low-grade ore from Helena and

Butte to Eastern terminals for \$16 a ton—a reduction of twenty per cent from the former rate.

MADISON COUNTY.

The several fluming companies in Alder Gulch, near Virginia City, have begun operations, but can not get along very fast, owing to the scarcity of water, due to the coldness of the weather.

SILVER BOW COUNTY.

LEXINGTON.—It is said that, on account of the scarcity of free ore in the Lexington, the old mill will soon be closed down, as the tailings will not pay to work separately. The mill will probably be leased for custom work, as there is plenty of available free ore in the district.

NEVADA.

ESMERALDA COUNTY.

ESMERALDA.—This mining and commercial company has developed a four-foot ledge on one of its Cat Creek mines. The ore is gold-bearing, and from several assay tests made, it is expected to mill about \$50 a ton.

EUREKA COUNTY.

A Chicago company interested in mines in the Schroeder, Bullion, Safford, and Mineral Hill districts is erecting a furnace for working the ores as well as reducing the ore of other parties.

ALBION VS. RICHMOND.—The suit between these companies has been set for trial in the District Court at Eureka for June 9th. This suit was begun in May, 1882, and is for the recovery of 5000 tons of ore, or its value at \$100 per ton, aggregating \$500,000, and also for \$50,000 damages alleged to have been done to the Albion mine, making in all \$550,000, for which the Albion Company asks judgment against the Richmond Company. The ore in controversy, it is alleged, was taken willfully and intentionally out of the Albion ground by the Richmond.

EUREKA TUNNEL.—The gentlemen to whom the property went for debts have reincorporated it under the name of the Eureka Tunnel and Mining Consolidated Company. Work has already begun on the mine.

ONONDAGA.—A tunnel is running from the mountain, to connect with the shaft. The tunnel is now in 350 feet, and there are 200 feet more to go to strike the shaft. In the bottom of the main shaft, is a large body of good ore, which will be worked when the connection with the tunnel is made. Twenty-five hundred tons of high-grade ore have been shipped, and there is now a quantity of low-grade on the dump, which will be worked at the new furnace.

STOREY COUNTY—COMSTOCK LODE.

It is expected that J. P. Jones will begin work in the old upper levels of the Bonanza mines.

In the north drift of the 2700 level of the Best & Belcher, material carrying metal is found.

On the 2700 level of the Gould & Curry, the diamond drill was put in the face of the southeast drift, and at a distance of 40 feet struck a body of quartz and a considerable flow of very hot water. Work has been discontinued in the drift, to allow the water to drain out.

In the north drift on the 2800 level of the Hale & Norcross, ore has been obtained that goes over \$100. At the point where this ore was cut, was also tapped a considerable amount of very hot water. Pending the construction of the bulkheads, this will probably drain out. The south drift started at this point did not reach the ore-vein, but it cut into quartz assaying as high as \$12.

Preparations are making at the Savage and Chollar for putting in bulkheads on the 2000 level, the cost of which, it is estimated, will be about \$6000.

The force of men at the North end mines is cut down.

At Gold Hill, all the mills on the Carson River are kept in constant operation. The big reservoir of tailings on Six-Mile Cañon, once the property of the late Ira S. Parker, will be concentrated with a newly-invented machine, and worked by W. T. O'Neale and George W. Hopkins.

WHITE PINE COUNTY.

STAR.—The case of Wells, Fargo & Co. against this mining company on motion to foreclose mortgage is now on trial.

OHIO.

CLEVELAND STORAGE COMPANY.—The organization of this company, which has recently been incorporated under the laws of Ohio, bids fair to fill a want long felt in Cleveland and elsewhere, and must necessarily be a valuable agent in facilitating trade. It is of special advantage to the large shippers of ore, etc., from this vicinity, as warrants are issued on all stock received, which will be advantageous to parties having stock on hand, but requiring ready cash, which they can realize without disposing of the property at ruinously low prices. As the company is not a dealer, when called for it delivers the identical goods. The directors are Joseph Colwell, Charles A. Otis, Thomas Axworthy, William H. McCurdy, Robert R. Rhodes, P. M. Hitchcock, and P. D. Nicols. William R. Drake is secretary and manager of the company, with head-quarters in the Merchants' National Bank, Cleveland.

VERMONT.

ROOKS.—To facilitate the work, the company has had a new hoisting-engine built by Kendall & Roberts, of Cambridgeport, Mass., which it now has in position, hoisting from the winze that it has sunk off the adit in its mines. On and after Monday, May 19th, it proposes to run its mines and mills night and day. Heretofore it has only run its mills by day. By these improvements, it expects to increase the product of its mines.

WISCONSIN.

The explorations going on in the Black River iron district, Jackson County, for the past eighteen months, have been attended with considerable success. Between \$20,000 and \$30,000 have been expended. A company with ample capital was formed last fall to put down a plant of smelting-works to cost \$100,000, says the *Florence News*. The gentlemen forming the company, from Pittsburg and Portsmouth, Ohio, are there, and work has just begun. The district has a history. Over \$100,000 were fooled away there some twenty-five years ago, before there were any railroads.

ASHLAND.—A specimen of ore from the company's mine was recently sent to the chemical laboratory of the University of Wisconsin, for analysis, and gave the following assay :

Metallic iron	71.40
Silica	0.62
Manganese	0.20
Phosphorus	0.03

GOGEBIC.—This company has recently made a strike on section 10, town 47 range 45, Michigan, near Sunday Lake. A 16-foot vein of fine hematite ore has been found.

NORTHERN CHIEF IRON COMPANY.—For the purpose of developing a number of promising properties in townships 45 and 46, range 2, east, this company has been organized. It owns 2000 acres of land, which were located in 1876, and show excellent indications of mineral richness, but litigation affecting the title has retarded operations thus far. A compromise effected between the conflicting claimants was followed by the formation of the newly organized company.

FINANCIAL.

Gold and Silver Stocks.

New York, Friday Evening, May 16.

Business was at a stand-still in the mining market this week. The panic in Wall street and the consequent shrinkage in almost every thing of value fortunately did not affect mining stocks, and while railroad stocks and pipe line certificates were doing a tremendous business at ruinous prices, the mining market was almost forgotten. The total number of shares sold aggregates but 41,085, as against 69,800 last week. A full summary of the market will be found below.

The Comstock shares were moderately dealt in at about steady prices. California sold to-day at 19c., with a small business. Consolidated Virginia was fairly dealt in at steady prices; it sold from 28@22c. Sierra Nevada ruled at stronger prices under a moderate business; it sold from \$1.40@1.90@1.75. Union Consolidated was strong under a small business, selling from \$1.85@2.20@2.15. Ophir sold at \$1.35, and Hale & Norcross at \$2.50. Sutro Tunnel was weak, and was fairly dealt in; it sold from 13@10c.

The Leadville stocks were very quiet, and sold at steady prices. Chrysolite was quiet and steady, selling from 97c.@\$1. Breese sold at 29c. Iron Silver sold from \$1@90@95c., with a small business. Climax was quiet and weak at 2c.

The Bodie stocks ruled weak, and were almost neglected. Standard sold from \$1.45@1, with a small business. Bulwer was quiet at 49@50c.

The Tuscarora stocks record a moderate business at steady prices. Grand Prize was quiet and steady, selling from 27@25@26c. Belle Isle was fairly dealt in at irregular prices; it sold from 42@54@45c. Navajo was strong under a fair business, selling from \$2.80@3.05. North Belle Isle sold from 20@19c. with small transactions.

In the miscellaneous list, Eureka Consolidated was quiet and steady, selling from \$4.10@4. Hall-Anderson sold at \$1.40, with a small business. Horn-Silver was quiet and steady, selling from \$5.63@5.88@5.75. Robinson sold from 21@20c., with a small business. Stormont sold at 11c.

Barcelona was quiet and steady at 16c. Bradshaw sold at 3c. Caledonia records a sale of 100 shares at 60c. Central Arizona was strong with a small business, selling from 26@27c. Eastern Oregon sold from 6@3c. Lacrosse was quiet and steady, selling at 14c. Rappahannock continues strong, and records a fair business; it sold from 20@18c. Sonora Consolidated sold at 5c., and was very quiet.

According to its quarterly statement, the receipts of the Horn-Silver Mining Company for the sales of silver and lead have been as follows:

1884.	Total.
January.....	\$243,146.46
February.....	200,808.72
March.....	166,390.82
	\$610,346.00

The operating expenses were:

1884.	
January.....	\$112,131.05
February.....	108,597.48
March.....	113,150.38—\$333,878.91

MEETINGS.

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

Amygdaloid Mining Company, office M. H. Hoffman, No. 629 Walnut street, Room 7, Philadelphia, Pa., June 4th, at twelve o'clock m.

Castle Creek Mining Company, No. 18 Broadway, Rooms 810 and 811, New York City, May 26th, from one to four o'clock p.m.

Dunderberg Mining Company, Nos. 90 and 92 Broadway, Room 37, New York City, June 3d, at three o'clock p.m.

Empire Copper Company, office M. H. Hoffman, No. 629 Walnut street, Room 7, Philadelphia, Pa., June 6th, at twelve o'clock m.

Girard Mining Company of Michigan, office M. H. Hoffman, No. 629 Walnut street, Room 7, Philadelphia, Pa., June 3d, at twelve o'clock m.

Grand Portage Copper Mining Company, office of Company, Hancock, Mich., June 2d, at two o'clock p.m.

Leadville Consolidated Mining Company, No. 92 Broadway, New York City, May 20th.

DIVIDENDS.

Father de Smet Consolidated Mining Company, of Dakota, has declared a dividend of twenty cents a share, payable at the office of Laidlaw & Co., No. 14 Wall street, on May 31st.

Homestake Gold Mining Company, of Dakota, has declared its sixty-ninth dividend of \$25,000 for April, making a total of \$2,412,500. The dividend is payable at the transfer-agency here, Lounsbury & Haggin, No. 15 Broad street, on May 26th.

Idaho Mining Company, of California, has declared its usual dividend of \$5 a share, payable immediately.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report for the week as follows:

The present week has been the most eventful one in two years in oil speculation. Oil opened last Saturday at 95½c., and to-day it sold at 65½c., or a break of 30 cents within six days. This has been very trying to brokers and customers, but they have borne it well. At the close to-night, oil was 77½c., which on merit is very cheap. The great decline is entirely due to Wall street troubles, tightness of money, and general fright. The Oil City and New York exchanges closed at three p.m. to-day, and will continue hereafter until further notice. This brings the business within bank hours.

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

	Opening.	Highest.	Lowest.	Closing.	Sales.
May 10.....	\$0.95½	\$0.95½	\$0.94	\$0.94½	3,706,000
12.....	.94½	.94½	.92½	.93½	8,621,000
13.....	.93½	.93½	.92	.92½	7,022,000
14.....	.86½	.91½	.81	.82½	11,388,000
15.....	.83½	.84½	.73½	.73½	6,703,000
16.....	.77	.78	.65½	.77½	4,258,000
Total sales.....					41,698,000

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

NAME OF COMPANY.	CLOSING QUOTATIONS.				
	May 9.	May 10.	May 12.	May 13.	May 14.
Albion.....					
Alpha.....					
Alta.....	1½	1½	1½	1½	1½
Argenta.....					
Bechtel.....			1	1½	
Belcher.....					
Belle Isle.....	1½	1½	1½	1½	1½
Best & Belcher.....	3½	3½	3½	3½	3½
Bodie.....					
Bullion.....					
Bulwer.....					20
California.....					
Chollar.....	1	1½	1½	1½	1½
Con. Pacific.....					
Con. Virginia.....	20	25	25	25	25
Crown Point.....	1½	1½	1½	1½	1½
Day.....	2½		2½	2½	2½
Eiko Cons.....			4	4	
Eureka Cons.....					
Exchequer.....	4		4	4	
Gould & Curry.....	1½	1½	1½	1½	1½
Grand Prize.....					
Hale & Norcross.....	1½	1½	2½	2	2½
Independence.....					
Martin White.....					
Mexican.....	1	2	2	1½	1½
Mono.....					
Mount Diablo.....				2½	
Navajo.....	2½	3	3½	3½	3
Northern Belle.....					
North Belle Isle.....					
Ophir.....	1½	1½	1½	1½	1½
Overman.....					
Potosi.....	.50	.60	.65	.65	.65
Savage.....	.70	.85	.85	.85	.85
Scorpion.....					
Sierra Nevada.....	1½	1½	1½	1½	1½
Silver King.....					
Tip Top.....					
Union Cons.....	1½	2½	2½	2	2½
Utah.....	1½	1½	1½	1½	1½
Wales Cons.....					
Yellow Jacket.....			2½	2	

The following are the financial balances of the various mining companies on May 1st:

	CASH ON HAND.	Exchequer.....	\$2,698.42
Alta.....	\$24,658.36	Gould & Curry.....	22,445.67
Argenta.....	1,230.42	Hale & Norcross.....	11,047.10
Andes.....	188.00	Mono.....	11,991.73
Alpha Con.....	6,826.83	Martin White.....	5,876.10
Bulwer.....	4,267.20	Occidental.....	4,010.54
Bodie Con.....	144,019.88	Potosi.....	4,783.81
Best & Belcher.....	2,207.80	Sierra Nevada.....	33,176.16
Benton Con.....	15,183.19	Savage.....	4,783.81
*Belcher.....	17,198.11	Utah.....	9,212.52
Crown Point.....	24,069.08	Union Con.....	40,682.51
Con. Virginia.....	56,711.13		
*Day.....	1,569.53		

	INDEBTEDNESS.
Chollar.....	\$840.77
California.....	6,527.81
Grand Prize.....	28,976.44
Lady Washington Con.....	4,063.74
Mexican.....	16,273.71
Ophir.....	19,387.88
Standard.....	11,403.46

* Due Sutro Tunnel Company, \$10,920.
† Bills payable, \$76,567.57; outstanding drafts, \$36,838.60.
‡ Due on assessment No. 81, \$5537.75.
Albion indebtedness, exact amount not known; approximate, \$260,000.

Copper and Silver Stocks.

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

Boston, May 15.

The market for copper stocks the past week has ruled dull, with but little to encourage holders of this class of securities. The events of the past two or three days in the general market have absorbed the attention of both investors and speculators, and while there has been no special pressure to sell copper stocks, there has, on the other hand, been no disposition to buy largely, even at reduced prices. The small holders of Calumet & Hecla are gradually selling out their stock, and it is passing into the hands of parties who have confidence in its ability to earn and pay dividends again in the near future. The stock advanced early in the week from \$173@174½, which was, however, lost with a further decline to \$168, being the lowest price yet touched. There was a slight rally to-day, and a small lot sold at \$170, which was also bid for at the close. The product for April was 2135 tons, the largest amount ever mined in one month. The dealings in Quincy have been very light, only sixty shares changing hands at \$37@36½. Franklin was exceptionally weak, declining from \$8½ (April 15th) to \$7½, on sales of 600 shares, one half of which was at the lower price. Atlantic sold at \$7½, and Huron at 75c. The rest of the list was neglected.

In silver stocks, there is no activity. The only feature is a little demand for Catalpa, which declined from 37½c. (April 23d) to 27½c., and again advanced to 35c. on sales of about 1000 shares.

At the Boston Mining Exchange, there is nothing doing, and the several specialties are dull and featureless. Bowman Silver is quoted at 14@15c. Empire, 8@10c. Sullivan, 5@8c. Dunkin, 16@18c. 3 P.M.—There was no change at the afternoon Board. Calumet & Hecla sold at \$170, and \$36 was bid for Quincy, no sales.

BULLION MARKET.

New York, Friday Evening, May 16.

The decline in silver abroad and in sterling exchange here is shown in the lower rates for silver in the accompanying table:

DATE.	London.		N. Y.	
	Pence.	Cents.	Pence.	Cents.
May 10	50½	111½	50½	111½
12	50 15-16	111½	50 13-16	111½
13	50½	111½	50 13-16	111

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of April.	Year from Jan. 1st, 1884.	
			\$	\$
*Alice, g. s.	Mont.	†		298,761
*Belmont.....	Mont.		6,081	209,475
Bodie, g.....	Cal.		120,499	135,161
*Bonanza King, s.	Cal.		37,483	170,296
*Boston & Montana, g.	Mont.		20,095	52,373
*Chrysolite, s. l.	Colo.		24,326	195,164
*Consolidated Bobtail, g.	Ariz.		42,028	128,703
*Contention, s. g.	Dak.		40,986	137,061
*Deadwood-Terra, g.	Colo.		12,732	25,000
*Derbec Blue Gravel, g. s.	Dak.		162,178	301,053
*Father de Smet, g.	Mont.	‡		17,980
Grand Prize, s.	Utah.		168,000	750,087
*Hecla Cons., g. s. l.	Mont.			184,169
*Homestake, g.	Mont.		3,508	15,147
*Hope, s.	Utah.		98,477	398,373
Horn-Silver, s. l.	Colo.		12,000	37,134
*Iron Silver, s. l.	Colo.			122,000
*Kentuck, g. s.	Mont.			24,820
*Lexington, g. s.	Mont.		29,268	115,018
*Little Pittsburg, s.	Colo.			536,205
Moulton, s.	Mont.			11,135
*Mount Diablo, s.	Utah.		4,090	14,332
*Navajo, g. s.	Utah.			45,164
*Ontario, s. l.	Mont.		88,399	364,177
*Original, s. c.	Mont.			5,819
*Paradise Valley, g. s.	N. S.		12,419	48,260
*Plymouth Consolidated, g.	Cal.			214,598
*South Yuba, g.	Cal.			7,174
*Syndicate, g. s.	Cal.			
*Tombstone, s. l.	Ariz.			
United Gregory, g.	Colo.			

Total amount of shipments to date.....\$4,801,272

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

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate

of discount, and it remains at 2 1/2 per cent. During the week, the bank lost £372,000 bullion, but the proportion of its reserve to its liabilities was unchanged, and is still 48 per cent, against 32 3/4 per cent at this date last year. The weekly statement of the Bank of France shows gains of 6,334,000 francs gold, and 257,000 francs silver.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, May 16.

The financial crisis has thus far had little effect on the iron trade.

American Pig.—The market remains practically unchanged, firm for the best brands, notably of No. 1 and Gray Forge, while No. 2 Foundry is in more ample supply. Business, of course, has been exceedingly dull during the past few days.

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

At the Metal Exchange, the following transaction was recorded: Monday, May 12th, 100 tons No. 1 pig, May, \$18.87 1/2.

Scotch Pig.—There is no change whatever to note.

We quote ex ship and to arrive: Coltness, \$21.50@22; Langloan, \$2@22.50; Summerlee, \$21; Dalnellington, \$20; Gartsherrie, \$21.25@21.50; Eglinton, \$19.50@20; and Glengarnock, \$21.50@22.

At the Metal Exchange, the following cable quotations have been received: Coltness, 56s. 6d.; Langloan, 52s. 6d.; Summerlee, 51s.; Gartsherrie, 51s. 3d.; Glengarnock, at Ardrossan, 50s. 6d.; Dalnellington, 47s. 6d.; and Eglinton, 44s. 6d. Warrants, 41s. 5d.

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

Old Rails.—We quote \$19.50@20.

Philadelphia, May 16.

[From our Special Correspondent.]

Pig-Iron.—For Pig, \$20@21, \$19@19.50, and \$18@19 continue to be asked and paid for small lots of Nos. 1 and 2 Foundry Iron, and Forge. Production is so light and stocks of good makes so low that even the moderate demand enables makers to keep prices firm for these desirable irons; but for any thing not first-class, prices are weak, and sales have been made at very low figures, \$19.50, \$18.50, and \$17.50 having been accepted. Stocks of ordinary irons continue large, and demand light.

Foreign Irons.—There are offers at \$27.50 for good lots of Spiegeleisen, with 50@75c. more asked; Bessemer is quiet at \$19.50 offered, and \$20@20.50 asked. There is nothing doing in Scotch iron.

Muck-Bars.—Sales of moderate lots have been made at \$31@32.50, according to quality.

Blooms.—Small lots are moving at \$55 for charcoal, and \$45 for anthracite.

Manufactured Iron.—Sales of Bars have been made at 1'70c. for Common, and 1'80c. for Refined, in good-sized lots. Best refined, in small lots, commands 1'90@2c. It is believed now more than ever that there will be a suspension throughout the West, and manufacturers are hoping for better demand and better prices on this account. Country mills are taking some good orders for common iron, but there is very little profit at the prices accepted. Mills are working far below full capacity, and few orders for late delivery are placed.

Nails.—Contrary to expectations, the Western Nail Association has failed to take any further action in the pool matter, and prices there are unchanged. There is a fair movement of nails here, and prices for small lots are \$2.50@2.60, but more favorable terms are obtained by large buyers. Prices will probably continue to weaken, owing to the large supply.

Plate and Tank Iron.—Quotations are 2'15@2'20c. for Plate, 2'20c. for Tank, 2'75c. for Shell. Flange, 3'75c., and Fire-Box, 4'75c. Only small orders are coming to hand. For large orders, prices would be heavily shaded.

Sheet-Iron.—Prices are moderately firm at the low limits of the past month. A good deal of business is done, and mills are busy.

Structural Iron.—No change in quotations and no business of importance.

Steel Rails.—Small lots of steel rails are selling at \$33@33.50 for summer delivery, and there are buyers for rails, for winter delivery, at about \$32, with \$33 asked. There are some negotiations pending, but no business worthy of note has been closed.

Old Rails.—Sales of foreign tees have been made at \$21 and \$21.50. There is considerable inquiry, with prospects of considerable transactions in a few days. Bridge rails are quoted nominally at \$23.50@24.50; Double-Heads, \$23@24.

Scrap-Iron.—No. 1 has sold at \$23@23.50 for wrought. Cargo lots, \$21@22. Crop-Ends are quoted at \$19.50@21.50.

Pittsburg, May 15.

[From our Special Correspondent.]

Pig-Iron.—Some commission men are hopeful of improvement within the next week, and the market may be said to be a shade firmer. There has been no further decline in values, and the general opinion is, that prices have about reached the lowest point. The wages scale is still the obstacle to any beneficial improvement, and is as far off as ever from satisfactory adjustment. I am inclined to believe that the mills will be shut down, although I only express the general hope of Pittsburgers that such will not be the case. There are but two more weeks yet to sign the scales, and after the 26th inst., when the men present their modified cards to the individual manufacturers, and they are not signed, all will depend on the conference committees. As matters are now, there is not the consumption here of a week ago, and every thing continues of a hand-to-mouth character. No one will risk any thing on the near future. The sales of last week in pig footed up to 2737 tons, but this week will hardly be as large. The following quotations will give the correct figures on standard brands this week:

Table with 2 columns: Item and Price. Includes Neutral mill, All-ore mill, Foundry, native ore, Foundry, Lake ore, Foundry, charcoal, Car-wheel, charcoal, C. B., Bessemer.

Manufactured Iron.—Business continues dull and very unsatisfactory, orders are still coming forward sparingly, and prices are irregular and unprofitable. Trade may improve later in the season, as stocks are very light in the hands of jobbers, who have been holding off this year in expectation of lower prices. This tells there is but little change from last week. Quotations are: Bars, 1'85@1'90c.; No. 24 Sheet, 3'10c.; Plate, 2'40c. All 60 days are 2 per cent off for cash.

Nails.—There is nothing new to report, but trade is a little better. Jobbers have been buying only to supply actual wants, but they are beginning to stock up more, and will in a week or two buy more freely, as they see that prices are not going lower. Prices are \$2.30, sixty days, and 10 cents additional per keg or jobbing.

Wrought-Iron Pipe.—Trade is picking up a little, but there are no changes in price.

Steel Rails.—No sales have been made to change the \$35 quotation. Sales of old rails have been made recently at a decline of 50 to 70 cents a ton, and quotations can now be made at \$22.50@22.70.

Steel.—Very dull, and prices without change. Other articles unchanged.

METALS.

NEW YORK, Friday Evening, May 16.

In a general way, it may be said that the Wall street financial troubles of the past few days have not had any more serious effect upon the markets than to divert the attention of business men to that quarter and to make them more cautious still in their dealings. It has therefore led to a falling off in business, but has not had any effect whatever on values, nor is it expected that it will on any class of merchandise. Our business men have for months had less at stake in Wall street than they have had for many years, and probably but few of them are entangled in its affairs.

Copper.—Very little has been done except the changing hands of small blocks of Lake at 14 1/4c., which we quote, while other brands range from 13 1/4@13 3/4c.

England has receded to £56 for Chili Bars, but is

quoted £65 for Best Selected, the latter therefore reflecting the improved statistical position.

Statistics of Copper in England and France.

Table showing copper statistics for April 1 to 30. Columns: Imports, Deliveries, Tons. Rows: Fine foreign, chiefly Australian, Chili, American, Spanish precipitate and sundries, Totals—England and France.

Table showing copper statistics for April 30 to March 31. Columns: Imports, Deliveries, Tons. Rows: Fine foreign, chiefly Australian, Chili, American, Spanish precipitate and sundries, Totals—England and France.

Table showing copper statistics for Jan. 1 to April 30. Columns: Tons. Rows: England and France, Imports, Deliveries, Total visible supply.

Table showing copper statistics for Jan. 1 to April 30. Columns: Tons. Rows: England and France, Imports, Deliveries.

Messrs. James Lewis & Sons, of Liverpool, report the following April sales of furnace material:

Table showing April sales of furnace material. Columns: Tons, Per cent, Per unit. Rows: 100 Reg. Rio Tinto, 500 Ore. New Quebrada (Yellow), 800 (Ruby), 500 Reg., 400 Bolivian, per Mary Jose, 50 Prec. English, 247 Mason's, 500 Ore. New Quebrada (Yellow), 100 Reg. Chili, per Annie Fletcher, 75 Canadian, 300 Ore. Mexican, 200 Norwegian, 100 Prec. English, 290 Mason's, 370 Spanish, 66 Rio Tinto (No. 1), 62 (No. 2), 65 Reg. Canadian, 1230 New Quebrada, 144 Betts Cove, 60 Prec. Seville, 200 Spanish, 1000 Ore. New Quebrada (Yellow), 1600 Mason's, 100 Cape, 700 Italian, 600 Bolivian, 513 New Quebrada (Ruby), 180 (Yellow), 200 Cape, 343 Australian, 700 Rio Tinto (No. 2), 50 English, 170 Spanish, 290 Ore. Garonne, 300 Peruvian, 300 Cape, 300 Reg. Rio Tinto, 45 Canadian, 200 Ore. New Quebrada (Yellow), 300 Mexican, 300 New Quebrada (Yellow), 300 Reg. Rio Tinto.

Tin.—We quote 19c. for cash spot lots of Straits, while England cables £85 12s. 6d., for Straits.

Lead.—No wholesale business whatever has been transacted during the week, holders insisting on 3'60c., while the best bids are 3'55c.

The Chicago Smelting and Refining Company has issued a circular to the refining-works, calling for a meeting in Chicago on the 22d inst. It is announced that the object of this movement, which has been shrouded in a good deal of mystery, is to give lead a boost and carry it to 4c. in St. Louis and 4'25c. in New York. We are not much impressed with the chances of success of any such movement. It is exceedingly doubtful whether it would have the cordial support of any but those who happen to have a good deal of high-priced lead on hand. It would be an exceedingly good thing, too, for the Missouri producers, and would be offering a premium to those who would consent for their customers' sake to part with their lead at a slightly lower price. The

refiners, let us hope, will have a good time at Chicago. They will overwhelm one another with the kindest expressions of good will, and will, we trust, conclude to let the price of lead alone.

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

The market has ruled with scarcely any fresh business since our last report. We quote Refined and Common lead salable at 3'40c.

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

The market remains about the same, if any thing a shade firmer, there being a better feeling, due to growing inquiry, especially for refined lead. Several large holders, anticipating better prices, have withdrawn from the market at present, and refuse to make sales for future delivery at present prices. Sales of 300 tons have been consummated at 3'40@3'42½c. for May delivery. Our market closes nominally at 3'40c.

Spelter.—Dull but firm at 4'60c. nominally.
Antimony.—Unchanged.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, May 16.

Anthracite.

Business has been very dull during the past week, and the immediate prospects are not particularly good. Transactions which do take place are based on lower figures. During the week, an effort was made to bring about a stoppage for the full week instead of three days only, but the objection to the original programme mapped out some time since was withdrawn. It appears to be the policy of the stronger companies to submit to the drawback of stocking the surplus coal, in order to afford the weaker ones an opportunity to keep their finances in fair shape. That they seem ready to make such sacrifices is certainly a good proof of the harmonious relations between them. The West is buying comparatively little coal, but the most of the companies shipping in that direction are active in filling up depleted stocks, a fact that to some extent counterbalances the disturbances in the markets of the Eastern States.

Mr. John H. Jones, official accountant, has published the following statement of the anthracite coal tonnage for the month of April, 1884, compared with the same period last year. This statement includes the entire production of anthracite coal, excepting that consumed by employes, and for steam and heating purposes about the mines :

	April, 1884.	April, 1883.	Difference.
Phila. & Reading RR.	1,062,357	578,518	I. 483,839
Central RR. of N. J.	*	413,796	D. 413,796
Lehigh Valley RR.	4565, 15	493,517	I. 72,298
Del., Lack. & Western RR	459,571	392,778	I. 66,792
Del. & Hudson Canal Co. .	2315,333	267,163	I. 48,170
Pennsylvania RR.	315,455	219,792	I. 37,663
Pennsylvania Coal Co.	136,041	119,991	I. 16,050
New York, L. E. & W. RR	31,638	26,155	I. 5,482
Total	2,828,210	2,511,710	I. 316,500
	For Year 1884.	For Year 1883.	Difference.
Phila. & Reading RR.	3,019,790	2,055,660	I. 964,139
Central RR. of N. J.	*	1,364,669	D. 1,364,669
Lehigh Valley RR.	1,717,069	1,835,543	D. 118,474
Del., Lack. & Western RR	1,454,364	1,410,798	I. 43,567
Del. & Hudson Canal Co. .	923,778	977,549	D. 53,771
Pennsylvania RR.	898,900	735,688	I. 163,212
Pennsylvania Coal Co.	382,686	418,888	D. 36,202
New York, L. E. & W. RR	105,336	102,166	I. 3,170
Total	8,501,932	8,900,961	D. 399,030

* Included in tonnage of the Philadelphia & Reading Railroad.

† This amount includes the production of the mines of the State Line & Sullivan Railroad Company, amounting to 7902 tons.

‡ In addition, there were 39,444 tons transported from mines by the Delaware & Hudson Canal Company, during April, which is included in the tonnage of other interests.

The stock of coal on hand at tide-water shipping points April 30th, 1884, was 859,450 tons ; on March 31st, 1884, 588,229 tons ; increase, 271,221 tons.

Bituminous.

Current orders are not numerous, though some of them are filled at comparatively fair figures.

Philadelphia. May 16.

[From our Special Correspondent.]

There has been an increase in inquiries from outside markets during the past week, and orders, especially from the East, are coming in more freely, although in no case are full requirements provided for. Consumers, as a rule, have very little faith in the ability of the anthracite combination to hold prices, in spite of their vigorous application of restriction. The chief reason why more coal is not shipped to New England at present is, however, that freight rates are too high to suit shippers, on account of the scarcity of vessels. But shipments are increasing, and will probably assume large proportions within a week or two. Prices are shaded for all kinds of coal, and the declining tendency will probably not be checked by the amount of restriction announced thus far, but it is believed that there will be more idle days. The facilities for production are so great that, even with the large restriction which has been enforced, the production falls less than 1,000,000 tons below the output for the same time last year. The anthracite companies are confident of being able to obtain firm prices in a short time, as in about a month heavy orders will probably be placed. Consumers in all markets are pursuing a very conservative course, and will do so as long as prices show weakness. Orders from the South are coming in slowly. The West is sending in small orders, but inquiries indicate that large quantities will soon be wanted there, as stocks are very low. The line and city trades are dull. Broken and egg are very abundant and hard to move, but the smaller sizes are in better demand. Stocks at Port Richmond to-day are 122,800 tons. The decline will be rapid as soon as vessels become a little more abundant.

The bituminous trade is very active. Production is large, and increasing steadily, and heavy contracts have been placed, and others are in negotiation ; but competition has reduced prices to abnormally low limits, and margins of profit are very narrow. Leading operators report most of the annual contracts placed. The Cumberland region produces about 60,000 tons a week, and the Clearfield region rather more.

Pittsburg. May 15.

[From our Special Correspondent.]

A summary of the trade this week would read : Railroad mining, busy ; river, generally idle ; and coke, unchanged.

The railroad Coal Trade Tribunal has finished one year of its existence, and at the first annual meeting held here reports were made up and a conclusion arrived at as to the benefits of arbitration under the Tribunal. The results are satisfactory to both sides, even if many first promises have failed to be fulfilled. Strikes have been much less frequent under it, and its power is becoming so universally admitted that a few more years will make it respected by all operators and miners. The workmen complain some that the last award was not lived up to by all operators, some of whom failed to put check-weighmen on their triples as required ; but, on the other hand, the operators say that no objection is made to the check-weighmen, and that the miners have been negligent and are to blame for any absence of check-weighmen. But these matters will regulate themselves in time. It would appear that the Tribunal has come to stay. All the miners are working full-time, and price on the wall remains at 5¼ cents. All the contracts expected this spring are in, and a fair amount of work is warranted throughout the summer if the iron mills do not close. Tonnage is good, and the delays over cars is largely remedied. There are no strikes at present, and the life of operator and miner has no events occurring out of the ordinary that would make good reading. Local trade is not quite as good as last week, as a number of mills have gone on single turn. One feature is the continued progress of natural gas as a competitor of coal. This is a never-wearying subject of talk with coal men, as they generally appreciate the danger to their business. It has already largely broken up the local market for nut, so that by far the greatest quantity of coal now shipped to foreign points is of three-quarter inch screen measure, where before but little less than 1½-inch screened coal was sent. Operators who have been compelled to sell coal to a number of mills below the market rate because of a threat to use

natural gas are beginning to see their mistake in postponing the inevitable, as other operators threaten to reduce price. This may bring about some unpleasant complications.

Just 5,810,000 bushels of coal went down the river on the rise of last Saturday ; 3,399,000 of this went to Cincinnati, where the price has been 8 cents a bushel and stocks small in first hands. It has reached there by this time, and will weaken prices, bringing them probably back to 7½ cents, where they were three weeks ago. At Louisville, prices have been holding their own at 7½ cents ; but as 2,411,000 bushels went to that market this week, that rate will hardly continue. No boats went out, but all barges were got away, the water rising just high enough. Already signs of activity may be noticed in the pools, and in another week, when the empties get back, mining will be partially resumed. The miners at O'Neil's and at Lysle's in the second pool refuse to work at the reduction offered them two weeks ago, and those pits have been idle since. They had some empties that might have been loaded but for that trouble. As it is, they still appear to be alone in the effort to reduce wages, as no other operators have yet given any indication that they intend to reduce to the same level. In the fourth pool, there are also some wages troubles, but it seems to be a habit up there. The talk of competition in the Southern markets still goes on, and to this is ascribed the fact that margins are very close and there is not much money in the trade. The year has not been remarkably satisfactory so far, and profits have not been large. The spring run was very short also. The resumption of work will not be full, as there will be too long a wait before the next coal rise.

The Pittsburg coke syndicate have a meeting on Saturday, the 17th inst., to consider what shall be done regarding production and price for the coming month. The 20 per cent curtailed production is not likely to be decreased, as shipments are now only averaging 700 cars a day, including that of the three independent operators. Thursday will continue to be a holiday throughout the region. Prices are as quoted previously, and are not likely to be changed. The ovens of Cochran, Moore & Raibeey, the independent operators, are running full-time. The Producers' Association is doing nothing to bring them to terms.

Buffalo. May 15.

[From our Special Correspondent.]

There seems to be a firm and united feeling among the anthracite coal dealers at this port. I have not heard of any cutting of rates thus far, and there is not that anxiety to procure orders that has been observable for some seasons past at this time of the year. Personally I have not had one solicitation to purchase. Perhaps there may be a change of heart when the trying time comes in the shape of a large contract. Trade may be quoted as very quiet.

The bituminous coal trade is without any new features. One thing is, however, noticeable, that for family use dealers make no reduction from old-time prices, and have not during the past fall and winter.

The stocks of bituminous coal are large, and consumers' cellars are well filled.

Coke is firm and unchanged in price ; trade, good.

The following article appeared in the Buffalo Courier on Sunday last. Perhaps it may be of interest to your readers : President Walston H. Brown, General Manager George E. Merchant, General Freight-Agent J. M. Sawyer, General Superintendent James T. Gardner, Chief-Engineer William E. Hoyt, Superintendent of Motive Power J. P. Hovey, Road-Master F. C. Whitelock, of the Rochester & Pittsburg, who, with Andrew Pierce, of Clifton Springs, one of the largest stockholders, have been on a tour of inspection, arrived in Buffalo last evening. In the course of a conversation with a representative of the Courier, President Brown said : " I notice that in your issue of last Saturday it is stated that the break in the price of coal in the Buffalo market is due wholly to the action of the Rochester & Pittsburg Company since the completion of the road to Buffalo. I would like to say, in answer to that statement, that the Rochester & Pittsburg has always been ready and anxious to maintain prices both on coal and on freights to Buffalo and other points. We offered to go into a pool with the Erie and the Buffalo, New York & Philadelphia, each to have one third of the tonnage of the coal entering the mar-

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (May 10-16), SALES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (May 10-16), SALES.

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 23,510. Non-dividend shares sold, 17,576.

BOSTON MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (May 9-15), SALES.

PHILADELPHIA MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (May 9-15), SALES.

ket. We considered this a fair proposition, because the Rochester & Pittsburg is the only direct and short line from the coal-fields to Buffalo, whereas, both of the other companies have longer lines and have to pay arbitrators to two other roads. Last winter, a meeting of all the coal producers in that basin and the three railroad companies transporting the coal to Buffalo was held in New York. After two or three days, an arrangement was perfected to limit the production whenever the market might be overstocked with coal. The producers signed the agreement, and also the railroads, with the exception of the Erie, which refused to sign any coal agreement whatever until the tonnage of the Rochester & Pittsburg was settled. We then offered to take one third of the tonnage, and the Erie and the Buffalo, New York & Philadelphia refused to accept any such offer. We have from that time to now been ready and willing to form a pool or agree on prices, but have found it impossible to make a fair and equitable agreement. We have never cut prices on coal to Buffalo, but have always been from ten to fifteen cents higher than the Erie, and have only made reductions when it was necessary to retain valuable customers, to whom they offered coal at much lower figures. Our contract with the Erie to use thirty-six miles of their road has nothing to do with the question of rates. When Mr. Blanchard, about two months ago, gave us sixty days' notice of the Erie's intention to abrogate the contract, we demanded an arbitration in accordance with the terms of the contract with the Erie upon that question. Finally the Erie consented, and nominated John A. Wright, of Philadelphia, formerly its representative at London, England. We took Chauncey M. Depew, and these two selected Allan Campbell, Ex-Comptroller of New York City. After they had presented their case, the Erie, learning that there was no question but that the decision would be against them, withdrew, as you were this morning advised by the associated press. The Erie has now brought an equity suit, the papers being served at five o'clock last evening, and the matter will be heard at Lockhaven, Pa., on Thursday next, the question involved being the same that came up before the arbitrators. They will give their decision Monday, but of course it will not amount to any thing under the new phase of the case."

A press dispatch from New York on Monday last says: The dispute between the Rochester & Pittsburg and the New York, Lake Erie & Western railroads was practically ended on Saturday. The Erie sent notice to the arbitrators that it would withdraw from the arbitration, with the understanding that the companies should be situated in the future just as they were before the dispute arose.

The Buffalo Courier is also responsible for the following article:

To all appearances, there is the greatest demoralization in the Buffalo soft coal market, and, what is worse yet, it is liable to continue. The Youngstown, Ohio, coal is coming into the market as a strong competitor, Brier Hill No. 1, an extra fine article, being quoted, delivered in Buffalo, at \$2.65. It comes via the Lake Shore and "Nypano," and has sold until now at \$2 delivered. Reynoldsville coal too, which has been selling at \$2.40, is coming in over the Rochester & Pittsburg at \$1.80, and coal men are holding up their hands in holy horror. The cause of this last drop was the New York Central order of 150,000 tons. The railroads are the ones most to suffer, for the coal is hauled on a contract for a percentage of the selling price. The Erie continues its \$1.05 rate, but is now in hot water at its Dagus mines, in Elk County, on account of a serious strike. A very large force was employed there, and unless the matter is soon patched up, the Erie will have to fill its contracts as best it can. It is also reported that Galusha A. Grow's men are all out at Brady's Bend mines in the Alleghany Valley. This, it is feared, will cause trouble on account of the 80,000 contract Mr. Grow has with the Grand Trunk. With the fine quality of Mahoning Valley coal at \$2.65, there can be no lack of coal, but the situation is not very assuring. The whole trouble is laid at the feet of the Rochester & Pittsburg and its contracting agents.

The coal committee of our Merchants' Exchange has reported that it is desirable for coal dealers and

others interested in the shipment of coal to meet every morning on 'Change and transact their business, instead of doing it by telephone and curbstone brokerage. It is thought that this plan would prove very beneficial to all concerned.

Freight engagements for the past week were at the following rates: To Chicago and Milwaukee, 75c.; to Racine, 85c.; to Duluth, 85 and 80c.; to Toledo, 40c.; to Green Bay, 75c.; to Sheboygan and Superior City, 85c.; and to Port Arthur, \$1.05 a ton net.

Canal shipments, three loads coal to Syracuse, 85c. per gross ton. Nominally asking \$1.10 to Albany and \$1.40 to New York.

The small sum appropriated last year to continue work on the breakwater at this port will be expended in constructing and sinking cribs. Workmen have been busy all winter building the cribs, and on Monday last the work of placing them in position commenced. Over 450,000 feet of timber have been used up already, and many tons of stone will be required to fill the cribs when sunk. Each crib is 50 by 36 feet, with 16 courses of timber.

Navigation is fully under way here. The first fleet from Duluth arrived Tuesday and Wednesday.

Receipts by Lake Shore & Michigan Southern Railroad for the past week were 552 tons, namely, 348 tons for Buffalo, and 204 tons for other points.

Shipments Westward by Lake from May 5th to 14th, both days inclusive, 75,429 tons, namely, 41,090 to Chicago, 16,079 to Milwaukee, 3030 to Toledo, 7740 to Duluth, 3050 to Racine, 1300 to Port Arthur, 2290 to Superior City, and 850 tons to Sheboygan.

The Canadian Pacific Railroad has agreed to make Fort William instead of Port Arthur the Lake Superior port of the company. The McKenzie government originally selected Fort William as the natural lake terminus of the railroad; but for political purposes, it is said, the present Canadian administration made the change before handing over the road to the syndicate. Immense sums have been expended to make a harbor of Port Arthur; but Fort William, situated at the mouth of Kaminestiqua River, affords an admirable natural harbor. This is a severe blow to Port Arthur.

Many of our anthracite coal dealers are at Toronto, Canada, to-day, preparing for the coal contract to be awarded to-morrow by the gas company. The bituminous brethren are also there for a similar reason.

The Lehigh Valley Railroad directors are said to be negotiating for the purchase of 65,000 acres of coal lands in the Snow Shoe region. This coal will pass to Mount Carmel over the Pennsylvania road.

Boston. May 15.

[From our Special Correspondent.]

There has been no large amount of business in any branch of the coal trade of this port for the week. It is at present a period of waiting. Jobbers can offer no inducements that are powerful enough to bring out business while the present demoralization of the city retail business continues. Quotations, f. o. b., are purely nominal at \$4 for Stove; \$3.65 for Broken and Egg; \$3.85 for Chestnut at New York. At Philadelphia, the nominal f. o. b. prices continue \$3.80@\$3.90 for Stove; \$3.40@\$3.50 for Broken and Egg. The absence of circulars for May occasions no comment. The value of circulars has now become very slight, and while they are quoted in some quarters, no one pretends to effect sales at circular figures. The transactions have continued small, and represent nothing of a stocking up trade frequently incident to this month. As has been said, the only thing to do is to wait. Jobbing prices, if lowered, would avail little; but this is a very unlikely result of the Boston troubles. The general belief is, that dealers will be left to fight it out without movement on the part of the general market, which, as all know, cares less for the Eastern consumption than it once did.

The pocket dealers maintain their quotations of last March on the small business that they are doing. For 100-ton lots, the quotations are: Stove, \$5.25; Egg, \$4.90; Broken, \$4.85.

Light trading continues in the gas-coal market for reasons already stated. It is claimed, however, that the cutting in this market is on inferior coals. The f. o. b. prices continue nominally: Philadelphia,

\$3.50; Baltimore, \$3.25@\$3.35; South Amboy, \$3.75.

In bituminous coal, only a few small orders are reported, with a dearth of contract business. A few cargoes of culm coal are coming along from the provinces on previously reported contracts. We learn of no further activity in this coal worthy of mention.

There is a steadiness in freights at the higher figures which we have now quoted for several weeks, particularly with regard to small vessels. We quote:

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

Retail trade is dull. There is little doing, and no one wants trade in the present unsettled state of affairs. We still quote wharf prices at \$4.75 for Stove and Nut, \$4.50 for Egg, and \$4.25 for Broken, with 50 cents added for delivery, which then leaves the gross price 50 cents below ordinary retail figures. The end of the unpleasantness does not seem to be immediately at hand. We quote delivered prices:

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

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ended May 10th, and year from January 1st:

Tons of 2240 lbs.	1884.		1883.	
	Week.	Year.	Week.	Year.
<i>Wyoming Region.</i>				
D. & H. Canal Co.	.....	1,102,991	51,296	1,203,779
D. L. & W. RR. Co.	31,944	1,537,199	71,814	1,521,793
Penna. Coal Co.	678	362,859	17,587	415,869
L. V. RR. Co.	.....	435,404	9,055	350,352
P. & N. Y. RR. Co.	.....	64,581	3,566	66,928
C. RR. of N. J.	*	*	36,583	822,348
Penn. Canal Co.	7,042	49,705	16,214	64,697
North & West Br. RR.	14,800	284,908	5,502	174,664
	54,464	3,837,647	211,617	4,620,430
<i>Lehigh Region.</i>				
L. V. RR. Co.	.....	1,399,576	72,071	1,586,635
C. RR. of N. J.	*	*	34,546	749,387
S. H. & W. B. RR.	6,511	73,299	3,064	15,153
	6,511	1,472,875	109,681	2,350,175
<i>Schuylkill Region.</i>				
P. & R. RR. Co.	957	3,280,613	107,437	2,203,513
Shamokin & Lykens Val.	*	*	26,127	452,462
	957	3,280,613	133,564	2,655,975
<i>Sullivan Region.</i>				
St. Line & Sul. RR. Co.	.....	25,960	1,160	21,219
Total	61,932	8,617,095	456,022	9,647,799
Increase	.....	.....	.....	.....
Decrease	.....	1,030,704	.....	.....

* Included in tonnage of the Philadelphia & Reading Railroad.

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

Total same time in 1879	.....	8,120,260 tons
" " " " 1880	.....	7,540,846
" " " " 1881	.....	8,912,430
" " " " 1882	.....	8,486,970

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 61,967 tons, as compared with the corresponding period in 1883.

Belvidere-Delaware Railroad Report for the week ended May 10th:

	Week.	Year. 1884.	Year 1883.
Coal for shipment at Coal Port (Trenton)	549	13,302	21,187
Coal for shipment at South Amboy	5,486	222,838	300,688
Coal for distribution	3,881	277,908	287,840
Coal for company's use	1,235	65,127	52,910
Total	11,151	579,175	662,625
Increase	.....	.....	.....
Decrease	.....	83,450	.....

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to May 16th.

PORTS.	From Philadelphia.		From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken.
	From Philadelphia.	From Baltimore.	
Alexandria.....	.65		
Annapolis.....			
Albany.....	.58		
Baltimore.....	1.40	1.50	1.00
Bangor.....	1.40	1.50	1.00
Bath, Me.....	1.25		1.00
Beverly.....	1.25		1.00
Boston, Mass.....	1.25@1.30	1.40	.90
Bristol.....		1.25	.55
Bridgeport, Conn.....		1.20	
Brooklyn.....	1.25		.90
Cambridge, Mass.....	1.30		.90
Cambridgeport.....	1.30		.90
Charleston, S. C.....		.70	
Charlestown.....	1.30		
Chelsea.....	1.25@1.30		.90
City Point.....			
Com. Pt., Mass.....	1.35		
E. Boston.....	1.25		.90
East Cambridge.....	1.25@1.30		
E. Greenwich, R. I.....			.80
Fall River.....	1.15	1.25	.75@.80
Galveston.....			
Gardiner, Me.....			
Georgetown, D. C.....	.70		
Gloucester.....			
Hartford.....		1.75	
Hackensack.....			
Hudson.....			
Lynn.....	1.45	1.50	
Marblehead.....			
Medford.....			
Milville, N. J.....			
Milton.....			
Newark, N. J.....		1.35	
New Bedford.....	1.15	1.25	.80@.85
Newburyport.....	1.40	1.75	1.05
New Haven.....		1.25	.55
New London.....		1.25	.60
New-Berne.....			.75@.80
Newport.....			.18
New York.....	.85	1.15	
Norfolk, Va.....	.55		
Norwalk, Conn.....		1.35	.70
Pawtucket.....		1.50	
Philadelphia.....		.75	
Portland, Me.....	1.25	1.40	
Portsmouth, Va.....	.55		
Portsmouth, N. H.....	1.40	1.40	1.00
Providence.....	1.15	1.25	.80
Quincy Point.....	1.35		
Richmond, Va.....	.75		
Rockland, Me.....			
Rockport.....	1.40		1.00@1.10
Roxbury, Mass.....	1.25		
Saco.....	1.35		
Sag Harbor.....			
Salem, Mass.....	1.25	1.40	.95
Saugus.....			
Savannah.....		1.15@1.25	
Somerset.....	1.05	1.25	
Staten Island.....			
Trenton.....		1.00	
Troy.....			
Wareham.....		1.40	
Washington.....	.70@.75		
Weymouth.....			
Williamsbz, N. Y.....			
Wilmington, Del.....			
Wilmington, N. C.....			1.00
St. Thomas, W. I.....			

* And discharging. † And discharging and towing. ‡ 3c. per bridge extra. § Alongside. ¶ And towing up and down. † And towing. ** Below bridge.

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended May 10th, and year from January 1st :

	—1884.—		—1883.—	
	Week.	Year.	Week.	Year.
Gallitzin & Mount- tain (Alleghany Region).....	2,788	47,938	1,941	44,064
West Penn. RR... Southwest Penn. RR.....	52	24,293	2,584	38,385
Penn. & West- moreland Re- gion, Pa. RR... Monongahela, Penn. RR.....	47,497	794,612	41,209	717,720
Pittsburg Region, Pa. RR.....	4,067	70,700	4,495	88,832
Snow Shoe (Clear- field Region)....	1,588	28,574		
Total.....		136	39	313
Increase.....	56,012	974,364	50,699	806,458
		77,906		

Comparative Statement of the Production of Bituminous Coal for the week ended May 10th and year from January 1st :

	—1884.—		—1883.—	
	Week.	Year.	Week.	Year.
Cumberland Region, Md. Tons of 2240 lbs. ...	60,566	832,978	49,775	731,187
Barclay Region, Pa. Barclay RR., tons of 2240 lbs.	6,651	125,464	6,554	123,976
Broad Top Region, Pa. Huntington & Broad Top RR., of 2240 lbs.	3,289	69,159	2,143	75,922
East Broad Top..... Clearfield Region, Pa. Snow Shoe.....				
Tyrone & Clearfield. 65,143	1,049,224	47,655	909,316	
Alleghany Region, Pa Gallitzin & Moun- tain.....	4,717	135,333	4,953	176,487
Pittsburg Region, Pa. West Penn RR.....	4,498	107,590	8,190	176,731
Southwest Penn. RR. 3,419	59,798	1,877	44,482	
Pennsylvania RR... 7,759	107,906	2,720	183,284	
Westmoreland Region, Pa. Pennsylvania RR... 26,110	396,782	28,426	504,794	
Monongahela Region, Pa. Pennsylvania RR... 3,852	60,388			
Total.....	186,004	3,010,141	154,987	3,108,512
Decrease.....		118,371		

Horsford's Acid Phosphate, Advantageous in Dyspepsia.

Dr. G. V. Dorsey, Piqua, Ohio, says: "I have used it in dyspepsia with very marked benefit. If there is deficiency of acid in the stomach, nothing affords more relief, while the action on the nervous system is decidedly beneficial."

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OFFICE HOMESTAKE MINING CO.,
MILLS BUILDING, 15 BROAD STREET,
NEW YORK, May 15, 1884.
DIVIDEND NO. 69.
The regular monthly dividend, TWENTY CENTS per share, has been declared for April, payable at the office of the company, San Francisco, or at the Transfer-Agency, New York, on the 20th inst. Transfer-books close on the 20th.
LOUNSBERY & HAGGIN,
Transfer-Agents.

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HIGSON, JOHN, F.G.S. Explosions in Coal Mines. 8vo cloth, plates. Manchester, 1878. \$5.
HUNT, T. STERRY, LL.D. Coal and Iron in Southern Ohio. 8vo, paper. Boston, 1881. 75 cents.
HYSLOP, JONATHAN, C.E. and M.E. Colliery Management. Second Edition. With Atlas of 17 Plates. Lond 1876. \$9.
MATHER, JAMES. The Coal Mines, their Dangers and Means of Safety. Lond. 1868. \$10.
PERCY, C. M. The Mechanical Engineering of Collieries. With 210 illustrations. Vol. I. Second Edition. 8vo, cloth. Lond. 1883. \$4.50.
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