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[WITH TWO SUPPLEMENTS.]

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THE METER AND THE METRIC SYSTEM.

The letter of Gen. VINTON, published in another column, is vigorous and interesting, and it may prove salutary to such as believe that the meter has an exact relation to natural and permanent dimensions. But we are not among that number, and we know of none among the intelligent advocates of the metric system who are ignorant that its unit is derived from erroneous measurements and calculations. What we want is the *system*, with its comprehensive harmony and commensurability of units of length, volume, and weight. We accept it, meter and all, because so large a part of the civilized world has already adopted it. Arguments about the origin of the meter and comparisons between it and hypothetical units are about as pertinent as those ingenious demonstrations by which the decimal notation is shown to be inferior to some other notation of which eight or twelve, instead of ten, should be the basis. Nobody can answer the arguments; but nobody cares for that.

On the other hand, the derivation of a unit of measurement directly from nature is neither so easy nor so important as Gen. VINTON seems to think. It is not important, because the practical standard always will be a metal bar; and the operation of comparing this bar with any natural magnitude, or of restoring it when lost, by new calculations and measurements, is one which will require to be performed very seldom. That being the case, it is of no consequence whether the unit bears a simple or a complex relation to any natural magnitude. It is quite immaterial whether the acceleration of gravity per second at Paris is ten times or eighteen times or any other number of times the unit. The unit once given, the relation can be determined with whatever degree of accuracy the nature of the case permits; and then, the unit being lost or needing correction, its proper length can be again determined by a reverse process. This is equally feasible for the meter, the yard, or any one of the innumerable feet and inches which infest the world.

But, on the other hand, the obtaining from nature of a unit which "will be there every time," as Gen. VINTON says, is not so easy as he seems to think. The acceleration due to gravity at any given point is not necessarily constant, though it is assumed to be so; nor is the sidereal day absolutely invariable, so far as we can judge. It is now longer by one part in 2,700,000 than it was 720 B. C. The progressive cooling of the earth and the dissipation of energy by tidal waves may be among the causes of this change. But the acceleration of gravity depends on the changing shape of the earth, and this element has never been measured. It may be admitted that these causes of variability are trifling; but that does not answer the criticism. Moreover, the practical difficulty of measuring the acceleration of gravity is very great. Probably Gen. VINTON would recommend the use of the pendulum. But no one who has attempted to determine the length of a pendulum will admit that it is easy; for the length required is the distance from the center of suspension to the center of oscillation. Now, there are no direct means of determining the latter point. Prof. W. STANLEY JEVONS (in *The Principles of Science*, p. 315) discusses this point, and refers also to the numerous questions concerning resistance, friction, etc., which require empirical or hypothetical equations of correction. In GRANT'S *History of Physical Astronomy*, we believe, it is shown that all the experiments made for the British government to determine the ratio between the standard yard and the seconds pendulum were vitiated by errors in these corrections. Prof. JEVONS concludes his chapter on the subject by saying, "Thus it is found that the pendulum standard cannot compete in accuracy and certainty with the simple bar standard; and the method would only be useful as an accessory mode of restoring the bar standard if at any time again destroyed."

Prof. CLERK MAXWELL has suggested that "in the present state of science the most universal standard of length which we could assume would be the wave

length in vacuum of a particular kind of light emitted by some widely diffused substance, such as sodium, which has well-defined lines in its spectrum." This is approved by Prof. JEVONS, who says that there can be no reasonable doubt that vibrations of light are, as far as we can tell, the most fixed in magnitude of all phenomena. But the whole matter is, declared to be one which possesses theoretical interest, but no present practical importance.

When Gen. VINTON, therefore, proposes the acceleration of gravity as furnishing the best, most accurate, most available standard of measurement, we reply that we can refer the meter to that standard as easily as he can the foot or yard; but that the accuracy of it is not absolute, since nobody can absolutely measure the acceleration of gravity, or even directly measure the length of the pendulum, and hence we do not agree with Gen. VINTON that this natural standard "can be measured more accurately than any line on the earth's surface." And whether this be so or not we do not see that it at all concerns the practical convenience and importance of the metric system. *

WATER GAS.

A very interesting paper upon the Lowe process, from the pen of Mr. ROBERT BRIGGS, of Philadelphia, appeared, much to our surprise, in the conservative columns of our contemporary the *Gaslight Journal* of the 17th inst. This paper was suggested by Prof. MORTON'S Harrisburg report, of which Mr. BRIGGS says: "Prof. MORTON'S analysis may be accepted fully, as exhibiting the most favorable production of this gas as a process." This statement is doubtless subject to qualification, because, among other reasons, the gas analyzed was unpurified, as our readers have already been informed by a correspondent in these columns, and because the accuracy of the analysis is still questioned. The article is an extended one, and shows so much familiarity with both the physics and chemistry of the subject, that we gladly reproduce as much of it as our space will permit.

The interest which the readers of this JOURNAL have in the question of water gas is not at all a controversial one, nor is it confined or even principally in the manufacture of illuminating gas. The experiments already made seem to have demonstrated the very important fact that both heating and illuminating gas can be economically manufactured by this process from peat, lignite, anthracite culm, and probably from any kind of coal. Mr. BRIGGS'S paper treats of the illuminating gas only, though the points made are of general interest. He says:

"The claim of the 'Lowe process' is that 50 pounds of anthracite and three gallons of petroleum (benzine) will make 1,000 cubic feet of illuminating gas of somewhat above standard quality on an average production. It is understood that about 4,000 cubic feet is the result of each effort or 'run' of the process. Reducing Prof. MORTON'S figures, there appears to be requisite for the production of 4,000 feet of the gas:

- 65.1 pounds of water in the form of steam.
- 38.8 pounds of carbon in the form of anthracite coal devoid of ash.
- 79.4 pounds of hydrocarbon in the form of petroleum* products of destructive distillation of benzine or petroleum.
- 2.7 pounds of atmospheric air.

186.0 pounds of gas of 0.62 density = 0.0465 lb. per cubic foot at 70° = 4,000 cubic feet in all. (In fact this gas must have had 1 to 1.25 per cent. in volume of aqueous vapor, but it may be supposed that Prof. MORTON neglected this in his analysis, and refers to dry gas.)

"If such gas, as Prof. Morton describes, can be made as a general thing from the materials claimed by the Lowe people, without inordinate wear upon the apparatus, the success of this new water gas project is but a question of time.

"In the absence of any specific gravity figures for the Harrisburg gas, the density of the vapors or gases designated as olefines can be taken to agree with that of olefiant gas (=0.981) when a careful computation of the data, which is otherwise ample for the exactness of this statement, gives a specific gravity of 0.62; that of ordinary coal gas, of 14 to 15 candle power, being 0.43. The same computation which gives the density finds nearly the same quantity of carbon present as in the same weight of ordinary coal gas; but as the volumes of these gases vary inversely with their specific gravities, that is, as 0.43 to 0.62, it follows that a cubic foot of Harrisburg gas contains 44 per cent. more carbon than a cubic foot of ordinary coal gas. Here again the data fails; no report of the illuminating value of Harrisburg gas accompanies the analysis. If this is on an equality in illuminating power with coal gas, then 44 per cent., and not 70 per cent., as given by Prof. MORTON, more of carbonic acid gas will be evolved in giving equal light in equal time.

"The remainder of Prof. MORTON'S paper, referring to the character of this gas, in regard to its suitability for public use for illuminating gas, is open to grave question as to the facts and deductions, and seems to demand an answer to prevent a popular spread of such views. The issue was made, considered, and determined years ago, not only with 'water gas,' but with other coal gas of any kind. Undoubtedly, the presence of even a few per cent. of (any illuminating gas as well as of) this gas in the air of a room renders it utterly unfit for breathing, and often even fatal. But carbonic oxide gas is not 'one of the most virulent and dangerous of gas poisons,' and no serious difficulty does arise from the presence of carbonic acid gas, whether resulting from the burning of carbonic oxide, or of carbon in other conditions of gaseous combination, in vitiating the air of rooms as usually constructed and occupied, where illumination, in the ordinary sense, proceeds from such burning.

"As a gas, carbonic oxide, pure and simple, is but in the least degree more dangerous than ordinary coal gas. The Professor can try for himself on the lower animals, and I am convinced he will find poor 'pussey' quite as quickly affected, and quite as difficult to resuscitate, and quite as little poisoned with the second as with the first; and that the percentage of gases present in the air necessary to produce asphyxiation in nearly equal times will not materially vary. From personal inquiry which I made a few years since at a gas works, where a water gas process continued in use for a long time, I obtained such information as to induce me to believe that no poisoning whatever followed the inhalation of carbonic oxide. It did seem to be more active in causing insensibility, in knocking a man over, as a workman said, but no real disaster, or even serious case of suffocation, ever happened. Headaches, of the same intensity of discomfort as those which follow the accidental breathing of coal gas, were the worst resulting effect. Certainly any one who will breathe an atmosphere largely composed of coal gas will be suffocated, unless promptly removed from the locality. . . . The chance of any person surviving who goes to sleep with an extinguished open gas burner

* In this estimate of petroleum I take the proportion of marsh gas to olefines as that given by Prof. Morton, considering the density of the olefines to be equal to that of olefiant gas—an approximate result, of course, follows.

in his closed room, and remains unawakened until morning, is not very great. What, however, I wish to show distinctly is that there is little choice as to whether the gas of suffocation, in such case, shall be thirty per cent. of carbonic oxide, or have the same thirty per cent. substituted by marsh gas.

"As to the final economical or practical result of this process I express no opinion; it remains to those who are interested in it to develop it if they can; but it is clearly proper that it should have a fair chance on its merits, and that it should not be condemned upon the hypothesis that it is especially dangerous above ordinary coal gas, or that it is too dangerous to use.

"There is, however, one other question of great public interest, in connection with this and other novel gas processes, which are being offered to form the bases of rival gas companies in our cities. Is it really good policy for our legislators to grant, or for our capitalists to encourage, or a sound political economy for our writers to advocate, the wholesale destruction of property which is involved in the formation of a new gas company, to occupy the best portion of a city already provided with means for supplying any demand for gas lighting?

"That man may be a great benefactor to his species who makes two blades of grass grow where one grew before; but it may remain a mooted point whether the inventor, who has succeeded in getting two capitals and two supplies for one demand, has really achieved what is conducive to the public good.

ROBT. BRIGGS, C.E.

PHILADELPHIA, December 5, 1877."

It is to be regretted that an article so perspicuous in chemistry and physics should drift into such a fog in the political economy of the subject. We suspect that Mr. BRIGGS has been influenced by the argument of his distinguished countryman, JOHN STUART MILL, against the multiplication of gas, water, and railway companies, and as that argument is just now being largely quoted by the same conservative interest that has so fondly relied on the carbonic oxide "bug-aboo" to ward off competition, it deserves brief analysis.

The gist of Mr. MILL's reasoning is that, "were there only one establishment it could make lower charges consistently with obtaining the rate of profit now realized." Doubtless it could, but would it? Is not competition an indispensable factor in the adjustment of supply and demand, especially of the prime necessities of life, among which in our present civilization may be reckoned artificial light? Mr. MILLS says:

"When, therefore, a business of real public importance can only be carried on advantageously upon so large a scale as to render the liberty of competition almost illusory, it is an unthrifty dispensation of the public resources, that several costly sets of arrangements should be kept up for the purpose of rendering to the community this one service. It is much better to treat it at once as a public function, and if it be not such as the government itself could beneficially undertake, it should be made over entire to the company or association which will perform it on the best terms for the public."

The force of this argument, as applicable to gas companies, depends on the assumption that, so far as process is concerned, they all stand on the same plane in the cost of production and distribution, and its weakness consists in its leaving out of calculation any advance in the arts of manufacture. Suppose, for example, that the electric system should be found to supply, as is not improbable, a vastly better and cheaper illumination than that of our present gaslight, should the "company or association" to whom the business of gas-lighting had been previously "made over entire" prevent its introduction? And, as Mr. MILL goes a step further in applying the principle to parallel railways, should we not remonstrate with the Elevated Railway Company of New York for depreciating the stock of the horse car roads?

Mr. BRIGGS admits he is "a benefactor to his species who makes two blades of grass grow where one grew before;" but how, we inquire, is this feat accomplished? Is it not by the application of labor and the expenditure of fertilizing agents, both of which are capital, and if so be that in his effort to bring in clover he crowds out wire grass, is he not so far guilty of a "destruction of property?" It seems to be established that the Lowe process can furnish a superior light to the consumer at a considerable reduction from the old prices—and the frantic opposition of the old companies seems to show that they are aware of the fact. This, we believe, has been the result in various places where the system is operating. We presume its owners would, on general business principles, be quite as ready that established companies should make the gas as to undertake the introduction of a new plant everywhere themselves. But if the old companies will not adapt themselves to the necessities of the times, then we predict that intelligent communities will follow Mr. MILL's suggestion to its true application, and give their patronage "over entire to the company which will" accept it "on the best terms for the public."

Mr. MILL's argument adopted by Mr. BRIGGS, while quite correct in theory for a millennial state, where the lion will lie down with the lamb and every man will have a scrupulous regard for the rights of his fellows, is not adapted to the present condition of human morals, and the only possibility of securing progress and economy in manufacture or safety for the public lies in wholesome competition among those who serve it, and this is as true in gas manufacture as in any other branch of industry.

THE LEACHING PROCESS IN NEVADA AND COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

It is stated that the lixiviation works recently erected at Ione and Ward districts, Nevada, have not proved successful.

Lixiviation, at present, is a term applied, rather erroneously, to all metallurgical processes where the metals are dissolved out of the mass of crushed ore by either water or some other chemical solvent. There are many modifications of the system, depending, first, on the nature of the solvent—water, brine, chlorinated brine, protochloride of iron, chloride of copper, and other chlorides—and second, upon the nature of the precipitant which draws out the precious metals from their solution. The process, in principle, is several hundred years old. What are known as Ziervogel's and Augustin's processes are perhaps the most

original of the class. Others are the Hunt & Douglass, and the Stewart; the Brunton chloride leaching, and the hyposulphite process. It will be seen, therefore, that lixiviation, or leaching, as a metallurgical process, is as susceptible of modification as smelting; and, if chloride leaching was employed disastrously at Ione, Nev., and successfully at Caribou, Colo., the probability is that the Ione ores were not so well suited for that process as those at Caribou—always supposing that the skill employed in both cases was equal.

Again, leaching, or lixiviation, is a correct process only on certain classes of mineral. Though it has been puffed and praised by ignorant writers beyond all reason, yet it will not succeed everywhere; exactly as amalgamation fails in certain cases.

The Caribou ores (where lixiviation has undoubtedly succeeded) are highly quartz ore, and contain but little base metal. When, therefore, they are placed, after being properly washed, in a dissolving reagent, the solvent is not overloaded, and the process advances economically. On the other hand, the ores of Ione and Ward districts carry quite large quantities of both lead and copper—the latter not, perhaps, enough to warrant smelting works, but enough to prevent the successful operation of a leaching establishment, if not preceded by dressing machinery to separate the heavier minerals. There appears to be, therefore, no cause of alarm on this subject. Probably, the judicious expenditure of a little chemical and metallurgical skill will determine the cause of the failure and suggest the remedy.

NEW PUBLICATIONS.

ANNUAL REPORT OF THE COMPTROLLER OF THE CURRENCY TO THE SECOND SESSION OF THE FORTY-FIFTH CONGRESS OF THE UNITED STATES, DECEMBER 3, 1877. Washington.

In the peculiar financial experiences through which the country has been passing since the war, the annual reports of the Comptroller of the Currency have been among the most important of the documents laid before Congress. Mr. JOHN JAY KNOX, the present Comptroller, has won a hearty appreciation among experts at home and abroad, by the clear, forcible, and comprehensive character of his reports. The one before us, while it contains less material of general popular interest than was afforded by the history of banking in the report of last year, is, nevertheless, timely and instructive beyond its special statistical value. The three most important points are, the proof that specie (gold) resumption is feasible; the argument against the excessive taxation of national banks; and the recommendation that the 4 per cent. consols of the United States be permitted to be used by the banks as a portion of their reserves. Coupled with this, Mr. KNOX recommends the issue of small 4 per cent. bonds (under fifty dollars), as an investment for the savings of the people, which bonds, being available to the banks for their legal reserve, would be always negotiable. That some relief should be afforded to the banks is plain enough from the elaborate statements of this report, and from the simple fact that they are voluntarily surrendering their circulation, which has decreased from \$348,516,478 (its maximum) in January, 1874, to \$315,881,990 in November, 1877. In speaking of the coin in the country, Mr. KNOX gives an estimate made by the Director of the Mint, placing the amount of gold coin and bullion in the United States, October 31, 1877, at about \$185,000,000 in value, while the silver coin and bullion amounted to about \$50,000,000. Reasonable persons will be likely to conclude that both these metals are needed to maintain a convenient currency of specie and redeemable paper, and will advocate the only system by which both can be maintained in concurrent circulation. Of course it is plain enough that to "demonetize" gold (as the BLAND bill, in fact, does) is to leave no basis at all for resumption.

ANNUAL REPORT OF THE DIRECTOR OF THE MINT TO THE SECRETARY OF THE TREASURY, FOR THE FISCAL YEAR ENDED JUNE 30, 1877. Washington. 1877.

Dr. LINDERMAN's report, like those which he has made in former years, is full of information, clearly stated, and well arranged. In addition to this there is a brief argument on the question of silver remonetization, and the double standard, which puts the theory of the case in a nutshell. The Director maintains the courage of his convictions, and declares, in spite of all the clamor of the times, that the legal tender of the silver dollar should be limited to an amount sufficient to prevent it from expelling gold from the country. This is a very neat phrase, and carries within it a whole argument. Another argument is skillfully suggested by the notice that, if the double standard should be established, and the coinage for depositors of unlimited legal tender silver dollars should be authorized, the mints and treasury offices will need to have new and larger vaults at once. The fact suggested is that under such a system all holders of silver will at once rush with it to the nearest Treasury office, deposit it, and receive for it certificates, redeemable at any time in silver dollars. These certificates, being much more convenient than the dollars they represent, will circulate in their stead, and the Government will be in the position of custodian, without pay, of immense quantities of silver bullion. The amount which the mints, running at full capacity, can coin in a year, is \$24,000,000; with extra appropriations, extra force, and some risk to machinery and to accuracy of work, perhaps \$30,000,000. The amount which would be deposited is, of course, much larger.

The director makes the following estimate of the "present average production" of gold and silver from the mines of the United States, "based upon the production for the first six months of the year, and the average monthly turn-out since, so far as it was possible to ascertain the same." We infer (since the

report is dated in November) that the estimate is made for the calendar year 1877:

State or Territory.	Gold.	Silver.	Total.
California	\$15,000,000	\$1,000,000	\$16,000,000
Nevada	18,000,000	26,000,000	44,000,000
Montana	3,200,000	750,000	3,950,000
Idaho	1,500,000	250,000	1,750,000
Utah	350,000	5,075,000	5,425,000
Colorado	3,000,000	4,500,000	7,500,000
Arizona	300,000	500,000	800,000
New Mexico	175,000	500,000	675,000
Oregon	1,000,000	100,000	1,100,000
Washington	300,000	50,000	350,000
Dakota	2,000,000	.....	2,000,000
Lake Superior	.....	200,000	200,000
Virginia	50,000	.....	50,000
North Carolina	100,000	.....	100,000
Georgia	100,000	.....	100,000
Other sources	25,000	25,000	50,000
Total	\$45,100,000	\$38,950,000	\$84,050,000

Dr. LINDERMAN expects that there will be a gradual increase of annual product in Arizona and Montana, and does not look for a decrease anywhere else, unless by the giving-out of the Comstock bonanzas in the State of Nevada. The yield of bullion from the Consolidated Virginia and the California, the two great bonanza mines, since the discovery of the ore chimney in 1874, has been \$78,852,918, of which \$36,736,348 was gold. These mines are now (November) producing at the rate of three millions monthly. *

NOTE UPON THE COST OF IRON RAILS AS MADE IN 1866 IN A LEADING ENGLISH RAILWAY COMPANY'S ROLLING MILL.*

By P. Barnes, New York.

The tabular statement accompanying this note shows the money cost in each of the three departments of manufacture, of 17 leading items, and also the proportion (expressed in a decimal fraction) which each of these items bears to the total cost.

The statement can hardly be taken for more than an average illustration of the clear showing of ratios and of results which may be made by such an arrangement, for not only will these items vary from month to month in any given works, but the methods themselves of manufacture differ widely in different works.

It is obvious that such a statement, however useful it may be, must be submitted with but exceedingly little explanation or discussion, or with none at all, for the reason that to enter at any satisfactory length upon the merits of the case would require a paper far exceeding the limit of this note:

COST OF ENGLISH IRON RAILS, 1866.

Item.	Classification	Puddling Forge.		Blooming Forge.		Rail Mill		Item.
		Money cost.	Fraction.	Money cost.	Fraction.	Money cost.	Fraction.	
1	Coal	£126	005	£255	055	£289	028	1
2	Pig iron	1,460	427	.....	.....	.....	.....	2
3	Scrap iron	473	135	78	016	70	007	3
4	Old castings	96	019	.....	.....	.....	.....	4
5	Turnings	249	073	.....	.....	.....	.....	5
6	Puddled bars	.....	.....	.....	.....	3,515	349	6
7	Old rails	.....	.....	3,591	754	436	048	7
8	Cobbles, etc.	.....	.....	140	029	.....	.....	8
9	Scrap from blooms	125	036	.....	.....	.....	.....	9
10	Blooms	.....	.....	.....	.....	4,634	462	10
11	Labor	44	128	515	114	742	073	11
12	Fire brick and clay	45	013	15	003	.....	.....	12
13	Castings and bar iron	132	038	30	00	.....	.....	13
14	Repairs	138	014	.....	.....	72	007	14
15	Stores	23	007	26	005	92	039	15
16	Interest on capital	25	007	75	016	100	030	16
17	General expenses	17	005	17	004	65	006	17
18	Total footing	£3,429	.....	£4,772	.....	£10,073	.....	18
19	Unit footing	.....	1000	.....	1000	.....	1000	19
20	Credit deduction	.....	.....	16	.....	837	.....	20
21	Total cost, £ sterling	£3,429	.....	£4,636	.....	£9,236	.....	21
22	Product, 4 weeks, tons	.....	tons, 590	.....	tons, 1009	.....	tons, 1101	22
23	Cost per ton, £ sterling	.....	£5 81	.....	£4 59	.....	£8 59	23
24	" " American gold, \$4.84	.....	\$28 12	.....	\$22 21	.....	\$31 89	24

COLORADO STOCKED MINES.

Staff Correspondence of the Engineering and Mining Journal.

The American Mine has recently declared a dividend of one per cent. We are informed, on good authority, that the mine is not producing enough ore to cover this dividend. Prospecting in the American is going on vigorously, with, as yet, no results of any importance. The reported great strike has not turned out to be as valuable as was at first supposed.

The Hukill is employing about thirty men and is producing heavily. Work has been begun upon the stopes, which show nearly \$600,000 in sight. We understand that the mine is, at the same time, being further developed.

The Miles Concentration Works, at Idaho, are handling all the ore, the low grade being dressed, while the high grade is being sampled and sacked for shipment. The Hukill we believe to be now under good and careful management. It is thoroughly capable of paying good dividends out of ore produced, and is, in every way, a good stock for investment.

The Bobtail, the finest mine on the New York Exchange List (from Colorado), maintains a steady and even yield, and has done so for some time past. It is under the best of management, and is so extensively developed as to preclude all danger from occasional pinches in the vein.

The Belle of Memphis property is still idle. This stock was killed by rascality among Wall Street Brokers, and will require some time for revival. The mine is a good one, however, shows an unusually large body of quartz on the surface, which can be made immediately available if the necessary works for its treatment are erected, and should be able without difficulty to support its capitalization, if provided with working means and managed

* A paper read before the American Institute of Mining Engineers, at the Wilks-Barre meeting, May, 1877.

with care. The recent newspaper attacks on its principal owner, and on others connected with it, have fallen to the ground of their own weight, and it has been ascertained that the Colorado correspondent of a contemporary publication, who furnished all the thunder for the attack, had never been in the mine, and was therefore thoroughly incapacitated from passing judgment upon it. The Memphis is as yet but slightly developed, but presents many features of encouragement to one who examines its prospects intelligently and honestly.

The Seaton is still idle. An incumbrance of \$3,000 rests upon it, as a legacy of the old management—money borrowed to pay dividends with. The company is endeavoring to lift this obligation. Gen. F. L. Vinton, the superintendent, will begin work as soon as this is done. The mine is undoubtedly one of value. It shows a vein that is regular, strong and highly ore-bearing. The property needs, however, some additional development, and some machinery. If re-opened under the present superintendent, it will, beyond question, be honorably and wisely managed.

UTAH MINING NEWS.

Special Correspondence of the Engineering and Mining Journal.

THE BINGHAM CANON GOLD STRIKE.

Some six months since rumors were circulated of a rich gold strike in Bingham. The fact proved to be that rich gold quartz was struck in the Rainbow and Steamboat claims, on the west side of the mountain dividing main Bingham from the head of Muddy Gulch. Considerable quantities of quartz showing free gold were extracted, and as there was promise of the ground proving valuable there was no difficulty in finding a number of owners. As much of the ground lay within the patent of the Jordan mine, a compromise was effected satisfactory to all parties, and the property saved. This strike is either on the same vein or a parallel one to that on which the Last Chance, owned by an English company, is located. The Last Chance is one of a system of veins in porphyry, found near the head of Bingham Cañon and its branches, contained either between porphyry walls or between the porphyry and quartzite. They are, in some cases, of later date than the great lead veins, and are distinguished by the different character of the ores contained, as well as by the difference in occurrence, the first being fissure veins cutting the strata in dip and course, the lead veins, however, conforming in general to the lay of the strata. The ore found in the fissure veins is a mixture of blende, galena, iron, copper, and arsenical pyrites, with the silver occurring in several forms, and usually a notable quantity of gold. I have also detected the presence of tellurium and selenium in some of these ores. The percentage of lead is usually low, and that of zinc high, while the silver content is very variable.

THE "LAST CHANCE" OF THE BRITISHERS.

From the upper works of the Last Chance ore was taken which assayed very high in gold, the last shipment being somewhat over \$300. This ore from the upper works found a ready market, owing to the silver and gold content, but at a depth of about 400 feet on the vein the water level was struck, when, the character of the ores changing from oxidized to sulphuret, they were no longer salable at fair rates on account of their refractory nature. The vein is from two to four feet wide in the lower works, below the lower tunnel, and the ore is rich, but being unsalable in its natural condition, and the company having no money to spend upon dressing works, the property has lain idle for upward of a year. The end will probably be that this property will go where nearly all other English mining property has heretofore gone—be sold to satisfy some small judgment, and, the term of redemption having expired, pass out of the hands of the company. Doubtless the English mining investor is a much abused individual, but if a balance was struck between his merits and receipts in the majority of cases the sums would balance. Their mismanagement is proverbial, but is not their only fault, as dishonesty toward their creditors is frequently an accompaniment. The average company in Utah has always been willing to draw every dollar from its mines which they will produce, and pay no bills for supplies as long as they can delay. When the time of settlement finally comes, should the mine not show that there is profit in paying up, then the creditors can do their best, the property is abandoned, and the stockholder is swindled by the Yankees. But they have just taught the Yankees a new trick by giving one and the same person three powers of attorney, one for the company, one for the trustees, and the other for the debenture holders. No one knew exactly who was running the concern, and as the attorney denied his responsibility in his several capacities, and as the mine was not liable, why creditors could whistle. The plan, you notice, is ingenious. Should any one wish to make his mining investments pay for a certainty, this plan can be commended, though for the credit of our national Yankee reputation it did not originate with us.

THE FLAGSTAFF.

To equalize this disadvantage, however, the Yankee nation has captured the Flag-staff mine, which is now owned by W. S. McCormick, who bought it in at sheriff sale, held it six months for redemption, and then received his deed. What the next move is cannot be guessed, but probably a notice that the company has been swindled. In any event it is now without mine or other property, and unsettled debts to the extent of over \$300,000. The Englishmen cannot complain of any one but themselves, since they have had ample warning of the condition of affairs through a party who, disappointed in his aspirations to become the resident agent of the company, has devoted his time gratis to publishing all the accessible facts and rumors in regard to the company's affairs. The probability is, that before long the Flagstaff shareholders will be called on for voluntary assessments, amounting to more than the company's indebtedness, for the purpose of suing some one for doing what they failed to do—conducting their business in a capable manner, and taking advantage of a good thing. I wonder how it is that most people lose all they have invested before they learn that mining requires some little business caution, and, being a speculative affair in general, should no more be allowed to care for itself than mercantile ventures.

THE OLD TELEGRAPH.

Yesterday, eleven of seventeen suits were commenced in the courts here against L. E. Holden, of the Telegraph Company, by his former fellow shareholders in the company, they alleging breach of trust and conspiracy to defraud on his part, and asking the rescission of the purchases of their stock, on the ground that the sales were made upon the basis of representations showing the mine to be non-productive, while it was, in reality, paying large profits.

And so it goes. Pending the decision of the above suits, the appointment of a receiver is asked. It is to be hoped that matters may be so arranged that work may continue in the company's mines, and the ores continue to come in the market, as the output from these mines constitutes the principal lead ore supply of our market.

S. C.

SALT LAKE CITY, December 9, 1877.

A HISTORY OF TUNNELING DURING THE THIRTY-FOUR CENTURIES
SUCCEEDING THE REIGN OF RAMESES II.* — II.

HINDU TUNNELING.

The Hindu caves and rock-cut temples are not as ancient as those of Egypt, the oldest dating back only to between the second and third centuries B.C., whereas the Ipsamboul Temple, above described, is said to date back as far as 1500 B.C., or to the reign of Rameses II.

These Hindu caves occur in groups, the number in a group in some cases reaching as high as 100 distinct excavations. It has been estimated that, in all, there are not less than 1,000 of them, of which 100 may be of Brahminical or Jaina origin, and the remainder Buddhist; the large majority of the latter being used as monasteries. Nine-tenths of the caves now known are within the confines of the Bombay Presidency; owing probably to the fact that the rock in that locality is especially adapted to the work, being composed of various trap formations of uniform texture, and occurring in abrupt perpendicular cliffs with few flaws or faults in the rock. The earliest work seems to have been done about 543 B.C., in improving the Satapanni Cave in the Behar group in Bengal; this, however, was simply a natural cave embellished with ornamentation.

The earliest cave excavated is the Sudama or Nigope Cave, cut in the twelfth year of the reign of Asoka, or about 260 to 264 B.C. Fig. 3 shows the facade of the cave at Bhaja, also of about this date; and it is interesting to note that in these early examples of stone work, the columns slope inward. The reason assigned for this curious conformation is that the caves were cut in imitation of the earlier wooden roofed temples, and the supports were thus sloped with Eastern fidelity to detail, so as to conform to the inward slope of the rafter supports of their wooden structures. Later come the caves of Nassick, about 129 B.C. It should be noted that, in all this most beautiful early tunnel work, there is not a particle of stucco or masonry. It was all pure laborious cutting with hand tools in the hardest of rock; and, undoubtedly, except perhaps in the center excavations of the largest caves, it would have been out of the question to risk shaking or cracking the rock by any fire-setting excavation.

The caves of Karli date about 78 B.C. Figs. 5 and 6 show the ground plan and elevation of the largest one, and Fig. 4 a view of its interior; in it we see that the early architectural defects are gone; the pillars of the nave are quite perpendicular, and in it the style of ornamentation reached a perfection never afterward surpassed in the Indian temples. The Karli caves and those of Ellora are the most magnificent in India; the latter range from 200 to 300, and some perhaps to 600 A.D., and their passages and excavations amount in all to over two leagues of underground work, a pretty strong example of primitive tunneling, executed by men who, though they perhaps knew of gunpowder, certainly seem never to have applied it to blasting, and to whom dynamite was not even a visionary suggestion of the distant future. Later came the caves of Salsette (about 500 A.D.), and those of Elephanta (about 800 A.D.), both on islands near Bombay. Still later (about 1400 A.D.) the Gwalior caves were excavated; these were among the latest cut, and are located further north than any of those previously cited.

Among the very famous open air rock-cut temples of India should be mentioned those of Bamian, in Afghanistan, cut in the rocky sides of a pass through the Hindoo Koosh range. These open air temples, however, though undoubtedly rock work, are not connected with tunneling proper. Many of them, it is said, have been defaced by the vandalism of the English. This we can readily believe; troops, for instance, who would stable their horses on the magnificent tessellated floors of Delhi, would not hesitate to deface what would appear to them the ruder structures of a so-called uncivilized race. Indeed, we are told that the barbarous civilization of the nineteenth century has actually sanctioned the construction of a railway through the Bamian Pass, in the course of which many of these beautiful temples have been destroyed.

THE METER AS A STANDARD.

By Gen. Francis L. Vinton, Denver, Col.

We need a straightforward decimal system of weights and measures, and, practically, it matters little what unit of length the system is based on, provided it have some convenience and permanence; but when nations are urged to adopt a general standard, an unexceptionable one should be selected, and the metrological societies would do well, therefore, to propose some better dimension than the meter, which the French themselves are ridiculing, at the very time we seem to fancy it a magic thing.

Those Americans who have studied more or less in the French and German schools, and still incline to this fancy, will find increasing difficulty to force the meter into practical building here, because at present every carpenter's and mason's rule is divided, at least on one side, into feet, tenths, and hundredths, so securing the facility of the decimal notation, which is the sole advantage of the metric system.

Were our pound and bushel referred decimally to the existing "foot" as a standard, we should be equipped as scientifically as any people in weights and measures; but if the whole question be made to hinge on the desirability of some universal criterion, we may, before we approve a change, at least demand

that the standard be something in nature fulfilling certain rational conditions. Some length, in short, positive, exact, invariable, and, above all, easily got at by direct observation, without elaborate calculations, involving partial developments, all sorts of approximations, incommensurable quantities, coefficients, and factors absolutely incorrect, or totally unknowable.

An actually measured length between two indestructible points on the ground, might suffice, awkward as it is, but the meter bears only a false resemblance to that. It is supposed to be, and was seriously intended to be an aliquot part of a meridian of the globe, a ten-millionth part of a quarter, as is quite historic. But no quarter of a meridian has ever been measured, or ever can be; and, moreover, the figure and dimensions of the earth, independent of its weight, considered as standards of precision, are preposterous. The earth is not an ellipsoid, the meridians are not ellipses, not even similar curves, nor are any two probably equal in length; the flattening of the earth at the two poles is not the same; the so-called eccentricity is no settled ratio, even if it can be said properly to exist; and, in a word, this planet resembles in form a potato more than anything geometric. When degrees of latitude were first measured, they were invariably, as it happened, found shorter toward the pole, instead of longer, and even now, in the best arc of ten degrees ever measured, the law of increase does not absolutely show, because the curvature of the surface is so variable.

Since, therefore, the true length of a meridian cannot be measured nor calculated exactly, and only a supposititious one can be estimated, it follows that the meter is no more than a blank assumption enveloped in mathematical clouds, as purely a dogmatic standard as the foot or barleycorn; worse than that, it is not even the phantom it pretends to be, for the French savants in measuring for it committed errors such that the prototype meter in the Archives is shorter in fact than it is in theory. First, Mechain made the arc between Montjoy and Formentera too short by 69 toises; and secondly, the commission of weights and measures assumed the square of the eccentricity notably too little. This famous measurement and calculation were imagined and commanded by the French Assembly May 8, 1790, about the time the nation, dressed in the garb of Agamemnon and La Belle Helene, worshiped the Goddess of Reason and rebegan chronology. Their classic costume, months, and years have disappeared, and they are ashamed of their meter also. They know well, of course, that it is too short, but they make an additional mistake in saying, "It would not be worth while to go over the labor of those great astronomers; we have only to take the legal length of our platinum meter at a temperature of one-tenth of a degree above zero instead of that of melting ice." If any combination of ingenuity can make a more arbitrary standard than the meter, then it will be higher than the highest mathematics. It appears, therefore, that, had the French assumed their old royal foot for a unit, called it a meter, and based their system thereon, we should have had the same reason for displaying our standard by it as this pretentious folly. The general talk about the meter in our country disseminates error; and it ought to be moderated, or, better, abated as a nuisance. As for a real standard, it is easy to find one. Standard time, latitude, and the earth's attraction at a given place are invariable and easily measured. The distance a body falls in a second at the Observatory of Paris, if you please, is the best basis for weights and measures. Others have been suggested; but, finally, it is incontrovertible that, with our present instruments of precision, the acceleration due to gravity can be measured more accurately than any line on the earth's surface; and, moreover, it will mean something, and "be there every time," as they say in the West.

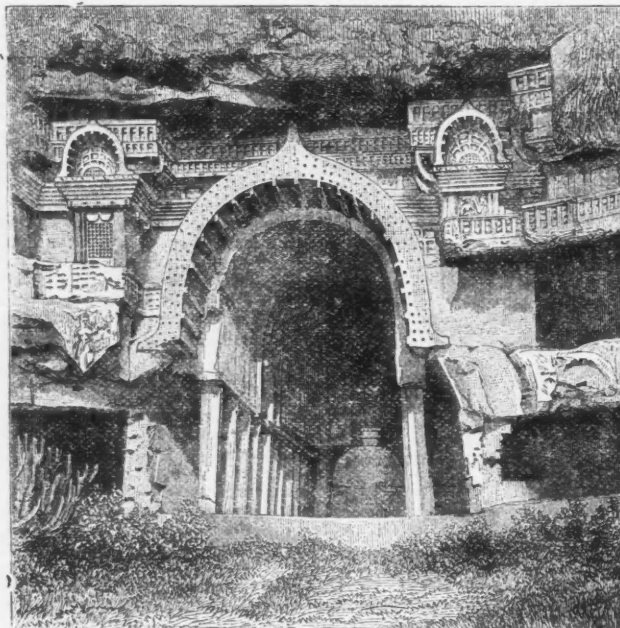


FIG. 3.—CAVE AT BHAJA.

THE LOWE GAS AND PROF. MORTON.*

By Henry Morton, Ph. D., President of the Stevens Institute of Technology, Etc.

The logic of Mr. Dwight in his article in the last number of this JOURNAL, under the above title, is so exactly like that of Mrs. Nickleby, and therefore so completely unanswerable, that there is nothing left for me but to acknowledge with good grace my entire inability to contest the ground with him, and retire from the field.

Admitting for the sake of argument, though it happens not to be the fact, that Prof. Rogers was my successor in the chair of chemistry in the University, this, of course, proves that the *animus* of my report on the Harrisburg water gas must have been very bad indeed.

Similarly an analysis of the Manayunk gas, signed jointly by him and Prof. Stevens, must be an analysis of the gas made at Harrisburg on the 20th of October, because Profs. Genth and Sadtler have on some other occasion made an analysis (not published) which Mr. Dwight asserts disagrees with mine.

Under such a storm of solid facts and logical deductions, it would evidently not be courage but folly to resist.

Add to this that a gentleman who has received an honorary degree from the Stevens Institute should in past time have thought well of the Lowe process, and the cup of my iniquity overflows.

The only thing left for me to do in such a state of affairs is to assist the disinterested labors of those gentlemen who "have pledged themselves to the development of the system upon its merits."

This I propose to do by making further analysis of water gas wherever I find it, and publishing the results, together with any other facts bearing on the question which may come within my knowledge.

* Extracts from advance proofs of *A Treatise on Tunneling, Explosive Compounds, and Rock Drills*, by Henry S. Drinker, Mining and Civil Engineer. Published by John Wiley & Sons, New York.

† See Ferguson's *Illustrations of the Rock-cut Temples of India*, and his *History of Indian and Eastern Architecture*. Also General Cunningham's *Archaeological Reports*; and *Monuments Anciens et Modernes*, par Jules Gailhabaud.

SALE OF A BLACK HILLS GOLD MINE.—A dispatch from Deadwood City dated December 18 says: "The 'Old Abe' mine, situated near Lead City, has been sold to parties from Lake Superior for \$50,000."

A CONVENIENT METHOD OF CALCULATING ASSAYS.

To THE EDITOR: SIR—The method of calculation ordinarily employed, and recommended by Fresenius, for reducing to troy ounces per ton the amount of silver obtained from our test assays, is quite complicated, and liable to lead to mistakes on account of the amount of figuring required. We employ a method in the works here very simple, requiring no figuring, and also saving much time, which may not be known to all of your readers, and hence may be interesting and useful to some. This is based on the fact that there are 29,166+ troy ounces in a ton of 2,000 lb. Now, we take a quantity of ore or bullion that represents a ton—say 29,166+ milligrams or 29,166+ grams, and divide it into three equal parts. For this purpose we have a weight or quad which is exactly counter-balanced by 9,722+ grams. The 9,722+ grams is the most convenient sized button to make, and besides we make three assays at the same time; however, any fraction of 29,166+ may be used. The three weighed quantities of ore or bullion are subjected to the ordinary process of assay, keeping each in a separate cupel, of course. The combined weight of silver buttons obtained in milligrams will give the number of troy ounces per ton of 2,000 lb. It will be observed that the silver may be calculated seven different ways—combined, separately, etc. This method may be applied in any case where any fire assay is used. We have used this process of calculation in the assay office of the smelting works here for some time, and find it very accurate, besides a saving of time and figuring.

CHICAGO, Dec. 11, 1877.

C. B. G.

REPORT ON A STANDARD WIRE GAUGE.*

The Committee on a Standard Gauge have been constantly engaged, since their appointment, in the duties assigned to them. They have corresponded with different persons interested in the manufacture and use of gauges in this country, and have received from several of them important information.

They have also entered into correspondence with the Governments of England, France, Germany, and Russia through their consuls, and with Austria directly. The consuls of Germany and France have taken the greatest interest in the matter, and have communicated to your committee a large amount of valuable information relating to the gauges used in their countries. Prof. Tunner, of Leoben, Austria, one of our honorary members, has communicated information relative to the uses of gauges in Austria. The replies to the communications addressed by the English and Russian consuls to their respective governments, have not, as yet, been received.

Your committee commenced its labors, having in view to find a gauge which should be simple in its construction, not readily worn, capable of easy adjustment, and not too expensive to be used by the ordinary workman. With this in view, they have examined a

differ according as they are made by different manufacturers, but in a package of a dozen made by the same manufacturer there often were very perceptible and annoying differences. They find that in the gauges with open slots the sides are rarely parallel, and that there are even greater variations in them than in the gauges made with closed round holes without plugs. They find that the numbers affixed to the slots and holes vary so much, on account of the differences in the width of the slots and in the diameter of the holes, as to be a constant source of inaccuracy, uncertainty, and annoyance. This variation has, in certain cases, been found to amount to as much as 50 per cent. of the weight of different wires of the same number which have been examined. It is, therefore, impossible to make even an approximative comparison of sizes, unless, besides the number, not only the kind of gauge, but also the name of the maker, is specified, and that even then this approximation cannot be relied upon when the gauges have been worn from constant use or bad tempering.

The best example of the round holes with plugs is the Whitworth gauge, which is made of a thick plate of tempered steel. Each hole of the gauge is provided with a hardened steel plug, which fits it exactly. In all the recent gauges of this kind the system of numbers is abandoned. The plug is made of a given diameter, which is stamped in figures on each one. These diameters, generally, vary by thirty-seconds, sixteenths, eighths, quarters, and so on, each size having a hole and plug of its own, so that a complete set will consist of as many holes and plugs as there are fractional parts. To obviate the difficulty of the indefinite repetition of the plugs, they are sometimes made so that when any two, or even three, plugs are placed together they will exactly fit the hole corresponding to the sum of their diameters. This arrangement is made to insure accuracy, as the multiplication of a very slight error would prevent even two plugs from fitting the hole corresponding to the sum of their diameters. When well made, this gauge is an instrument of precision; but it is evident that, in order to have such a gauge even moderately accurate, it must be a very expensive instrument, and altogether beyond the reach of an ordinary workman, or even of a manufactory with small capital; and that from the indefinite multiplication of holes and plugs, it must necessarily be very cumbersome. When they are used, there must always be two such gauges, one for comparison and one for use, and when the gauge is only very slightly worn it ceases to be an instrument of precision, and is then open to all the objections of the ordinary gauge with fixed holes.

Your committee, very early in the course of their investigation, formed the opinion that no reliance whatever was to be placed on the numbers of gauges, as an indication of size, except for the individual gauge to which the number was attached; and that the only accurate and scientific way of expressing the size of an article to be gauged was by some expression of its diameter, which should be more exact than num

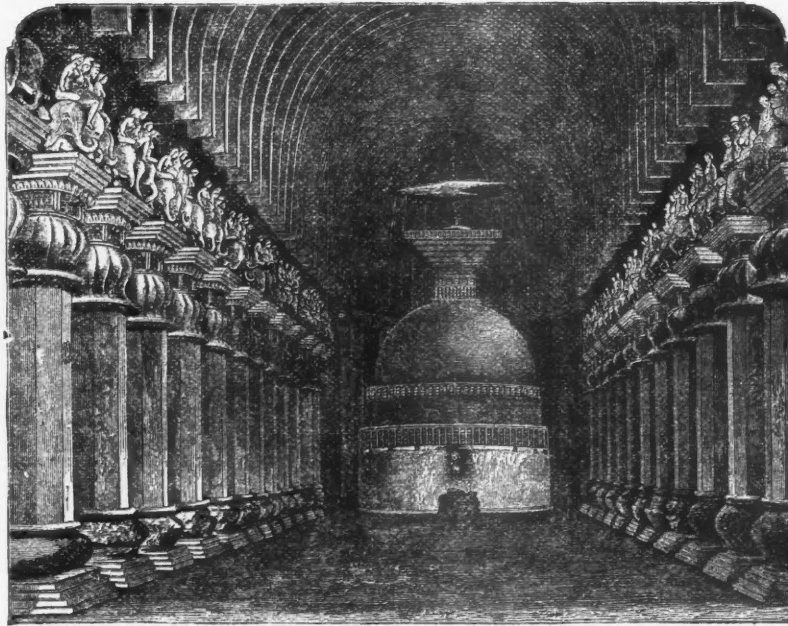


FIG. 4.—VIEW OF CAVE AT KARLL. (See page 452).

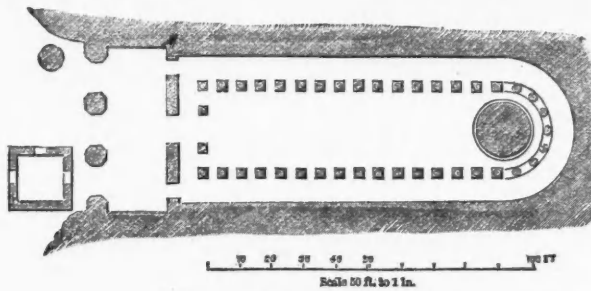
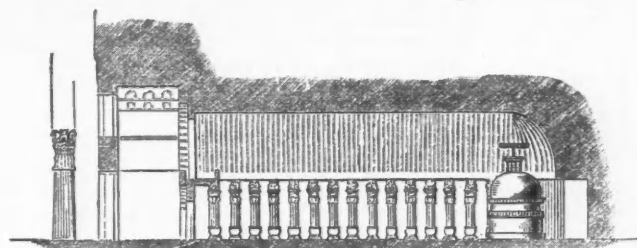


FIG. 5.—PLAN OF CAVE AT KARLL.



Section of Cave at Karll. Scale 50 ft. to 1 in.

FIG. 6.

large variety of gauges, and believe that all those in general use in the United States have passed under their inspection.

We find, as the result of our examination, that, although there are a great number of patterns, most of the gauges in general use differ but slightly in principle. The different systems may be divided into two general classes. These are—*first*, fixed; and, *second*, movable gauges.

Of the fixed gauges, there are three general types. These are, first, those made with slots, open at one end, the sides of which are intended to be parallel, as the ordinary wire gauge; second, those made with round holes made in a plate, with or without a plug corresponding to each hole to check the size, such as the Whitworth gauge, and the Stubbs wire gauge, better known in this country as the "twist drill" gauge.

In both these kinds of gauges, the slots and holes are designated by numbers.

The third kind of fixed gauge consists of a V, either cut into sheet of steel, or formed by placing two bars of steel together at one end, and leaving them open at the other a fixed distance.

Of the movable gauges there are two types: Sliding calipers with verniers, with or without a micrometer screw for adjustment; and the micrometer screw gauge.

Your committee find that the gauges which are characterized by round holes or slots, designated by numbers, are only approximately correct. They not

only allow of an accurate comparison of all the dimensions by whatever gauge they were taken.

Your committee are supported in this opinion by the present practice among some European manufacturers who have recently acted in this matter, who have decided that a given number on a gauge shall correspond to a given diameter expressed in fractions of the legal standard of length of the country; but as, in all fixed gauges made for ordinary commercial use, the diameter can only be approximately expressed, neither the number nor the diameter is ordinarily correct, so that there is a double source of inaccuracy, as the number does not express the exact diameter, nor the diameter the number.

Owing to the great liability to error, and the impossibility of correcting it, even in the most elaborate forms of this kind of gauge, your committee, early in the course of its investigation, after having themselves examined a large number, and having had communicated to them the results of examinations made by others, dismissed this class as being unsuitable, either from their defective construction, the impossibility of adjusting them when out of order, or their great cost, from their consideration as a standard gauge.

Your committee next turned its attention to the V gauge, which is made by placing together two pieces of hardened steel, so that they touch at one end, but are open a given distance at the other, the numbers or diameters corresponding to the opening being graved upon one or both of their sides. The accuracy with which measurements can be made with this gauge when it is new, and the jaws properly tempered, adjusted, and fastened, is surprising. Exceedingly

* A paper read before the American Institute of Mining Engineers, at the Amenia meeting, October, 1877.

minute differences even in the diameters of the same wires can be detected and measured with great nicety, but by constant use the gauge wears unevenly. It must then be taken apart, reground, and readjusted, which will generally cost more than the gauge is worth.

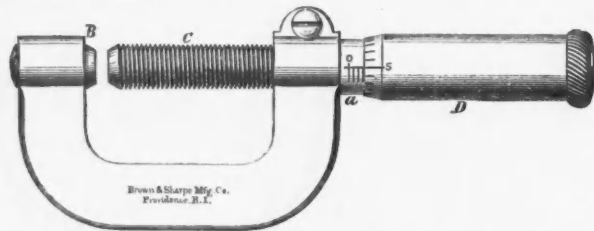
Your committee, while having the highest opinion of it for ordinary purposes, after some months of study abandoned the idea of recommending it as a standard gauge.

Their attention was then turned to the other two kinds of gauges, namely, the sliding gauge with a vernier, with or without a micrometer adjustment, and the gauge known as the micrometer gauge. The advantage of these gauges is great accuracy. The sliding gauge with a vernier necessarily wears, but the error of wear can be ascertained and allowance made for it, so that accurate measurements can always be made with it when it is worn.

In the micrometer gauge the wearing surfaces are so arranged that they can be adjusted with ease in a few moments. The wear between the male and female parts of the micrometer can be adjusted by a binding screw. This adjustment can be repeated as often as required, so that the instrument will read with great accuracy until it is worn out.

Your committee assured themselves by actual trial that with such a gauge boys can very easily be taught to read the thousandth of an inch or the fortieth of a millimeter, and that it is practicable to read even the eightieth of a millimeter.

The micrometer gauge is, of these last two gauges, the simplest. It consists of a micrometer screw, C, with a vernier attachment on D, is susceptible of easy adjustment, is not likely to wear, is not complicated, is less likely to get out of order than the other gauges, is more easily read, and requires less skill to read it than the sliding gauge with a vernier. Your committee are therefore of the opinion that this gauge, which is shown in the annexed cut, is the gauge which should be adopted as the standard gauge.



They are of the opinion that all gauges should be graduated so as to read fractions of an inch or of a millimeter, and that the sizes should be expressed as the only means of insuring correct measurements, and not by numbers, which constantly lead to error. That this, while it insures great accuracy, presents no difficulty in practice, is shown by a number of experiments made during a period of several months, to ascertain the practical difficulty in the way of the adoption of this method by a member of your committee. The sizes of some of the steel bars, the orders for which were expressed in thousandths of an inch, are given below.

Sizes expressed in decimals of an inch, taken at random from the order book of a manufactory which has adopted this method:

15.5 x .014	3.00 x .0145	2.25 x .059
15 x .02	3 x .018	2.25 x .046
15 x .014	3 x .02	2.25 x .040
5.25 x .061	3 x .0125	2.25 x .038
4.50 x .062	2.75 x .030	2.25 x .055
4 x .024	2.75 x .051	2.25 x .020
4 x .022	2.75 x .035	2 x .018
4 x .071	2.50 x .059	1.50 x .032
3.475 x .062	2.50 x .022	.75 x .095
3.25 x .01	2.25 x .031	.25 x .062

The trial of this system by some of the manufacturers has resulted in banishing all the old forms of gauge from their work-shops.

The conclusions which have been arrived at, for the most part independently, by the different members of your committee, and in which they unanimously agree, are:

1. The abandonment of the system of fixed gauges for commercial use.
2. The abandonment of the system of representing the diameters and sizes by numbers.
3. The adoption of the system of expressing sizes in thousandths of an inch or fractions of a millimeter.
4. The adoption of the micrometer gauge as the method of measuring sizes.

Your committee beg to acknowledge their indebtedness to J. B. Knight, Secretary of the Franklin Institute in Philadelphia, for the reports of various committees on gauges of the Franklin Institute; to C. Hewitt, Esq., President of the Trenton Iron Company, for a large number of measurements of wire made with different gauges; to P. Ritter von Tunner, of Austria, for the description of the kind of gauges used in Austria; to the German Consul, for his interest in procuring from Germany a report of their gauge system; to the French Consul, for his interest in the work of the committee; and to the Minister of Agriculture, Commerce, and Public Works, for a complete description of the gauge system as used in France.

Your committee is, however, particularly indebted to Darling, Brown & Sharp of Providence, who have loaned to them without charge all the gauges which they manufacture for comparison, and have contributed besides a very large amount of information on various matters connected with this subject.

All of which is respectfully submitted.

T. EGGLESTON, Chairman.
WM. METCALF,
JOS. D. WEEKS.

DISCUSS ON.

Mr. A. L. HOLLEY asked if the committee had examined the gauge used by the Washburn & Moen Co. and others; it was a screw gauge with a micrometer scale, but the movable jaw of the gauge was set up against the piece to be measured was not regulated by the feeling of the hand; it was made perfectly uniform, for all sizes of work, by a spring arranged like that in the stem of a stem-winding watch. Hence the pressure of the jaws on the work was perfectly uniform, and the measurement was very delicate and exact.

Dr. EGGLESTON said that the committee had heard of this gauge, and had endeavored to get one, but had not succeeded in doing so, and hence had not examined it.

THE FULLER PLACER MINES, COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

[WITH TWO SUPPLEMENT SHEETS.]

The JOURNAL is illustrated this week with two supplementary sheets, showing views of the more prominent properties of the Fuller Placer Mining Company, and a map of the Swan River, in whose valleys most of the claims of the company lie. The map explains itself in full. Swan River flows from the western slope of the front or main range of the Rocky Mountains, having three main sources, named respectively the South, Middle, and North Swan Rivers. The cañon of the first mentioned is cut along the northern slope of an extensive porphyritic overflow, and is gold-bearing at every point of its bed. Its southern banks and ravines, from the valley to the crest of the porphyry divide, carry also deep and rich deposits of gravel. The Middle Swan, from its head to its junction with the main stream, lies wholly in slates and sandstones, while the North Swan heads in granite. These two forks are barren of gold. Passing down the main stream, all the gulches coming in from the south are found to be rich in auriferous gravel, while those on the other side have yielded nothing.

As the formation of this noted gulch will be fully shown in a geological map now in course of preparation, and which will be published in the JOURNAL before long, it is unnecessary to give any further details on this point.

The Fuller Placer Company owns almost all the ground in the South Swan, the whole of Georgia Gulch and its tributaries, large patches on Brewery, Brown, and other gulches west of Georgia, Helen Patch, on the French Gulch divide, and Mayo, Illinois, Boston, Dry, and Negro Gulches still further south, embracing altogether over 2,500 acres, having an average depth of gravel of 20 feet. The map in one of our supplements shows all this ground, excepting Mayo, Illinois, Dry, Boston, and Negro Gulches, which lie about two miles south of Lincoln City, and includes the entire length of the gulch from the crest of the divide down to the Blue River.

The history of the Swan River is similar to that of many other placer districts. Entered first by way of Georgia Pass in 1859 by a band of wandering prospectors who were traveling from the Hamilton diggings, the first tests were made in the barren gulches flowing into the river from the north and east, and, of course, no encouragement was met with. Later in the season, however, another party came across the range, and immediately found enormously rich pay in Gold Run, Delaware, Galena, Georgia, and Humbug Gulches. The valley was immediately colonized, and a very lively little town named Parkville sprang up at the mouth of Georgia Gulch. For two years a very heavy yield was maintained. Georgia gulch for its length proved to be the most productive placer ground in Colorado, and both Humbug and American paid in places enormously. Profitable working was also carried on in nearly every gorge entering the Swan and its southern branch from the south, but in a short time the rich pay streaks in the bed of the richest and most accessible gulches were washed out after the rude fashion of the earlier miners, and it was found that, to work the upper parts and side claims of gulches, extensive and costly ditches were required. This necessity immediately put an end to the flush times, and resulted in an almost total abandonment of the valley and its mines.

In 1871, Col. Thomas H. Fuller, of Boston, Mass., the treasurer and principal stockholder of the celebrated Globe Nail Company, became interested in the mines, purchased certain water-rights and ground, which gave him command of the entire upper parts of the Swan River. From that date onward, Col. Fuller and the company that bears his name have been steadily accumulating ground, buying up segregated claims, pre-empting new gulches and patches, and perfecting its water system, until, at the present date, it is one of the largest placer mining organizations in the State, and, so far as development is concerned, far in advance of any other. Its property includes nearly all the gulches of the Upper Swan, which in the early day were found to be so enormously rich, and from which hardly a quarter of their gold contents was taken by the former owners; a number of entirely new gorges and ravines, which were never claimed by the first inhabitants of the valley because water could not be brought to them, and many acres of patch diggings located far up on the slopes of the divide between the Swan and French.

In order to open this ground and work it profitably a flume was projected to take the water of the North, Middle, and South Swan Rivers at their head, and bring it around to the head of Humbug and other rich gulches whose deep banks were found to contain gold in paying quantities up to the top of the divides, from which they flowed. This flume is at the present date completed to the head of the Middle Swan, is thirteen and three-quarters miles in length, has a section of four feet two inches by four feet, and is capable of delivering 2,400 inches of water per day. It is solidly built of sawn lumber from end to end, and can be boarded up at the sides so as to increase its carrying capacity by 2,000 inches, if desired. This has not yet been done, because the flume is at present sufficiently large to carry all the water of the streams it crosses, but when it is extended seven miles farther to the North Swan this addition will be needed and will be made.

Among our illustrations to this property is one showing the entire range of mountains from the head of the Middle Swan around to Brown's gulch, on whose flanks will be noticed the course of this great flume as it winds around from ravine to ravine, bearing the element which is destined gradually to tear away and destroy the magnificent forest which now crowns each slope. The point of view selected for the picture gives one of the finest scenes to be obtained anywhere along the course of the Rocky Mountains in Colorado. Mount Guyot and Old Baldy, the two prominent peaks of the vicinity, reaching far up above timber line, barren and capped with snow, form an imposing background, against which the green slopes and the deep-cut gulches present a striking contrast.

Of course but a small portion of this large area is as yet under work. It requires time to open a placer mine as well as a quartz lode. Preparatory pits must be sunk, flumes built, and connection made with the great supply flume. At present five of the gulches in the property are in a working and producing condition. These are the Dry, American, Humbug, Little Georgia, and Mayo.

Our second illustrated sheet gives accurate views of each of these, the two first being presented together, as Dry is a tributary of American.

Humbug, the richest gulch next to California cañon yet found in the State, is the eastern fork of Georgia. It is about 5,000 feet in length, and gradually disappears on the steep divide between the Swan and French rivers. There is one large pay streak on its lower part, but up towards the head the streak divides and the gold becomes coarser. The illustration gives a fine idea of the extensive workings carried on in the lower parts, and the operations now in progress above. Two giants have been at work during the past season, one on each side of the gulch. The head of water attainable is 300 feet, and it will be possible to wash down the banks in a direct line several hundred feet farther before the flume is reached. The ground pays well far up the mountain side, and, in fact

is rich clear to the summit of the ridge. The production from this gulch has averaged during the last season \$25 per day to the man. An immense area of ground is yet untouched, besides which, as the sketch shows, there is a piece of ground in the center of the gulch, several hundred feet in length, which still remains.

Little Georgia is the western fork of Georgia. The pay streak was lost at the mouth of this ravine in the early day, and was not found again until last season, when the Superintendent of the Fuller Company made explorations some distance above the mouth, and found not only good pay, but plenty of it; the bank being very deep and the ground unusually good. Our illustration is taken from the head of the gulch looking downward, and shows the giant in the foreground playing against the deep banks of the pit. In the middle distance is the sluiceway, and in the background the bald-headed mountains, among which rises the North Swan River. Operations in this channel have just begun. The ground is almost wholly new, and will not be exhausted for many years. During last season the average yield of dust per man was \$20.

Dry and American gulches (represented together in our supplement) are also quite recently opened, though work has been prosecuted with great vigor in both. Each bank is supplied with a Giant with a head of 300 feet. By referring to the map the reader will notice that these two gulches are parallel to Georgia, and flow from the same divide from which all the gold of the Swan River has originated. During the past season Dry has yielded \$10 per day to the man employed, and American \$22. Both promise to be as valuable as any ground owned by the company. American was the first gulch worked in the Blue Valley.

Mayo gulch flows from the divide between French and Illinois, and heads in the formation from which Nigger gulch runs. The latter has been worked continuously from the earliest days of the country, and has always paid handsomely. It is to-day one of the most valuable ravines in the valley. At its head, and consequently at the head of Mayo, is a large outflow of the same porphyritic trachyte, which occurs on the divide between the French and the Swan. The claim of the Fuller Company comprises the whole length of Mayo, and 600 feet in width. Two Giants are in operation, deriving their water from the head of Illinois gulch. Mayo is very even in its yield. It has paid regularly about \$20 per day to the man. Its banks are deep and easily worked. The supply of water is sufficient to work the deposit up to its head.

Since the Fuller Company took hold of the ground and began to work it, the production has, of course, been comparatively light because some time was required to build the immense flume and to place all the other present improvements on the ground. These improvements consist of fifteen good cabins, boarding-houses, offices, feed ditches, a saw-mill capable of sawing 7,000 feet of lumber per day, rabbeting machines, tonguing and grooving machine, accessible roads from one point to another upon this immense property, and in fact everything necessary for the working of the mines and the comfort of the officers and miners.

The following resume of the property and improvements of this company will be of interest:

Wooden flumes.....	21 1/2 miles.	Total area of claims.....	2,500 acres
Ditches.....	25 "	Average depth of banks.....	20 feet.
Sluices.....	2 "	Am't of ground worked out.....	50 acres.
Number of pressure boxes....	6	Yield per cubic yard.....	.25c. to \$1.50
Length of iron piping.....	9,000 feet.	Average altitude of ground	
Little Giants.....	7	above level of the sea.....	9,000 feet.

In our sketch of Humberg gulch will be seen one of the many boarding houses of the company, the head office at the same time, and way up on the mountain side, in the large view of the Swan Valley, may be seen the little saw mill, which has turned out the millions of feet of lumber used in constructing the big flume.

During the past season the company has built a flume one and three-quarter miles long, from the eastern base of Mount Guyot to the line of the main flume, which, in the middle of the season, adds about 600 inches to the supply. This flume crosses the dividing range of the continent at an altitude of 12,000 feet above sea level, and carries the water from the head of Michigan creek, which

would ultimately find its way into the Gulf of Mexico, over to the westward slope, where it passes after a journey of nearly 3,000 miles into the Gulf of California. There is no other place on the continent, we believe, where Atlantic waters are diverted to the Pacific.

Col. Fuller, the former owner of this property, and President of the Fuller Placer Mining Company that succeeded him, has developed this valuable ground in a systematic, careful, and intelligent manner, sparing no money, where it could be advantageously spent. As a result the company has to-day one of the finest placer properties in the West. If Colorado had more men of his style and financial ability, a very notable increase in her bullion yield would be the result.

HAYDEN'S SURVEYS.

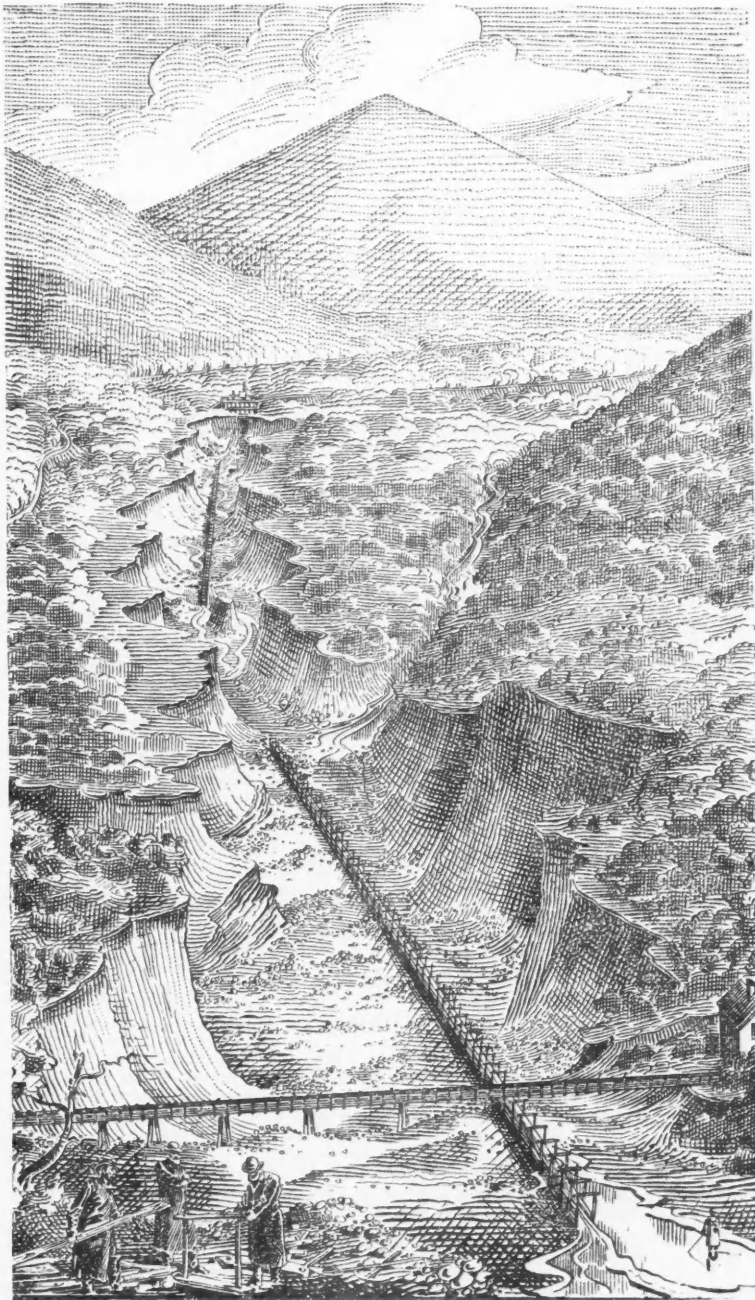
The New York Tribune, under date Washington, November 25, says: Dr. Hayden, director of the United States Geological Survey, has prepared his annual report to the Secretary of the Interior, and the following is a synopsis of the most interesting portion of it:

"On the completion of the survey of Colorado last year, it was determined by the Department of the Interior, that the work of the geological and geographical survey of the Territory, under the direction of Professor F. V. Hayden, should be transferred to Wyoming and Idaho. The belt of the country along the Pacific Railroad having been explored and mapped in detail by the survey of the 40° parallel, it was deemed best to begin at the northern line of that work, and continue it westward from the longitude of Fort Steele, Wyoming Territory, to that of Ogden, Utah, and northward to the Yellowstone National Park.

"The survey during the past season was divided into six parties, one of which was engaged in primary triangulation; three had charge of topographical and geological work; one of critical paleontological study, and one of making level connections. There were also three smaller parties engaged in special investigation in different parts of the West.

"The primary triangulation party began work at Rawlins Springs, Wyoming. From that point a base line was laid down with great accuracy, from which a network of triangles was constructed, and landmarks were set up at intervals of from twenty to thirty miles. The primary system was extended with great care over an area of 25,000 square miles, establishing twenty-six main stations. The three well equipped topographical and geological parties surveyed an area of 28,535 square miles. In accordance with instructions from the Department, stone monuments were built at all of the important geodetic stations for the use of the surveyors of the public lands, under the direction of the Commissioner of the General Land Office. The entire number erected was 225. As soon as the topographical work is sufficiently advanced a chart will be prepared, showing the locations of all the monuments and their relations to the arable public lands. Careful attention was given to the study and classification of all areas suitable for cultivation, grazing, or mining purposes, and the materials were secured for

MAYO GULCH.



the construction of a detailed economic map of the area surveyed, showing the different classes of land by a series of colors. Attention was also given to the measurement of the volume of water in the more important streams, for the purpose of irrigation and the accumulation of water in reservoirs, and the sinking of artesian wells. The possible methods for the redemption of what are called the 'barren lands' were examined with care.

"A party was organized during the past season for the purpose of making a critical study of doubtful points in the geological structure of the Rocky Mountains region, and the results have been of a gratifying character. A large collection of fossils, including shells, fishes, insects, plants, etc., were obtained, many of the specimens being new to science.

"An interesting feature of the work of the survey during the past season was the careful examination of the ancient outlet of the Great Salt Lake.

"The publications of the survey during the past year have been quite numerous, consisting of more than ten thousand pages quarto, with a great number of illustrations. The reports, which are in an advanced stage of preparation,

are two quarto volumes on vertebrate fossils of the West, one on the fossil insects, and one on the rhizopods. The atlas of Colorado, which was described in the last annual report, will be completed about February, 1898. The tenth and eleventh annual reports of the survey are well advanced, and will be printed and ready for distribution before the close of the regular session of Congress.

"In 1872, the organization of the survey was matured on a basis of an annual appropriation of \$75,000, with \$20,000 for the engraving of charts and illustrations of reports. This amount was granted until the past two years, when the appropriation for engraving was omitted, which has caused the preparation and publication of the more important works of the survey to be greatly impeded. The estimate for the fiscal year ending June 30, 1879, is \$75,000."

THE BORAX MINES OF NEVADA.

Many of the most wonderful and valuable discoveries and inventions, both ancient and modern, have been accidental. Notable instances will be readily called to mind by the intelligent reader, not only of the discovery of gold and other mines of great value, but also the germs of such great and useful arts and inventions as printing, steam, electricity, and various kinds of mechanism. Among the modern and indeed recent discoveries of great value to mankind, one in our country is particularly noteworthy. It is that of the discovery of a mine or vast bed of borax, by which a most useful and necessary article, instead of being an expensive luxury as formerly, is rendered so cheap as to bring it within the means of all classes.

This remarkable discovery was made in Esmeralda County, Nevada, some four years ago, by a young man who was prospecting for gold and silver mines. While thus engaged, traversing mountains, cañons, and valleys on horseback, he saw, in a valley known as Teel's Marsh, what appeared to be a vast bed of white sand, resembling dry sea foam. The appearance was so novel and singular that he dismounted and descended to prospect the object. Upon arriving at the place, he found it to be the bed of a dry lagoon with the appearance of having been dry for centuries. Walking cautiously over the place, he found the surface to be soft and clayey, and often sank ankle deep. After an examination of the curious clayey deposit, he put several handfuls into his pockets, mounted his horse, and returned across the mountains to his home in Columbus. There he handed the contents of his pockets to an assayer, who, after an analysis, pronounced it the richest sample of borax he had ever seen. This fact at once created great excitement, and no little expense attended the necessary claiming, etc., on the part of the fortunate discoverer. It soon proved to be an enormous lagoon or deposit of crude borax, two and a half miles wide, and five or six in length. It was more than one man could properly manage, so a brother was sent for, and the two (now widely known as the Smith Brothers, of Nevada and New York) worked with a will, sparing neither time nor money until the whole deposit was their property, and its wealth being developed. They at once obtained boilers, tanks, crystallizers, etc., from Chicago, and commenced operations. The result is that, in the course of three or four years, the brothers have perfected an immense establishment, and are producing an enormous quantity of a chemically pure article of borax, which stands first, and is in demand in every household, to whom it is supplied by grocers and druggists throughout the country. So important has this new industry become that the eminent house of W. T. Coleman & Co., New York and San Francisco, some time ago became the sole agents for the article, and they are now pushing its sale in all parts of the world. We are indebted to them for the foregoing particulars.

The most wonderful part of our story is that the vast deposit of borax in Teel's Marsh reproduces itself every two or three years, so that the supply will continue inexhaustible. This fact, and the additional one that the article has been put at the lowest figures, must prove a great benefit and blessing to the people, for borax has become indispensable for many purposes, being much used in the arts, the household, and as a hygienic remedy. Indeed, the uses of borax are so varied, and its properties so valuable, that those who have thus cheapened its production—by discovery and improved preparation—are entitled to rank among the few who have bestowed lasting benefits upon mankind and the world.—*Scientific American.*

RIVER-TRAINING OF THE INDUS AT SHAH JAMAL.*

By G. W. Vyse, Assoc. Inst. C. E.

Few rivers have more variable floods, shifting streams, and less stable channels than the Indus throughout the greater part of its course. There is no single reach of its main stream which is straight for 1,000 feet. If its banks do not curve and twist every 200 or 300 feet, its stream will rebound from left bank to right in a most persistent manner; and what is very noteworthy, when the river is thus acting, is the variable way in which it discards the silt on the side it regurgitates, erosion and retrogression of lead going on where it impinges. The bays, so common along the soft shores of the Indus, are due to the action of whirlpools, which scour the bed and change the course of the river far more than do the high floods. To attempt to check the erosive action of these whirlpools by throwing masses of brushwood, or bags of stone, or weeds into the middle of them is utterly useless, indeed such means tend only to increase the scour and to add to the power of the whirl. These whirlpools can, however, be stopped or checked by turning the current some distance above their influence. In some cases $\frac{1}{2}$ mile up stream is not too far up to commence operations, and on one occasion it was found necessary to work 1 mile of running water before an unusually powerful whirlpool could be checked.

For some years past erosion has been taking place to a considerable extent in the banks of the Indus at Shah Jamal, where the sand is of a very friable nature. Various means have from time to time been adopted to keep back the floods from inundating the surrounding districts; such as throwing up massive bunds and embankments some distance back from the sides of the river. These have answered their purpose fairly enough until the Indus approached them, when the erosion setting in made short work of the most massive of earthworks, and swept out everything else that opposed its course. At Shah Jamal several lines of these bunds have been run up, one behind another, for many years past, only to be carried away by the succeeding season's flood. At one point in particular a number of bunds were thrown up to check the Indus from pursuing a westerly direction, and from proceeding towards the head of the Dhundi Canal. The end of a great embankment constructed in 1864 was more than 4 miles east of the present Dhundi Canal head. In 1870 an addition became necessary, owing to the erosion extending $\frac{1}{2}$ mile in that direction, at the end; this was followed by a further addition of embankment directly behind it in 1871. The 1872 bund was run up 1 mile behind that of 1871, and almost parallel to it, until it joined the Dhundi Canal head, which was then 3 miles from its present mouth, and a

* Abstract of paper in the *Professional Papers on Indian Engineering*, from the Minutes and Proceedings of the Institution of Civil Engineers, of London, edited by James Forrest, Secretary.

oo p line followed this in 1874, which was eaten through in the following year. This state of things at last attracted serious attention, and after many experiments with various kinds of floating breakwaters, spurs, and barrier works, to check the velocity, and thereby cause silt and deposit, orders were given to defend a sharp bend in the river, opposite Tiger Island, above the point where the principal erosion was taking place, by means of "Brownlow weeds" thrown out to meet the main current and to act as spurs. After the floods were over, a narrow, shallow creek was discovered, newly formed from Tiger Island, connecting the two ends of the horse-shoe curve of the river, wherein the principal erosion was taking place, and it was determined, if possible, to divert the main stream of the Indus down this channel. The creek ran dry early in December, but by clearing out the accumulated silt at the head, the channel was reopened, and by means of a little cutting, and by throwing out a strong 500-foot catch-barrier across the main stream below the mouth of the creek, the volume of water passing through it increased to 2,200 cubic feet per second. Subsequently a freshet came down the river, and a vast quantity of water being forced to take this course, the channel was increased from 10 to 80 feet wide in a single week, and before the end of March it had increased to a minimum width of 400 feet, with a discharge of 7,000 cubic feet per second. Across the low sandy banks at the west side of the river barriers were constructed of piles driven into the sand, and strongly interlaced with *lei brun*-wood, with cross-bars, supports, and counter-supports to strengthen them. To the end of these barriers, floating breakwaters composed of stacks of jungle were thrown out to check the stream and to help in causing deposit. Some of these breakwaters were 4,000 feet long. They consisted of a main cable, measuring 1 foot in circumference, which was attached to supports from the shore at every 100 feet or so. Where the shore was not safe, the supports were held by anchors at suitable distances. To the cable were attached 4-inch ropes, holding stacks of jungle, thrown over at every 20 or 30 feet; these stacks were about 20 feet long and 10 feet in diameter. In some instances as many as a dozen stacks have been thrown over in one place. They should not be used sparingly, and they do no good until the velocity of the stream diminishes to 2 feet per second, when silt accumulates, and the desired result is obtained. At other points "Brownlow weeds" were placed across the stream. These consist of fascines held by an anchor at the bottom at one end, and supported by a float at the other. These must be placed close together, and so constructed that the float should be just submerged. The fascines should never exceed twice the depth of the water in length, for, if longer, the rope to which they are attached will fall into a parabolic curve, only doing half its work. As the course of the stream changed, these weeds were shifted, and by May the entire river left its old course, and the old bed began rapidly to silt up. The whole of the works above described, which included 20,000 lineal feet of breakwater and 13,000 feet of barriers, cost 15,040 rupees, and the result is that the river Indus has been diverted at Shah Jamal, "sending it well over to the other side of the works, saving canals, inundation bunds, headworks, 2 miles of encroachment, and an outlay to the Government of over 5 lakhs of rupees, while reclaiming over 6 square miles of rich arable lands."

THE OUTPUT AND CONDITION OF THE LAKE SUPERIOR IRON MINES.

From the *Marquette Mining Journal* of various dates we take the following notes regarding the mines of the Lake Superior region, also a statement showing the shipments for the season up to the 21st of November in tons of 2,240 lbs. We have added, for the sake of comparison, the shipments for the year 1876:

IRON ORE.		IRON ORE.		IRON ORE.	
Name of Mine.	1876.	1877.	Name of Mine.	1876.	1877.
Cleveland.....	145,661	126,555	Bessemer.....	4,779	10,645
Republic.....	120,094	165,849	Humboldt.....	3,333	16,940
Lake Superior.....	111,766	119,037	Excelsior.....	2,857	.....
Jackson.....	78,879	63,289	Wheeler.....	2,022	.....
Michigan.....	70,007	26,926	Erie.....	1,058	.....
Champion.....	66,002	70,833	Nelson & Curry.....	732	.....
New York.....	59,230	56,649	Grand Central.....	456	.....
Saginaw.....	56,979	43,230	Foster.....	320	.....
Rolling Mill.....	53,265	28,837	Smith.....	225	8,432
Barnum.....	37,632	37,505	Mitchell.....	.....	8,807
Winthrop.....	27,236	10,799	South Jackson.....	.....	8,183
Lake Angeline.....	22,539	19,111	Breen.....	.....	5,080
Salisbury.....	20,315	37,659	Vulcan.....	.....	2,433
Spurr Mountain.....	20,276	22,768	Marquette.....	.....	1,658
Edwards.....	19,330	8,782	R. P. Traverse Quartz.....	.....	1,281
McComber.....	17,275	19,970	Carp River Quartz.....	.....	671
Palmer.....	15,324	20,208	Stewart.....	.....	934
Keystone.....	7,715	14,496	Goodrich.....	.....	503
Cambria.....	6,329	10,082			
Shenango.....	5,596	90	Total.....	968,233	963,252

Pig Iron.—The shipments of this article were as under:

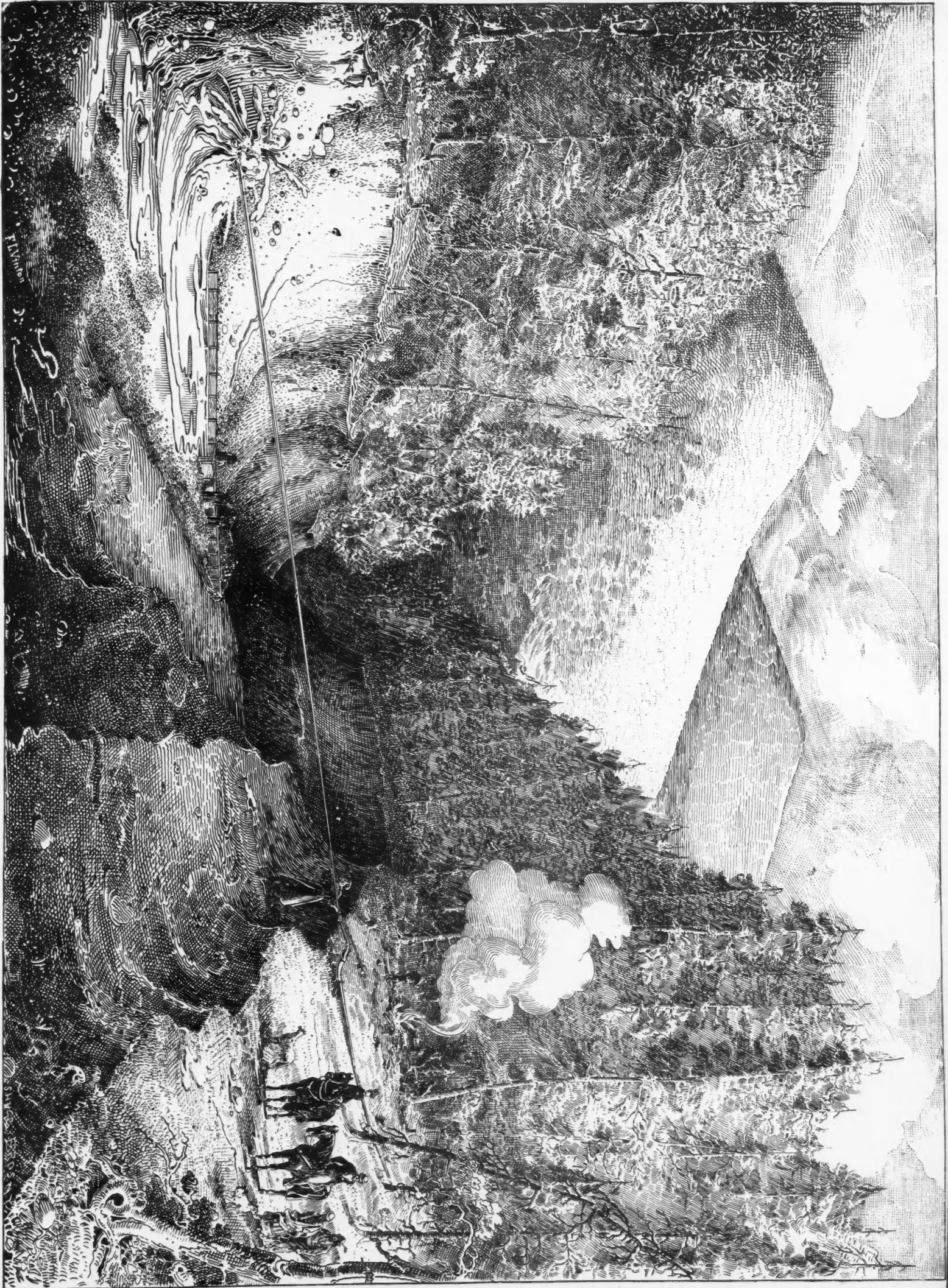
Pioneer Furnace.....	2,467	Morgan Furnace.....	663
Carp River Furnace.....	2,911		
Rolling Mill Furnace.....	6,856	Total.....	tons 12,897

The tables of shipments given above do not include the ore sent by rail and to local furnaces, which will be added at the close of the season. The decreased production of the mines, as compared with 1876, will be about equal to the difference in the quantity of ore smelted in the district, though the shipments by rail have not been nearly as large as last year. The falling off will not be much, if any, more than 5,000 tons.

The Cleveland Mine.—The diamond drill at work in the bottom of the School House mine, 400 feet from the surface, on the incline or dip of the vein, and 117 feet vertically, after passing through 29 feet of rock, struck a deposit of very pure ore, through which it passed 55 feet into mixed ore and rock. This mine was considered practically exhausted, the hanging and foot walls having approached so closely to each other in the bottom as to give the vein or deposit more the appearance of a pocket than anything else. It would now appear, however, that there is a break or shove in the vein, since the drill certainly reveals the existence of a very large body of ore of the same quality as that formerly taken from the mine, beyond the apparent junction of the foot and hanging walls.

The Republic Mine.—The season's output of this mine amounts to 165,849 tons. While mining this large product the mine has been prepared for work on a lower level, and its productive capacity thus materially enlarged. Ore will be raised from the new levels during the winter, and we expect to see stock piles in the spring that will eclipse anything heretofore accomplished, even at this most wonderful of all the known iron mines of the world.

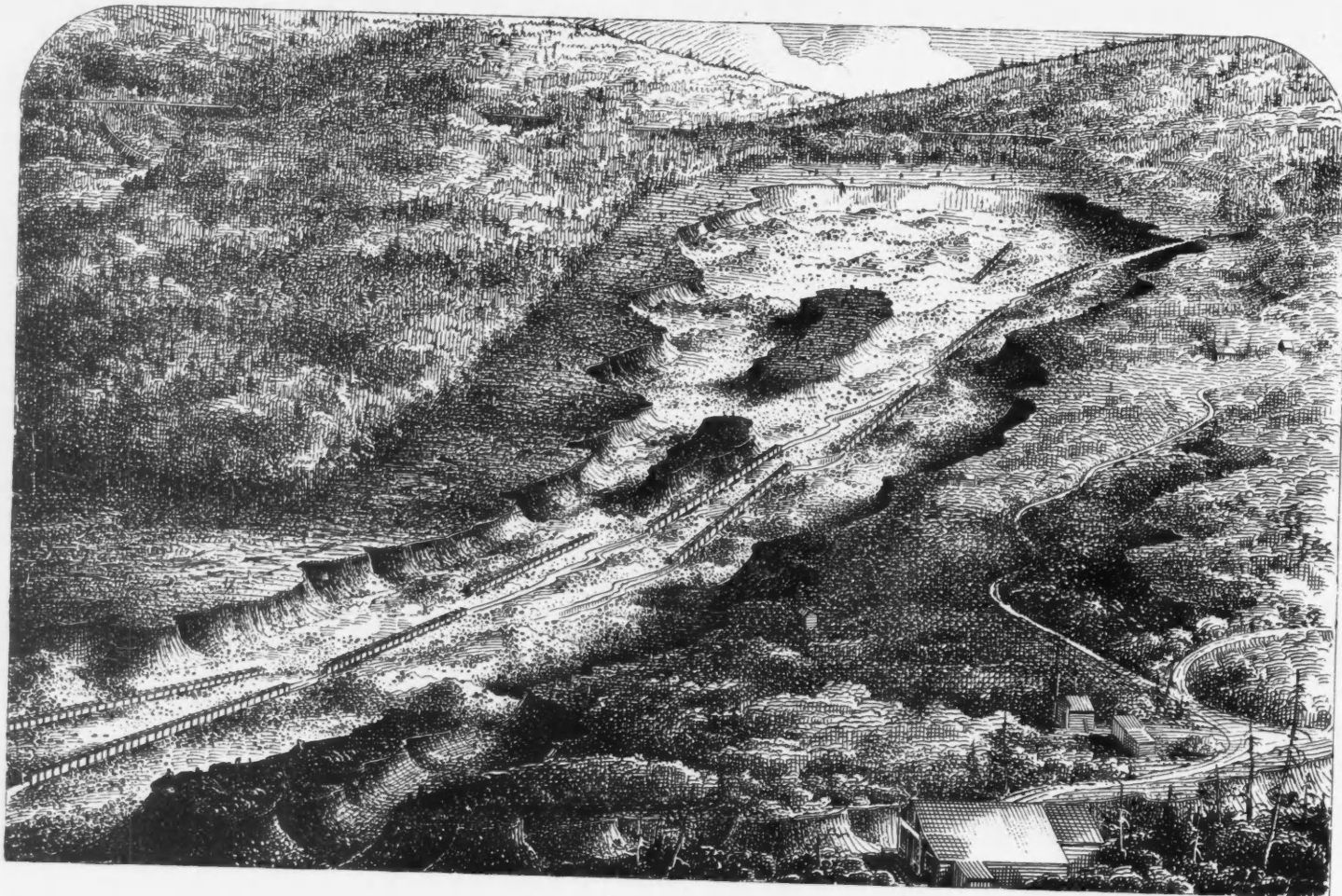
The Lake Superior Mine.—Late developments at this mine have demonstrated that the prospect for continued large yields of ore are better now than for many years. In the main open workings of the mine they are constantly



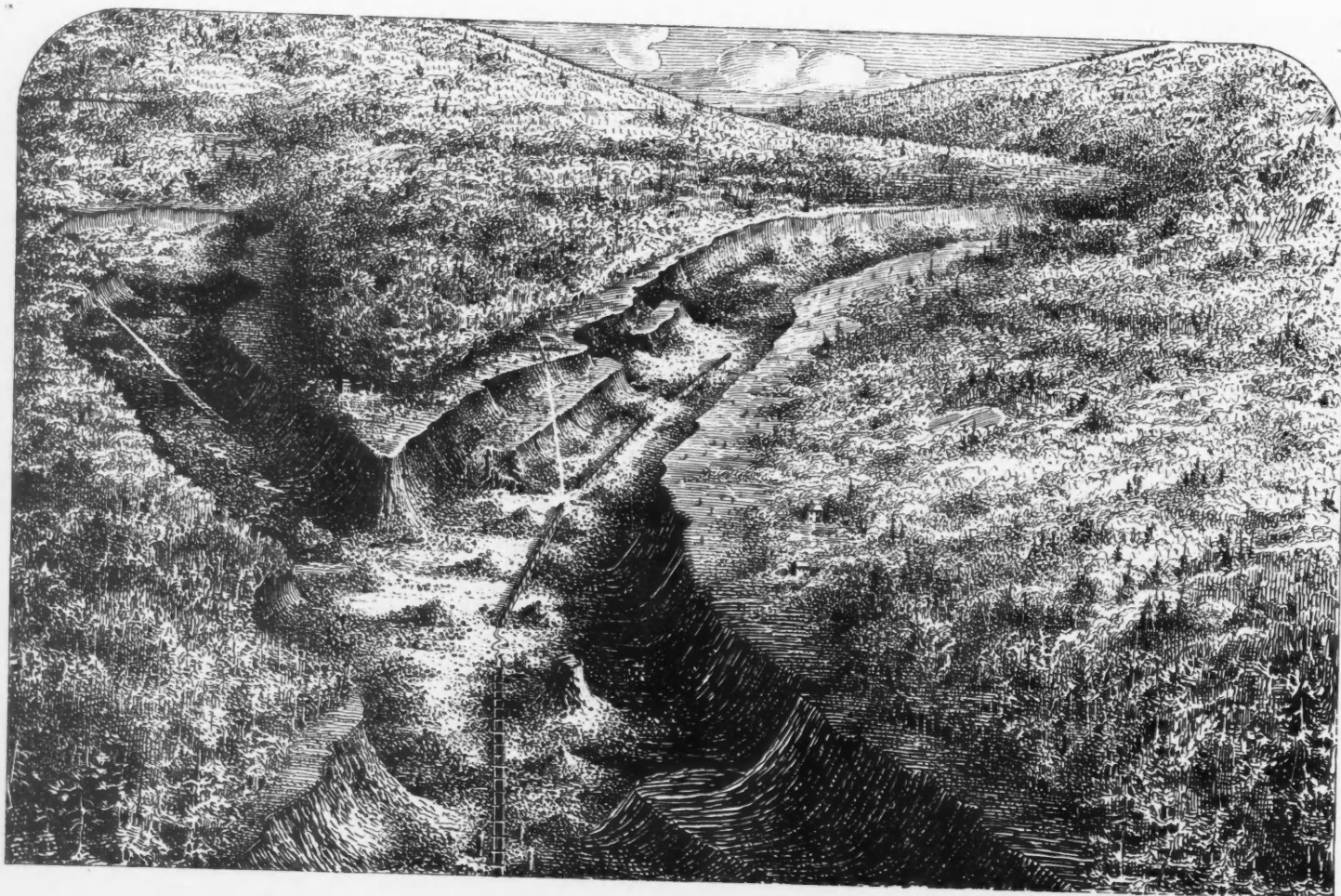
LITTLE GEORGIA GULCH.

FULLER PLACER MINING CO., COLO





HUMBUG GULCH.



DRY & AMERICAN GULCHES.

sinking and taking out large quantities of first-class ore, the vein keeping its uniform width down to the lowest level. At the western wall of the open workings the vein becomes very narrow, and at one time must have looked as though it would run out. But as drifting was continued westward along the vein, it began to widen again and to dip to the south, and now work is being carried on in one of the largest solid bodies of ore ever developed in the county. The foot wall has been followed to the north and worked westward several hundred feet, and drifting began south, through solid ore, in order to ascertain the width and extent of the deposit. The deposit, from all appearances, seems like an immense body of ore, formed by the junction of the veins running from the east and west, and meeting at this place, forming a solid basin of rich ore of an extent which cannot be known until the southern wall rock is reached. The bodies of ore lying to the east and west of the narrow strip on the west of the open pit are in the shape of two immense pumpkin seeds, meeting at the points. Entering and going through the tunnel leading from the open pit, the wall rock on the south is noticed to shoot off in a southerly direction, and at every step westward the vein widens rapidly. Then an immense chamber sixty-five feet in diameter is reached, with miners working south and west in the solid, unbroken body of ore, with the rock visible only on the north, which forms the foot-wall. Leading from this is another tunnel, which terminates in a second chamber, double the size of the first one, it being about 125 feet from east to west, and 65 feet from north to south, and about twenty feet high. Here the foot-wall is also visible on the north, and work is being pushed in three directions through the solid ore. The both chambers are being worked from the foot-wall southward to ascertain the width of the vein, but in neither case gotten through the ore. It penetrated 65 feet directly across the vein in both places, and it would not be surprising if found to be one hundred feet wide. The bottom of these workings is 175 feet below the surface. Thirty feet above these are several other large chambers, also in the solid ore. These vast deposits of ore seem to dip from the foot-wall in the farther chamber, towards the south and east, and their full extent can be known only after the exact width from north to south is ascertained; but enough is known to assure a continued large yield of ore for a great many years. It will be seen from this that the Lake Superior mine is tolerably well fixed to turn out ore in the future. All in the mine seems easy of access, and is economically mined.

The Michigan Mining Company has resumed operations in its eastern opening, known as No. 1. The deposit, while not over 80 or 90 feet in length, is rapidly widening, or jutting into the hanging wall, and looks as if it might make an extensive opening. This pit has been idle since the fall of 1874. The company commences stocking for next year's shipments with a start of 30,000 tons already broke. If they do not ship any ore next year, they will probably reach that 200,000 tons in 1879, as predicted.

The Champion Mine.—The new machinery for this mine is on the ground, and will probably be in operation in the course of a month. This machinery is the largest of any in the district, requiring a train of thirty-two cars and two engines to transport it from this city to its destination. The shipments of the Champion the present year will exceed 70,000 gross tons.

The Barnum Mine.—At the shaft on the Barnum property, just east of the mine, they have struck the ledge at a depth of 65 feet from the surface. The diamond drill that has been at work at the Excelsior mine has been placed in position over the shaft, and the company will soon know what the prospects are for ore.

The Winthrop Mine.—At the Winthrop mine the new contractors are jubilant over the favorable outlook for a largely increased product the coming year. The machinery has been put in perfect order, and everything about the mine put in the best possible shape for economical work, and we learn that a force of nine men in one pit are mining and sending to the surface about 100 tons daily. What was supposed to be a "horse" of rock in one part of the mine, and which had been left standing, is found to be simply a thin shell with a large body of ore behind it. The contractors expect to have the mine in shape by spring, for a production of at least 300 tons per day.

The Spurr Mine.—Explorations of an important character have lately been carried on at the Spurr mine, some of which have produced very satisfactory results. The cross-cut driven north from the western end of the mine has now reached about 100 feet from the line of the vein, passing through a large body of diorite, and is now in ore carrying a large portion of sulphate of iron. It will be remembered that the Spurr vein is abruptly cut off by an immense heave, or rock crossing, about 700 feet from the section line dividing the Spurr and Stewart properties; this heave is composed mainly of diorite, and crosses the vein in an oblique direction, the vein running almost east and west. The crossing extends from the northeast to the southwest, the dip of the heave itself being to the northwest. The magnetic attractions on the surface show a displacement of the vein of about 100 feet, and the underground workings at a depth of 150 feet by the cross-cut above mentioned, verify the accuracy of the magnetic observations on the surface. The presence of sulphate of iron at a point so far north from the vein is indicative of the cross-cut being at or near a large deposit of pure ore. If such should be the case, it will give to the Spurr Company in the neighborhood of 600 feet more of available working ground.

The McComber Mine.—At this mine about 60 men are employed, the average daily output being about 100 tons. No. 4 is known as the manganese pit. The manganese ores found at this mine, and of which four or five thousand tons have been shipped, bring an advance of \$1.25 per ton over the other hematite ores, and is much sought after by furnacemen. It is believed that 10,000 tons of this ore can be mined next year. The openings are gradually being prepared for underground work.

The Cambria Mine.—The new shaft being sunk on the Cambria has now reached a depth of nearly 16 feet. A force of about a dozen men are steadily at work sinking, it being the intention of the company to reach a depth of about 45 feet. The shaft, so far as sunk, passes through a body of clean ore.

The Bessemer Mine.—Work on a new shaft has been commenced at this mine, where a force of about 20 men will be kept employed during the winter. This shaft will be sunk to a depth of 50 feet, and from the bottom a number of drifts will be driven in various directions in order to determine as nearly as possible the extent of the deposit, with a view to economical work in the future.

The Smith Mine.—At this mine about 35 men are employed, and will probably be kept at work all winter. The mine is in excellent condition, and the show of ore much better than ever before.

The Mitchell Mine.—This Mine, formerly the Shenango, is idle, and has been allowed to fill with water. This is not owing to any lack of quantity or quality of the ore, but to the depressed state of the market, and the disinclination of the company to mine the ore faster than it can be sold. The operations will most probably be resumed early in the spring.

The Stewart Mine.—At this mine a drift is being driven east from No. 1 shaft towards the Spurr, in good, clean black ore, the width of the vein being about

that of the drift. The ore has changed somewhat in appearance from that taken from the shaft last summer, the latter being a fine-grained ore of a steely nature, while that taken from the drift is a soft black magnetic, and much easier to mine. The mining force of this company is being increased slowly, men being added as fast as the work is extended.

The Burt Mine.—They are building a new warehouse at the Burt mine 24 by 60 feet. They are also completing their new ore dock, which, when finished, will be one of the finest and largest in the county.

The Menominee Iron Region.—The *Menominee Herald* says: "An analysis of the recent discovery of a vein of magnetic ore on Section 32, two miles west of the main workings, gives 64 per cent. of iron. It is strongly magnetic in bulk, attracting a needle 90°, but in small quantities has no perceptible influence upon it. The vein was much broken up on the surface, but at a depth of five feet was five feet wide. The recent rains have interfered with the mining operations somewhat, causing the banks bounding the strippings to give way, but the delay caused was only temporary. The company now has in its employ fifteen miners and three teams. The owners of the Ingalls property are making arrangements to give it a thorough exploration during the coming winter. It embraces the north half of the northwest quarter of section 9, town 39, range 29; and the south half of the northwest quarter of section 8, same town and range. The outcrop has been found on the first description, which is just half a mile west of the Vulcan mine. The outcrop is first developed in the face of a hill, and consists of a bed of black-looking ore some 50 feet wide, a surface specimen of which analyzed 58 per cent. The continuation of this hill to the westward is disturbed by a swamp, through which the ledge is known to pass. In a hog-back which rises from the swamp two other kinds of ore have been discovered, which are very promising.

The Menominee Mining Company has contracted for 11,000 tons of ore to go south over the railroad this winter.

Kimberly Iron Company.—A new corporation to be known by this name is being formed, based on some 10,300 acres of iron lands purchased in 1872, by George C. Reis, trustee. The company's lands embrace choice selections in Marquette and Menominee counties, and are believed to be quite valuable.

MISCELLANEOUS IRON NOTES.

The New Jersey Iron Mines.—The *Iron Era*, of recent date, furnishes the following notes regarding the iron mines in that vicinity:

"One of Wilson's patent furnaces is being erected at the Rockaway rolling mills, and another at the same place is in contemplation. It is said that a strong company has been formed, and that work will begin at once.

"All work is now suspended at the Ogden Mine, and all that remains of that once thriving mining community is about 100 empty houses.

"The Carbon Iron Company has been reorganized, and we may hope to hear of their resuming business soon in this section.

"Ten additional men were put to work at Hibernia by the North Jersey Iron Company on the 3d inst.

"About 160 tons of ore per day are being shipped from Hibernia by the Anderson Iron Company.

"There is again some talk about the rolling mills at Port Oram."

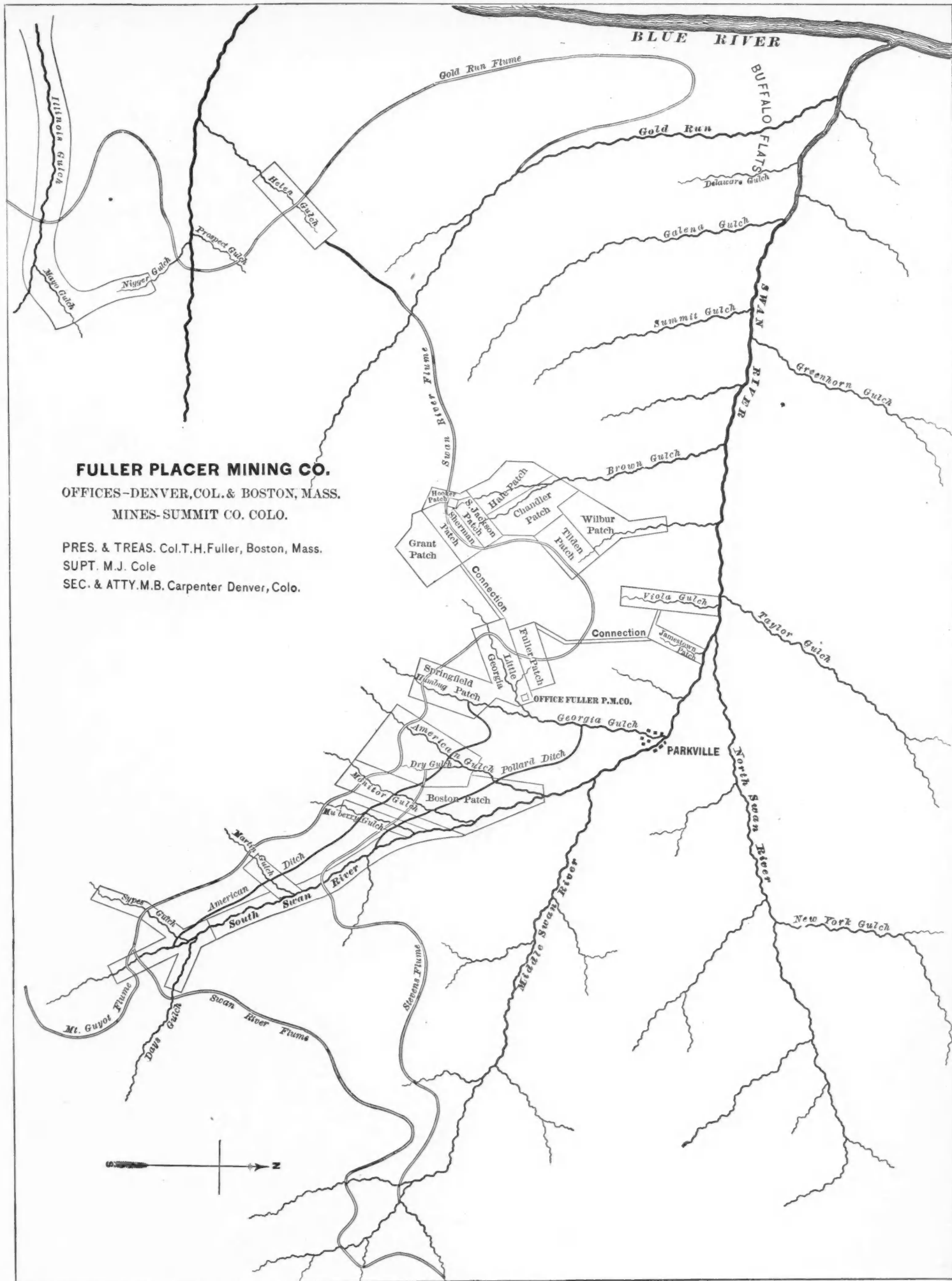
Hanging Rock Iron Region.—The following are from *Greenup Independent*:

"That portion of the Hanging Rock iron region centering about Ironton numbers nine charcoal furnaces and three stacks running on stone coal. Of these, the Center and Grant are now out of blast. The Vesuvius and *Ætna* furnaces are not numbered among the living furnaces any longer, although 130 tons of iron ore are being dug by them for the Alice stone coal furnace at \$1.25 per ton for digging, and, according to distance, at 75 cents to \$1 for hauling. The Alice furnace, running on native ore and coke, is averaging \$3 tons of very good foundry iron. The Belfont furnace, using 5 buggies of coke to 1 of raw coal, and running on Missouri ore, mill cinder and native ore, makes 47 tons per day. Her hot blast indicates 860° and her blast gauge two pounds. The new Hiram Campbell furnace is putting up her Whitwell oven shells, which look like small giants alongside of the main stack. Work on the furnace inwall has been begun. The stock house is to be 66 by 100 feet, the casting house 49 by 71 feet, and the smoke stack 107 feet high. Of the mills, the Lawrence and Belfont are running, as well as the nail department of the latter. At the tunnel coal mines, only those miners are at present at work who are employed at the Belfont and Lawrence banks. The price for digging is 50 cents per ton for screened coal. The Olive, Howard, Buckhorn, and Vernon furnaces continue doing well. Their irons are hauled to Center Station. The iron of the Pine Grove furnace, making from 16 to 17 tons, is taken to Hanging Rock, and that of the Ohio to the Union landing. The Lawrence furnace, now in the hands of an assignee, will not run much longer. She is making coal blast iron, and is doing tolerably well. She is situated almost directly on the railroad. The Norton Rolling Mill and Nail Works only are in operation, with about two months' stock of pig iron on hand. It is now believed that the improvements of the Ashland and Norton furnaces will not mature before the 1st of January. The Princess furnace continues making an excellent grade of iron, and is also giving satisfaction as to quantity. At Coalton, only ore is being received, of which some 7,000 tons have now accumulated. The price for good native ore, dug and delivered, which was paid here up to 30th September, was \$1.75 per ton, store goods, but was, we understand, to be raised to \$2 this month. One hundred and sixty coal miners and other necessary laborers are now steadily at work at the Rush mines, receiving 45 cents per ton of screened coal. A late decision of the managers of this company, ordering the loading of all their 106 coal barges, whose aggregate capacity exceeds 1,000,000 bushels, will continue to keep these men employed for several months. At the Star furnace department, which represents the ore and coal supplies of the Norton works, iron ore is at present coming in at an average rate of 700 tons per month, and is paid for at \$2.25 per ton in store goods. There are now on hand at this place from 9,000 to 10,000 tons of good ore."

The Connecticut Iron Mines.—Of the eight furnaces in Connecticut and New York in which Senator Barnum is largely interested, two at East Canaan and one each at Sharon and Millerton are in blast, one at Lime Rock just gone out of blast, and one at Huntsville just gone into blast. The production is about 3,000 tons per annum to each furnace, and the product goes to the Middle and Western States.

Extensive Purchase of Iron Property in Virginia.—The *Staunton Virginian* says:—"The Elizabeth furnace property on the Chesapeake and Ohio railroad, sixteen miles west of Staunton, Va., was recently purchased for \$135,000 by the Eureka Iron and Manufacturing company of Virginia. This company is principally constituted by parties of experience in the iron business in Ohio. The landed estate embraced in the purchase contains, with other tracts, about five miles of an elevated ridge abounding in brown and red hematite ores."

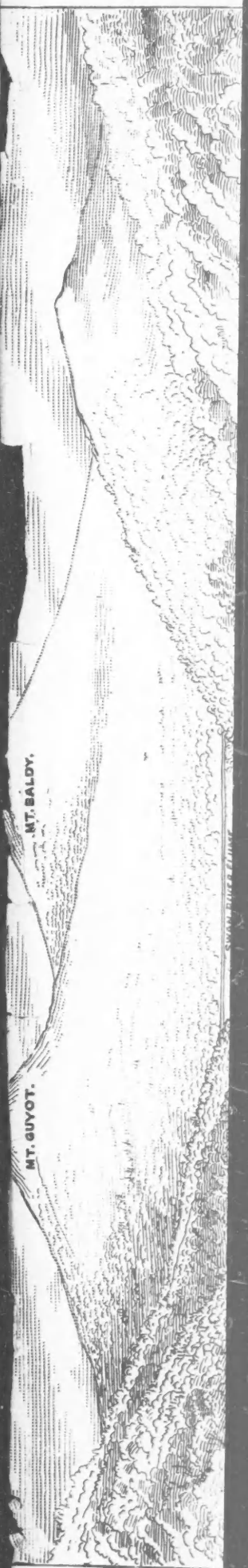
Activity of the Tennessee Iron Mines.—At Chattanooga, Tenn., the Tennessee Steel and Iron Company are working double time to their fullest capacity on



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SOUTH SWAN VALLEY, SHOWING SWAN RIVER FLUME (13.75 MILES LONG).

The Philadelphia & Reading Railroad Company has advanced its tolls, which, to Port Richmond and New York are now 25c. per ton higher.

CIRCULAR 19.

From December 17th, 1877, until further notice, and at the option of the shipper, the Main Line freight and tolls upon all anthracite coal shipped from Port Richmond, wherever consigned, will be one-third of the price at which the said coal is sold on board at Port Richmond; provided, the minimum rate of freight and tolls shall not be less than one dollar and twenty-five cents per ton on stove coal, and one dollar and fifteen cents on all other sizes; and provided that the regulations issued by the Secretary, relative to the adjustment of freight and tolls, be fully complied with by the shipper.

CIRCULAR No. 20.

From December 17, 1877, until further notice, and at the option of the shipper, the freight and tolls upon anthracite coal by canal from Schuylkill Haven to New York harbor, to points upon the Hudson River, or to points upon Long Island Sound, will be one-half of the price at which said coal is sold alongside at the point of delivery, exclusive of the charge of towing from New York City: provided the net rate of freight and tolls, exclusive of towing from New York City as aforesaid shall not be less than \$2 per ton, and that if the coal is sent in private or leased boats no higher rate of freight will be taken into account than then current in company's line boats: and provided, that the regulations relative to the adjustment of freight and tolls under the circular issued by the secretary are complied with.

CIRCULAR No. 21.

Notice is hereby given that circulars No. 16 and 17 of October 20th, 1877, are recalled, and the drawbacks therein referred to discontinued;—to take effect on the 17th inst.

The Delaware, Lackawanna & Western Railroad Company will sell at auction on the 28th inst. (next Friday) 75,000 tons of coal.

The production of anthracite for the week ending December 15 was 480,784 tons, as against 471,470 tons for the previous week, and 392,637 tons for the corresponding week of last year.

Bituminous.

This business is being steadily put on a winter basis and furnishes no features of interest.

New York.

Wholesale Prices of Bituminous Coal.

Table with 3 columns: Coal type (e.g., Westmoreland, Kanawha), Price per ton at shipping ports, and Price per ton alongside in New York.

Manufacturing and Steam Coals.

Table listing manufacturing and steam coals such as Cumberland at Georgetown and Alexandria, Va., with prices per ton.

Foreign Gas Coals.

Table listing foreign gas coals like Newcastle at Newcastle-on-Tyne, Ince Hall Cannel, and Scotch Gas Cannel, with prices.

Retail Prices.

Table listing retail prices for anthracite and bituminous coal, including Pittsburg, Lackawanna, and other brands.

* These prices are for coal delivered below Canal Street. The prices for coal delivered above that point are soc. per ton more.

Bituminous.

Table listing bituminous coal delivered per ton of 2000 lbs. from sources like Liverpool House and American.

Boston.

Dec. 15, 1877. The market is excited and feverish on account of the meeting of the coal magnates Thursday, and the strong probability of a combination being formed.

We quote Boston wholesale prices as follows:

Table listing Boston wholesale prices for anthracite, do. egg, do. stove, and various other coal types.

Chicago, Ill.

Table listing Chicago retail prices for Lackawanna Stove, Chestnut, Grate, and Egg.

Hamilton, Ont.

Table listing Hamilton retail prices for Lehigh Lump, Egg, Stove, and Nut.

Milwaukee, Wis.

Table listing Milwaukee retail prices for anthracite, egg, chestnut, and Lehigh lump.

Montreal.

Table listing Montreal retail prices for Scotch Steam, Pictou, and Anthracite.

New Orleans, La.

Table listing New Orleans wholesale prices for steamboats, manufacturers, families, and hhds.

Philadelphia.

Table listing Philadelphia retail prices for anthracite coal at wholesale and retail.

A very sudden advance in tolls taking place last Monday, the rates being those ruling before the last decline, has affected the shipments from Richmond.

The local trade is active, notwithstanding the unusual mild weather. The demand is not from consumers, but from dealers who desire to have a large stock on hand.

Vessels continue scarce here, and freights rising—\$2 being the lowest rate to Boston. Many vessels are laid up for the winter.

Pittston, Pa.

Table listing Pittston retail prices for Lump, Egg and Stove, Chestnut, and Pea.

Richmond, Va.

Table listing Richmond retail prices for Kanawha Cannel, Coalbng Splint, Lewiston, and Kanawha Gas Coal.

San Francisco, Cal.

Table listing San Francisco imports from various ports like Vancouver Island, Australian, Coos Bay, etc.

Arrivals for the week under review embrace the following cargoes: Ship Shirley, 1,500 tons Wellington from British Columbia. This is esteemed one of the best varieties in use for domestic household purposes.

are located on Vancouver Island, British Columbia, and the Seattle mines in Washington Territory. From New South Wales we have the Argomene, with 2,000 tons, and the Ennerdale with 1,798 tons.

COAL IN SOUTHERN CALIFORNIA.—William A. Witte, who, with his brother, discovered the Black Diamond Coal Mine in the Santiago Canon, yesterday brought to the Herald office several specimens of the coal, one lump weighing about fifty pounds.

Freights on Bituminous Coals from the Mines to Tide Water Shipping Ports.

For the above rates we refer to our issue of Nov. 17. For freights on Lehigh and Wyoming Coal we refer to our issue of Sept. 15.

For rates of freights on the Chesapeake & Ohio Railroad we refer to our issue of Dec. 1.

Towing.

For the above see issue of December 1.

Freights

Per ton of 2240 lb.

Representing the latest actual charters to Dec. 20, 1877.

Large table with 6 columns: PORTS, From Philadelphia, From Baltimore, From Georgetown, From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.

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

Rates of Transportation on Anthracite Coal to Tide Ports.

Table with columns for destination (e.g., Port Richmond, Harrisburg, Allentown), route (e.g., via P. & R.R.R., Main Line), and rate per ton of 2240 lb. Includes sub-section for Schuylkill Coals.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Dec. 21, 1877.

American Pig.—The lateness of the season and the approach of the holidays has reduced business to the smallest dimensions. This is not an unusual or unexpected state of affairs, yet it has had a demoralizing effect on prices, which are decidedly weaker than they were a month ago.

Scotch Pig.—Sales are only in a small way for consumption, and foot up about 100 tons of Coltness, and 200 tons of Eglinton. We quote, Eglinton at \$24; Coltness, \$26; and Glengarnock, \$24.50.

Rails.—The large sale of steel rails to the Pennsylvania railroad is now reported to be from 35,000 to 40,000 tons at \$40 at the works. In addition to this there has been a sale of 8,000 tons to the Lake Shore railroad at the same figure, and other business, making a total of about 50,000 tons.

Old Rails.—We are reported sales aggregating 1,800 tons at \$18@18.50, which may be considered the market price.

Wrought Scrap.—We learn of no business and quote nominally at \$22@22.50.

Baltimore, Md. Dec. 17, 1877

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

The pig iron market for the past week has been unusually dull. We quote prices as follows: Baltimore Charcoal... \$29@30; Virginia Charcoal... 28@30; Anthracite No. 1... 19@20; Anthracite No. 2... 18@19; Anthracite No. 3... 17@18.

Buffalo. Dec. 20, 1877.

Specially reported by PALEN & BURNS.

Quotations on pig iron in this market remain unchanged since our last. Market inactive. Our foundrymen report an increased business for the year, but at reduced prices.

Table listing iron products and prices: No. 1 Ex Foundry... \$20 91; No. 2... 19 91; Gray forge... 18 91; American Scotch A... 24 25; Cherry Valley... 23 25.

Per gross ton 4 months delivery here.

Chattanooga, Tenn. Dec. 18, 1877.

Specially reported by J. F. JAMES, dealer in pig iron, ores, etc.

The general tone of the iron trade South remains unchanged. A few small orders in single car load lots to carry the foundries over the holidays have been filled during the past week. No large sales to report except 200 tons of charcoal mill pig for the West.

Table listing iron products and prices: Tenn., Ala. and Ga. Charcoal, No. 1 Foundry... \$18 00@19 00; Tenn., Ala. and Ga. Charcoal, No. 2 Foundry... 17 00@18 00; Tenn., Ala. and Ga. Charcoal, Gray Forge... 15 00@16 00.

Table listing iron products and prices: Old rails... 18 00@19 00; Wrought scrap... 12 00; Cast scrap... 10 00; Muck bar... 32 00@33 00.

Iron Ores.

Table listing iron products and prices: Red Hematite (about 55 per cent. metallic iron) f. o. c. at mines... 1 25; Brown Hematite (about 55 per cent. metallic iron) 1 75.

Columbus, O. Dec. 19, 1877.

Specially reported by KING, GILBERT & WARNER, dealers in Pig Iron and Ores.

Trade for the past week has been fair with no changes to note in prices. We quote as follows:

FOUNDRY IRONS.

Table listing iron products and prices: No. 1 Hanging Rock Charcoal... \$23 50 to 24 00; No. 2 Hanging Rock... 22 00 to 22 50; No. 1 Hocking Valley soft and strong from pure limestone ores... 21 50 to 22 00.

MILL IRONS.

Table listing iron products and prices: Gray neutral... 18 50 to 19 00; Mottled and white neutral... 17 50 to 18 00; Gray cold short... 17 50 to 18 00; Mottled and white cold short... 16 50 to 17 00.

Louisville, Ky. Dec. 18, 1877.

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

We have no change of importance to chronicle since last report. Purchasers are buying to tide over New Years; are indisposed to purchase largely for future delivery.

FOUNDRY IRONS.

Table listing iron products and prices: No. 1 Hanging Rock, Charcoal... \$23 00@24 00; No. 2 Hanging Rock... 20 00@21 00; No. 1 Southern Charcoal... 20 00@21 00; No. 2 Southern Charcoal... 19 00@20 00; No. 1 Hanging Rock, Stonecoal and Coke... 20 00@22 00; No. 2 Hanging Rock... 19 00@20 00; No. 1 Southern Stonecoal and Coke... 19 00@20 00; No. 2 Southern Stonecoal and Coke... 18 00@19 00; "American Scotch"... 20 00@22 00; Silver Gray... 18 00@19 00.

MILL IRONS.

Table listing iron products and prices: No. 1 Charcoal, Cold-short and Neutral... 18 50@19 50; No. 1 Stonecoal and Coke, Cold-short and Neutral... 18 00@18 50; No. 2 Stonecoal and Coke... 17 50@18 00; No. 1 Missouri and Indiana Red-short... 21 00@22 00; White and Mottled, Cold-short and Neutral... 15 00@16 00.

CAR-WHEEL AND MALLEABLE IRON.

Table listing iron products and prices: Hanging Rock, and Cold Blast... 34 00@38 00; Alabama and Georgia... 25 00@33 00; Kentucky Cold-blast... 25 00@33 00.

Philadelphia, Pa.

[Weekly Report of the Philadelphia Iron Market, furnished for THE ENGINEERING AND MINING JOURNAL, by JUSTICE COX, Jr., & Co., Iron Merchants, 333 Walnut Street, Philadelphia, Week ending Dec. 20, 1877.]

PIG IRON.—There has been quite a movement in pig the past week, several large sales are reported with deliveries into the new year, and contrary to usage and expectation several quite large sales for immediate delivery. A feeling seems to have gotten abroad that prices would be firmer if not advanced after the new year comes in, hence the sales. And then again, some contracts pending for some time have been closed that will take quite an amount of iron in one way and another. We report sales of about 5,000 tons, and quote No. 1 \$18.50 to \$20; No. 2 \$17 to \$18.50; Gray Forge, \$16 to \$17.50, all Philadelphia delivery.

MANUFACTURED IRON.—In bars, very little in the way of business can be reported. Prices are firm but most consumers of bars are holding off until after stock-taking time and the new year comes, when it is hoped there will be more business to re-

port. In plate and tank there is a little more doing. Some orders have been placed for immediate shipment. In skelp nothing is reported, most mills making this class of iron are shut down until after the holidays, if they start up they depend on orders. We quote bars 2 to 2 1-10c. per lb.; plate and tank, 2 1/2 to 6c. as to quality; skelp, 2 1-10 to 2 1/2c. per lb.

RAILS.—Nothing new in steel rails to report this week. The mills running have all they can do for some time to come. In iron rails little or nothing is doing. We quote steel \$41 to \$43 at mill; iron \$32 to \$35 at mill.

OLD RAILS continue scarce and good prices are obtained for all lots for immediate delivery. The market is bare of stock and prices are advancing. We quote \$20 to \$21.

OLD WHEELS are in plentiful supply at low prices. We quote \$17 to \$18 with offers for round lots a dollar off for cash.

SCRAP.—Wrought scrap is dull of sale, and low prices are quoted. We quote \$20 to \$24; cast \$12 to \$16.

St. Louis, Mo. Dec. 18, 1877.

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

Pig iron is in fair demand and present prospects indicate a good demand through the winter. Most of our foundries and mills have small stocks of pig iron on hand, and any indication of prosperity for the coming year we think must increase the demand to that extent that an advance in prices is almost a certainty.

COLD BLAST CHARCOAL—ALL NUMBERS.

Table listing iron products and prices: Hanging Rock... 25@38; Assorted Bar Iron \$2. rates. Tennessee... 26@30; No. 1 Wrought Scrap 8cc. cwt. Kentucky... 26@30; Heavy cast " " 65 " Missouri... 26@30; Light " " 55 " Georgia... 26@30; Old rails... 19 00 to 20 00 Alabama... 26@30; Old car wheels... 17 00 to 18 00.

Table with columns for No. 1, No. 2, Mill, White and Mott'd. Missouri stone coal... \$22 00; Tennessee charcoal... 22 00; Tenn. coke very soft and strong... 23 00; Hanging Rock charcoal... 25 00; Alice Hanging Rock coke... \$25 00; Quinnimont, W. Va., coke... 23 50.

METALS.

NEW YORK, FRIDAY EVENING, Dec. 21, 1877.

The quietness usual to the last fortnight of the year has appeared to an unusual degree this year. The attitude of England on the Eastern question has, and is likely to have, a disturbing influence on the metal market until Parliament convenes in January.

Gold Coin.—The price of gold has ranged from 102 3/4 to 102 1/2, and closed at 102 3/4.

Bullion.—Silver has improved in London since the award of the India Council bills on Wednesday, at 3/8d. advance over last week's award, and is correspondingly higher here. This advance was unexpected in London and must have had a special cause not yet known here. The quotations are 117 1/2 in this city; 8 per cent. discount in San Francisco, and 54 1/8d. in London.

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

Table with columns for Date, London, New York, Pence, Cents. Dec. 15... 53 1/2@54; Dec. 17... 53; Dec. 18... 53.

BULLION SHIPMENTS.

We give below a statement showing the amount of of the latest bullion shipments in addition to these announced in our issue of December 15th:

Table listing bullion shipments: Dec. California... \$151,150 00; Consolidated Virginia... \$31,337 23; Standard... 39,426 00; 4 Gila... 6,144 00; 6 Tybo Consolidated... 12,419 00; 10 Martin White... 17,084 00; Nov. Leopard... \$21,170 00; Grand Prize... \$121,530 00.

* From 1st to 11th inclusive. * For month of November.

BULLION TAXES.—The bullion taxes of the Californian and Consolidated Virginia paid for the quarter ending Sept. 30th amounted to \$156,036.87.

Copper.—There is no business worthy of note doing in this market. The large holders are asking 18c, while only 17 3/4c. is bid for large lots. We can call the market only 17 3/4c. although but a very small quantity could probably be obtained at this figure. According to cable advices, Chili Bars (g. o. b.), were quoted at £65 10s. with buyers, and a quiet market.

Messrs Vivian, Younger & Bond of London, under date of December 7 say of copper: "A variety of very strong reasons and arguments have been brought to bear on this article by the buyers to cause a general feeling of depression throughout the

trade, and the success is to be seen in the exceedingly low prices which have been accepted for English copper and Chili produce; prices which have only ruled once before during the present generation, and then it was under the influence of panic during the Franco-German war, when the trade was brought to a standstill, and we had then a stock of 35,417 tons, and afloat and chartered for 9,586 tons, total 45,003 tons in copper, against the present stock of 29,974 tons, afloat and chartered for 5,700 tons, total 35,674 tons, or 9,320 tons more in 1870 than now. During the last few days, however, the consumers have taken heart a little, and some pretty considerable purchases having been made, prices for all sorts of raw copper have advanced about 20s. a ton from the worst. It is estimated the purchases for consumption and shipment during the last week amount to about 5,000 tons.

The quantity of Chili bars, ores, and regulus in stock at and afloat for Liverpool, Swansea, and Havre, and of English and foreign copper in London is thus estimated in fine copper:

Table with columns for Stock, Chili produce shipping and afloat, and Total, tons. Includes sub-tables for Dec 1, 1877, 1876, 1875 and Dec 1, 1877, 1877, 1877.

Tin.—There has been no business in this article in this market. The closing quotations, in gold, per pound, are: Straits, on spot, 15 1/4 d., and to arrive late in January, or early in February, 15 1/2 c; L. & F., 15 1/2 c; Refined, 15 3/4 c; and Banca, 17 1/2 c. The quotations on the 18th inst. were at Penang \$19 and Singapore, \$19.75, with exchange at 4 s 1/4 d. The shipments from the Straits to the United States for the first fortnight of December, amounted to 300 tons by steam. According to cable advices the London market closed to-day with buyers at £66 15 s for Straits, with upward tendency.

Messrs. Vivian, Younger & Bond of London, under date of December 7, say of tin: "The trade doing has been good, and the deliveries of foreign, as will be seen from the undernoted figures, have been very heavy. The price has gone back a little, but at current rates there is a firm market. There is a fair amount of evidence that these values tend to pretty considerably increase the consumption, and to some extent curtail production, but the stock is large, and therefore naturally any advance in prices seem to check business.

The stock of foreign tin in London and Holland is thus estimated:

Table with columns for Foreign tin in London, Banca tin in Holland, Billiton tin in Holland, and Quantity of tin afloat for Europe. Includes sub-tables for 1877, 1876, 1875.

Tin Plates.—The business in these, as in all other articles on this list, has been very quiet. We quote, in gold, per box, as follows: Charcoal tins, \$6.25@6.37 1/2, and ternes, \$6; Coke tins, \$5.37 1/2@ \$5.40, ternes, \$5.50@5.37 1/2.

Messrs. Robert Crooks & Co., of Liverpool, under date of December 6, say of tin and terne plates: "Most of the large buyers are keeping out of the market, which is consequently very flat. For charcoal tins there has been more inquiry, and this may result in business at slightly under makers' present spot rates, for delivery over opening months of next year. Ternes are decidedly weaker, with the exception of a few favorite brands. Coke tins for future could be booked at lowest rate for present delivery, but this does not tempt buyers, who expect lower rates."

Lead.—This article is nominal at 4 1/2 c., with nothing doing.

Spelter and Zinc.—Spelter is quiet at 5.75s. 5.80 c. Sheet zinc has been further reduced in price and is quoted at 7 1/8@7 1/4 c.

Antimony is quiet at 12 c. for Hallett's, and 12 1/4 for Cookson's.

Quicksilver.—The San Francisco Commercial-Herald of December 13 says: "Leading holders con-

tinued firm in their demands at 47 1/2 c., and at which moderate sales have been made, but at present the export demand is light and shippers not disposed to purchase freely at over 45@46c. The production of the State is now much less than it was in midsummer, and some of our largest mine producers say that there is very little profit at under 50c." The Napa Register, speaking of the Great Western Quicksilver Mine, says: "Some 225 men, mostly Chinamen, are employed by the company; 120 tons of ore are reduced per day, and from 500 to 600 flasks of quicksilver are bottled every month. During the last year the company has paid off all its debts, made \$20,000 worth of improvements, and disbursed a \$50,000 dividend. The monthly payroll foots up \$10,000. In the vicinity of the mine there are 20 or 30 families." The market at the close exhibits increasing firmness. Price, 47 1/2 c. Receipts for the week, 1,009 flasks.

Salt Lake Ore and Metal Market.

SALT LAKE CITY, UTAH, December 21, 1877.

Argentiferous Lead (Base Bullion).—\$40 per ton for lead; \$1.17 per ounce for silver; \$20 per ounce for gold. The quotations for silver are based upon the silver contents in the lead of 80 to 120 ounces per ton of 2,000 lb.

Ore and bullion shipments from Salt Lake during week ending Dec. 8, 1877:

Table with columns for Consignor, Smelting Works, and Totals. Lists various companies like Morgan, Telegraph, Frisco, Mingo, Durell, Pascoe, and Germania.

Table with columns for Consignor, Consignee, lb., and Totals. Lists various companies like Telegraph Mine, Yosemite, Carbonate, ConklinSampL W., Mackintosh, and Shoebridge Mine.

* Copper ore.

FINANCIAL.

New York Stocks.

NEW YORK, Friday Evening, December 21, 1877.

The total sales of the coal stocks has been but about 110,000 shares. As has been the case for several weeks, prices have been fluctuating under various rumors, favorable or unfavorable to a coal combination. From the slight advance that has been secured in these stocks since combination meetings began to be held, it is evident that the "street" has but little confidence in a combination being formed, or else that it was fully discounted in the advance established during the summer. The sales of Delaware & Hudson Canal have aggregated 13,554 shares at 52 1/4 @50, closing at 51 1/4. Delaware, Lackawanna & Western has been dealt in to the extent of 95,260 shares at 49 1/4 @51 1/4, closing at 50 1/4.

New Jersey Central Railroad.—This stock has been steady during the week, and closes at 13 1/2 with sales of 1,500 shares. The New York Guaranty and Indemnity Co., who are the Trustees of the consolidated mortgage, bondholders have instructed their counsel, Wm. Butler Duncan, to take measures at once to foreclose the road. The holders of over \$2,000,000 of the bonds have signed the agreement of reorganization during the past three days. Leaving out of account those who may have signed in London, this makes an aggregate of \$9,000,000 of signatures out of \$20,000,000 thus far. Mr. John S. Kennedy, one of the sub-committee of the consolidated bondholders, recently said that he did not know whether the first mortgage bondholders or the stockholders would fight or not.

James River & Kanawha Canal.—The damage done to this canal by the recent freshets was so great that it will be a very difficult matter for the company to raise money for the repairs. Some sections of the canal will have to be rebuilt. In view of this state of affairs it is suggested that the canal be abandoned altogether as a canal and its works be used as the road bed of a railroad. A proposition is already before the Richmond City Council for city subscription for this purpose. It is said that the necessary changes can be made and the rails laid in about the same time as would be required to put the canal in working order again.

The Cleveland, Columbus, Cincinnati & Ohio Railroad Company will build this winter at its docks in Cleveland, Ohio, extensive steam hoisting apparatus for the transfer of coal from cars to lake vessels. This will be in addition to the shutes now in use at the docks.

The Columbus and Coal Valley Extension Railroad Company, organized a short time ago to build a line from Columbus southeast to McConnellsville, has been consolidated with the Columbus and Northwestern Railroad Company, another new company, which proposes building from Columbus to Fort Wayne, Ind.

Miscellaneous Sales and Quotations.

Sales and quotations of the stocks and bonds dealt in here at Philadelphia, and Baltimore for the week ending the 21st inst. are given in the following tables. The Philadelphia quotations will have a * affixed. The Baltimore quotations are indicated thus †.

STOCKS.

Table with columns for STOCKS, QUOTATIONS (High, Low, Close), and Sales Shares. Lists companies like American Coal Co, Cambria Iron Co, Pennsylvania Salt Manfg Co, etc.

BONDS.

Table with columns for BONDS, QUOTATIONS (High, Low, Close), and Sales. Lists various bonds like D. L. & W. 7th, N. J. C., L. & W. B. Coal Co, etc.

Total transactions for the week \$136,455

Philadelphia Stocks.

PHILADELPHIA, Friday Evening, Dec. 21, 1877.

Quite a dull market has characterized the operations in coal shares during the business of the past week on the Philadelphia stock market. The quotations remain at nearly the same prices as recorded in our last issue, with very steady fluctuations throughout the dealings of the week. The total transactions scarcely reach 50,000 shares, the bulk of which were in Pennsylvania Railroad, and the Philadelphia & Reading, 25,000 shares being in the former, and 22,000 shares in the stock of the latter company. Regarding the improvements in Pittsburg, proposed by the Pennsylvania Railroad, the Philadelphia North American of the 21st inst. says: "The ordinance authorizing the changes proposed by the Pennsylvania Railroad in making its improvements in Pittsburg, has passed Common Councils, and will doubtless receive the favorable action of Select Council. This, says the Commercial Gazette, will open the way for the extensive improvements proposed, if the delay has not resulted in such preparations as will preclude any change."

Cambria Iron Co.—The annual meeting of this company will be held on the 15th of January, 1878.

United New Jersey Railroad and Canal Co.—This company announces its regular quarterly dividend of 2 1/2 per cent., payable on the 10th of January, proximo.

Mount Farm Coal and Oil Co.—This company announces a dividend of 2 per cent.

Puassac N. J. Zinc Co.—The annual meeting of this company will be held on the 23d of January, proximo.

AUCTION SALES OF STOCKS AND BONDS.—The following stocks and bonds were sold at auction during the week:

Pennsylvania Railroad Co.—80 shares at 31 1/2 per share.

Reading Railroad Co.—16 shares at 16 1/2 per share.

Lehigh Valley Railroad Co.—9 shares at 40 1/2 per share.

Pennsylvania Canal Co.—\$10,000 6 per cent. bonds at 60 1/2 per cent.

Pennsylvania Salt Manufacturing Co.—\$1,000 bonds at 103 1/2 per cent.

United Railroads of New Jersey.—\$3,000 6 per cent. bonds at 101 1/2 per cent.

Pennsylvania Oil Creek Petroleum Co.—The annual meeting of this company will be held Jan. 8.

COAL TRANSPORTATION AND GENERAL MINING STOCKS.

Main table with columns: Name and Location of Company, Feet on Vein, Capital Stock, Shares (No., Par Val.), Assessments (Total levied to date, Date and amount per share of last), Dividends (Total paid to date, Last Dividend, Rate per Ann.), Highest and Lowest Quotations per Share in Currency (Dec. 15, Dec. 17, Dec. 18, Dec. 19, Dec. 20, Dec. 21), and Sales.

Total Assessments levied to date 4,116,530 | Total Sales of coal stocks for the week 16,433 shares.
Total Mining Dividends disbursed to date 20,996,001 | Total Sales of Mining Shares for the week 79,855
*A dividend of 3/4 per cent. was declared on the preferred stock of this Co. in July, 1877.

Copper Stocks.

Reported by Wilson W. Fay & Co., Room 7, Traveler Building, 31 State Street, Brokers in Mining and Miscellaneous Stocks.

BOSTON, WEDNESDAY EVENING, Dec. 19, 1877.

There is an evident waking up in the market and a desire to invest shown by outsiders, which is having a favorable impression upon the stocks, running up the prices and creating a general good feeling, which looks like the forerunner of an active season in mining stocks.

Outside orders are flowing in and everything indicates that the time to invest has arrived. Stocks that have remained quiet all summer are suddenly springing into life and showing a strength and firmness that could hardly have been expected after such a long period of quietude.

Calumet and Hecla has had a slight decline, there being numerous transactions at 180, 179 3/4, 179 1/2, 178 3/4, and closing 178 1/2 @ 178 3/4.

Copper Falls also declined and sold as low as 1 1/2, but has strengthened again, and is now 2 3/8 @ 2 1/4.

Franklin has been in demand, and, consequently, has shot up to 8 1/2 bid and 9 1/2 asked, there being sales at 8 1/2 and 8 3/4.

Oseola has also strengthened, closing 17 @ 18.

Pewabic has not changed a great deal, although there is evidently more interest taken in it than there was six months ago, and a rise may be looked for at any time. It closes 1 1/2 @ 1 3/4.

Quincy is firm at 40 @ 40 1/2, and very little stock changing hands.

Ridge remains about the same, there being sales at 1 3/4, closing 1 3/4 @ 1 1/2.

Dawson silver has been active, there being sales at '08 and '10, closing '08 @ '10.

Duncan has taken a jump, having sold as high as 2 1/2, and fluctuating between 2 and 2 1/2 for two or three days, immense amounts of stock changing hands, the majority of which has been bought by parties who intend to hold, it being reported that a vein of silver had been struck, from which big things were expected. The market fell off to-day, however, and closes 1 3/4 @ 1 15-16.

International caught the infection from Duncan and went up to 45, but has also dropped off, and sold at 37 1/2, closing 35 @ 37 1/2.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Dec. 21, 1877.

Nearly the total week's business of the New York Mining Exchange has been confined to dealings in the stocks of the six companies in the order under-mentioned. Kings Mountain Mining Co., N. C. This stock was placed upon the list on Monday. The mine is located 35 miles southwest of Charlotte, and has been worked a number of years. It has recently been organized under the laws of the State of New York with a capital stock of \$1,200,000 in \$10 shares. The sales for the week aggregate 18,400 shares, at quotations ranging from \$2 to \$2.50 per share, closing at \$2 1/2. Lacrosse has sold to the extent of nearly 16,000 shares, opening at 40 c. and closing at 28 c.—these prices representing the extreme quotations.

The dealings in Moose still form a prominent feature in the operations of the board, the sales amounting to 14,200 shares at from 7 1/2 to 6 7/8, closing at 7 1/2. American Flag closes at 11c, with sales of 13,200 shares. The stock of the American Gold Mining Company of Colorado closes at 6 1/2 per share, with sales of 6,300 shares; we refer to our Colorado correspondence for some information concerning this mine. Bertha and Edith has been fairly steady during the week, nearly 6,000 shares of the stock changing hands. The Idaho Gold Mine of Grass Valley, California, has paid its one hundredth or centennial dividend.

The Foot Hill Tidings says: "This mine commenced paying dividends in 1869, and has paid regular monthly dividends to this time, the aggregate amount being \$2,270,820. Beside the payment of these dividends the mine has paid for the erection of costly hoisting works, a 35-stamp mill, and a fire-proof building for the pumping engines, air compressors, and all the improved apparatus used in mining. The main shaft is down over 1,000 feet, with levels well opened, and large reserves of ore in the stopes. The mine is looking well wherever opened, and gives assurance of continuous dividends in the future; and as it stands today is good for three or four years work to come without reference to developments which may be made in the future."

California advices of yesterday report a quiet market for mining shares, with generally a fractional advance. Superintendent Fair has ordered the Ophir Cross Cut to be started, which causes some excitement among speculators. The annual meeting of the Gould & Curry mine stockholders was held yesterday: 84,000 votes were cast, Flood and Heydenfeldt controlled the election. An assessment of \$1 has been levied.

The San Francisco Post says it learns on good authority that the Chollar-Potosi Mining Company have decided to increase the capital stock five shares for one, and to divide the property into two mines of 600 feet each, one to be known as the Chollar, and the other as the Potosi, besides selling 200 feet to the Hale & Norcross Company.

The Commercial Herald of the 13th inst. says of the market: "Considerable weakness is manifested at present throughout the list, and this coupled with the unearthing of more or less crookedness in a number of companies, does not help the market to an advance as all expected would be the case toward the close of the year. The good time coming is yet apparently very far off, and the outsiders generally are very sick

of the present condition of the market. So long as the brokers are the only ones who are making money, dissatisfaction will prevail, and we do not, therefore, look for a very speedy improvement under these circumstances. As the general trade of the city and coast is greatly affected for the want of rain to give us an assurance of a good crop of cereals, just at that ratio are all our speculative circles depressed, and until this fear is dissipated by a prolonged and heavy rainfall, we may look for a marked inactivity in all avenues of trade and commerce."

MINING STOCK QUOTATIONS IN SAN FRANCISCO.

We give below a table showing the closing prices of mining shares in San Francisco yesterday, 20th inst.

Table of mining stock quotations in San Francisco. Columns include company name, price per share, and other financial details. Includes entries for Alpha, Belcher, Best & Belcher, Bullion, Caledonia, California, Chollar Potosi, Con. Imperial, Con. Virginia, Confidence, Crown Point, Eureka, Exchequer, Gould & Curry, Hale & Norcross, Indian Queen, Julia, Justice, Kentuck, Kossuth, and Leopold.

The Gold Hill News of the 12th inst. says: "Ophir is quietly developing, as far as that new ore vein at the 1900 level is concerned, and in a week or two from now the new management will have the pumps in readiness for whatever water is likely to be encountered in case it should be deemed expedient to crosscut the ledge."

According to latest accounts from San Francisco, the rascally looking transactions in the old management of the Justice Mine, which are being brought to light, are proving worse and worse as further developed. A perfect lead or rich deposit of rascality is being unearthed by the new management which so suddenly and promptly stepped in to the rescue. It is shown according to the accounts of the old managers, that over \$3,000,000 worth of bullion has been taken from the mine in the last two years, and \$1,000,000 received from assessments; yet no dividends have been paid during that period. This has to be accounted for. The following telegram received by us from San Francisco is significant in this respect:

"Attachment suits against Shultz & Von Bargaen have been commenced in the Fourth District Court, at the instance of the Justice Mining Company, to the amount of \$155,000. The attachments are now being levied on all the property of the firm."

"The Investigation Committee find the Woodville affairs in about as bad a condition as those of the Justice, and they warn the public against purchasing Woodville stock, as an over-issue has been discovered, the amount of which is not yet ascertained."

Ontario Silver Mining Co.—The production of this company from the 1st to the 14th inst. inclusive, was 50 bars of bullion having an assay value of \$88,911.06.

Northern Belle Mining Co.—The trustees of this company have concluded to omit the regular monthly dividend for December.

Sutro Tunnel.—This work is making very good advancement at present, through favorably working ground, consisting of ledge porphyry with seams of quartz and clay. Total length of tunnel, 18,478 feet.

Assessments, with dates when delinquent: Alameda 10c, Jan. 23; Belmont 40c, Jan. 7; Silver Hill \$1, Jan. 5; Lucky Jack 5c, Jan. 12; General Lee 5c, Jan. 5; Alta \$2, Jan. 17.

The Tip Top Mining Co. has levied its second assessment of 40c per share, aggregating \$40,000.

The Bulwer Mining Co (Mono Co., Cal.) has levied an assessment of 50c per share.

The Standard Mining Co (Cal.) has declared its 4th monthly dividend of \$1 per share.

The Grand Ridge Mining Co. has declared a dividend of \$1 per share.

DECEMBER ASSESSMENTS.

The San Francisco Stock Report of the 14th inst gives the following list of mining assessments delinquent this month, so far as made public:

Table of December assessments. Columns include Name, Per. Share, Amount, and Del. Dec. Includes entries for Mutual, N. Y., Gold Bonds, N. York, Metrop., Certf., Bonds, Harlem, Manhat., Brooklyn, Nassau, Certf., People's, Certf., B'ds, Metrop., Wmab'g, Certf., Citizen's, J. C., N. J., Cent. Westch. N.Y., Subur'n, Municipal, N.Y., and Jennie A. & B. R.

Table of stock prices for various companies. Columns include company name, price per share, and other details. Includes entries for Loyal Lead, Mint, Modoc Consolidated, Moore's F. B. Gravel, New Coso, New England, New York Hill, Navajo, Overman, Pawnee, Rex Montes, Savage, South Navajo, Savajo, Union Gravel, Utah, Ward, Wall Street Quicksilver, and William Penn.

Total. \$1,065,650

Gas Stocks.

NEW YORK, FRIDAY EVENING, Dec. 21, 1877.

We are reported no change in the quotations of gas stocks, prices in every instance remaining as given in our last. The only transactions coming to our notice is a sale of 10 shares of the stock of the New York Gas Co., on the 18th inst., at auction, at 120 per cent.

Lighting the Streets of New York.—The Gas Commission, comprising the Mayor, Comptroller, and Commission of Public works, met at 2 o'clock in the office of the latter on the 15th inst. and adopted a resolution awarding a contract to the Harlem Gas Light Company for lighting all the public lamps, 4,220 in number, between Seventy-ninth street and Harlem river, at the rate of \$7.90 for each lamp, for the four months ending April 30, 1878. This award completes the contracts for the entire city for the above term. The rate paid the Harlem company for the corresponding term of 1877 was \$13.32 for each lamp.

The Gas Question in Easton, Pa.—The Free Press says: "We believe but one opinion prevails about the new gasoline lamps. They are generally voted a failure. The plain truth is, if our citizens want light at night they must use gas, even if it is a trifle more expensive."

The Pittston (Pa) Gas Company has reduced the price of gas to \$3 per 1,000 feet, commencing with the present quarter. Their winter supply of coal cost them less than formerly, thus enabling them to make the reduction. The company has nearly four miles of pipe in use and about 270 consumers.

The Sunbury (Pa.) Gas Co.—The Democrat says: "The Borough Council and the gas company of this place are at loggerheads. The council concluded to pay the company only \$1 per month for each street light instead of \$1.50. The company will not stand the reduction, and we are constantly compelled to plod the streets in darkness. This is very dangerous to life in the localities where the sidewalks are as bad as they are on Third street, below Chestnut."

The Reno, (Nev.) Gas Co. has fixed the price of gas at \$6 per 1,000 feet, a reduction of 25 per cent. from former rates.

Poor Economy of the Municipal Authorities of Reading, Pa.—The municipal authorities of Reading have ceased lighting the streets of that city. Already one life has been lost, and the city mulcted in damages on account of its negligence in failing to keep its highways properly lighted; and now the doctors of the place are talking of "unanimously refusing to make professional calls after midnight, on account of the personal danger incurred in the present state of unlighted streets."

Jeffersonville (Ind.) Gas Co.—A new gas company is being organized in this place, with a capital stock of \$25,000. Many citizens have subscribed. This company will apply for a charter soon.

Metropolitan (N. Y.) Gaslight Co.—The annual meeting of this company will be held Jan. 14.

Peoples Gas Co. of Baltimore.—150 shares of the stock of this company sold during the week at 14 1/2 @ 3 1/2 per cent.

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

Table of gas stock companies in New York and vicinity. Columns include Company name, Capital Stock, Par., Rate per an., Am. of last, Date of last, Bid., and As'd. Includes entries for Mutual, N. Y., Gold Bonds, N. York, Metrop., Certf., Bonds, Harlem, Manhat., Brooklyn, Nassau, Certf., People's, Certf., B'ds, Metrop., Wmab'g, Certf., Citizen's, J. C., N. J., Cent. Westch. N.Y., Subur'n, Municipal, N.Y., and Jennie A. & B. R.

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Something Worth Knowing.

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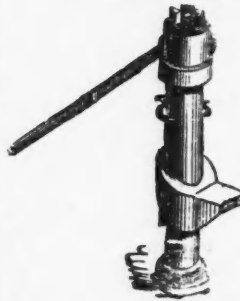


Patent Sept. 6, 1870
Trade Mark, Jan. 21, 1872
Priority Aug. 28, 1872
Patented March 17, 1874.
Patented Dec. 12, 1872.
Patented Oct. 8, 1873.
Patented Dec. 24, 1872.
Patented Sept. 30, 1873.

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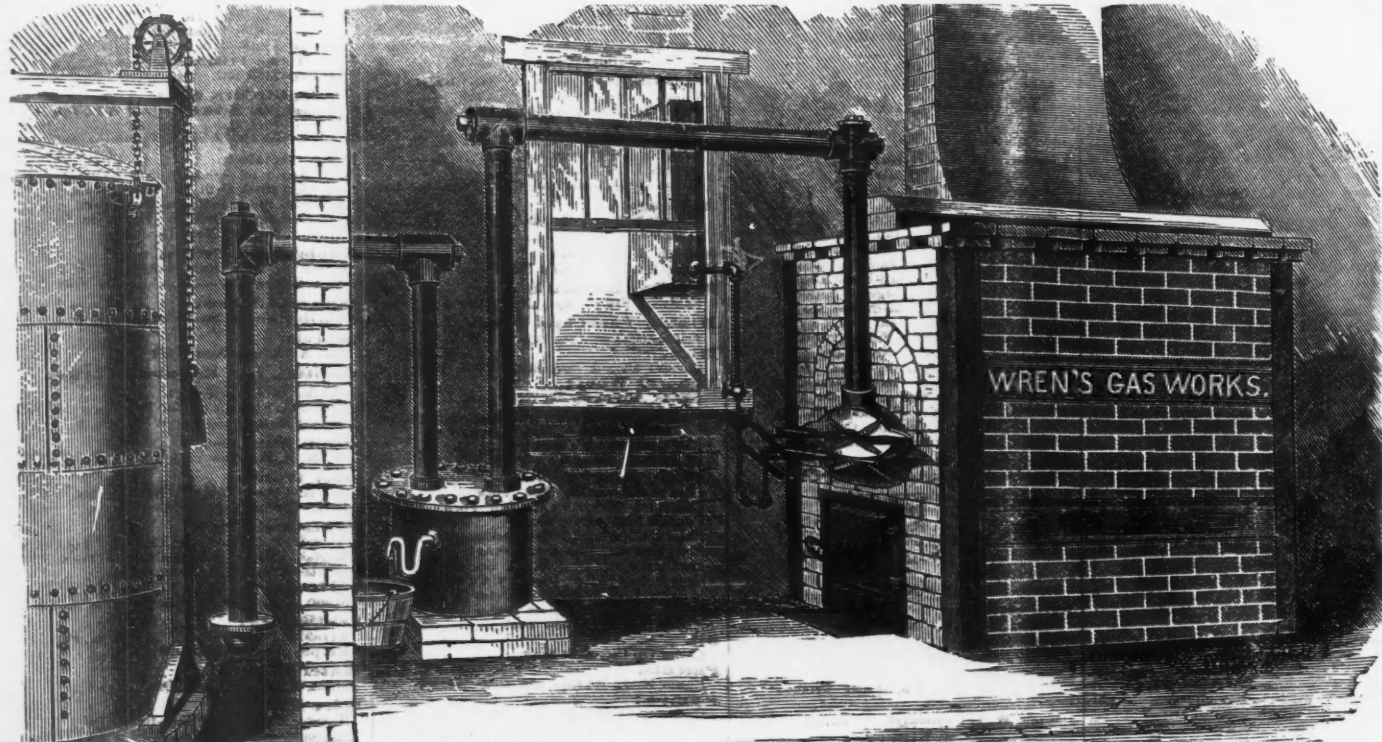


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