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1874	XVIII.	4, 11.	1875	XX.	7, 12, 22, 23.

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ACTION OF SMALL SPHERES OF SOLIDS IN ASCENDING CURRENTS.

Errata.—The numbers in the last line of the article on page 130 should read, 2 473, 2 856, 3 193, instead of 2 671, 3 162, 3 623, respectively.

THE GREAT MINING SUIT OF THE EUREKA AND RICHMOND CONSOLIDATED, NEVADA.

This remarkable case, which has been on trial for some time past, has just been decided in favor of the Eureka upon all the points. No other case ever tried in this country has had so formidable an array of experts on each side. On the side of the Eureka were Dr. R. W. RAYMOND, of the ENGINEERING AND MINING JOURNAL, Dr. T. STERRY HUNT, and W. S. KEYES. On the side of the Richmond were CLARENCE KING, Prof. J. D. WHITNEY, J. D. HAGUE, N. WESCOATT, and PROFESSORS PRICE and ASHRBURNER.

The case involved questions of vein formation of the greatest interest. We shall, in an early number, give a full resume of it, and of the arguments presented on each side.

REMARKABLY QUICK WORK IN RAILROAD CONSTRUCTION.

The Philadelphia & Atlantic City Railway, three and a half feet gauge, is fifty five miles in length, and has recently been opened, having occupied but three months and seven days in construction. Ground was broken April 1, 1877, and the first train was run over the road July 7, when one and three-quarter miles of track were laid in advance of the train, delaying it two hours. The following particulars show that the rapidity of construction was due to remarkable energy on the part of the Consulting Engineer, Mr. THEODORE F. WURTS, and not to unusual facility.

The deepest cut on the line is 30 feet; deepest fill, 35 feet; largest single excavation, 40,000 cubic yards; embankment, 30,000 cubic yards. An embankment of 23,000 cubic yards, 1,800 feet long, was made in one week! And five miles of track were laid in one day. There are more than one hundred bridges and culverts on the line. The longest three bridges aggregate 1,300 feet in length, and one bridge has a draw of 100 feet. The road has 4,400 feet of wharf in Camden, built in two months. The company has for its depots, offices, and excursion house, the Centennial Buildings, known as the Centennial Commission Building, Lafayette Restaurant, Board of Finance Building, Centennial Bank Building, and the Car Annex to Machinery Hall. These, in their light architecture, are very appropriate to the requirements of a railroad built for summer travel. The average cost of grading was but ten cents per cubic yard of excavation and embankment. The equipment of the road consists of 8 locomotives, 44 passenger coaches, and 60 freight cars, and the track is laid with 40-lb. steel rails. The entire cost of construction and equipment was but \$770,000, or \$14,000 a mile. Not the least remarkable thing in this connection is that the road was built within the original estimates of cost. Though it is not yet fully completed, when this is done according to the engineer's plans, it will be equal to our best wide gauge roads in safety, speed, and comfort. Trains run through the 55 miles without stopping in two hours, and one train has carried 2,300 passengers each way.

The remarkable progress made in building this road naturally kept the engineer corps pretty busy, night and day work being in order; sixteen hours being an average day's work for the consulting engineer.

The road was built and the train force organized by Mr. THEODORE F. WURTS, who certainly deserves great credit for the speed and economy with which he has completed the work; we believe, the most rapid example of railroad construction on record. The Atlantic division, 25 miles including the drawbridge and five miles of track laid on stringers over the salt meadows, was under the charge of Mr. J. ROWLAND, Division Engineer. The work performed is the best testimony to the ability of each and all engaged in it.

LET US HAVE THE METRIC SYSTEM OF WEIGHTS AND MEASURES.

In the year of grace 1877, there are few rational beings who do not recognize the necessity for the general adoption of a simple and uniform system of weights and measures in the place of that nightmare of standards and denominations which we have inherited from our ancestors of "the dark ages." There are few of us who have any just appreciation of the magnitude of the evil we are laboring under with the infinite variety of measures in use, for there is not one in a thousand who knows, or attempts to charge his mind with, even a half of them. What a state of barbarism we are in, when scarcely one man in ten thousand knows the values or equivalents of the weights and measures in common use among our people! We humbly confess we are not the exception, though we have for the last few years witnessed the despairing efforts of a bright little girl to comprehend the mysteries of a "grammar school arithmetic," and we have had many a time to "give up" her conundrums as to why there should be different kinds of ounces, pounds, hundredweights, tons, bushels, gallons, miles, acres, etc. In short, why our so-called system should be so complicated as to suggest the idea—if we did not know that every part of it is the result of a separate accident—that it was devised as a kind of Chinese puzzle, which should give a monopoly of knowledge to the few experts who had devoted a lifetime to conquering its intricacies.

Could anything be more absurd than our tons? In a copper works, for example, ore is measured and paid for by the (tribute) ton of 2,352 lb. from the mine through the mill, till it comes out of the jigs, when suddenly it is transformed into a ton of 2,240 lb. (the difference, perhaps, going out in the tailings), which is the ton of the roasting and smelting furnaces and of the teamsters. This continues till the copper is sold or carried over some roads, when the ton shrinks again and becomes 2,000 lb. At the iron works there are still more tons, different from these, and on the railroads one will report the coal carried in tons of 2,240 lb., and another connecting road uses the ton of 2,000 lb. And in order to maintain the beautiful symmetry of our system, they, of course, rarely, if ever, state what kind of a ton is used in either case. Coal is mined and miners are paid by tons of various weights from 3,000 lb. to 2,000 lb. It is sold by tons of 2,240 and 2,000 lb., and by tons running down all the way to 1,500 lb. The use of the ton less than 2,000 lb. is called cheating, but the large purchasers, those who buy from a car load (6 tons) up, may get 2,240 lb. to the ton; but if they buy from the same company's retail yard, they find the ton weighs no more than 2,000 lb., if it does that. Coal is sold by bushels of 76 lb. and 80 lb., by barrels, loads, hogsheads, and other "standards," the weights of which depend originally on the fancy of the individual, and subsequently on "immemorial custom."

Now compare this veritable nightmare of standards with the exquisite simplicity of the metric system, where the one standard of length, surface, and solidity is the meter, divided decimally, and the cubic contents of the linear measures in distilled water furnishes the sole standard for weights and measures of capacity.

The metric system has now been adopted by nearly every civilized country—by France, Germany, Spain, Italy, Portugal, Holland, Belgium, Mexico, Austria, Wallachia, Switzerland, Greece, Denmark, by the French, Dutch, and Spanish colonies, and by nearly all the South American States. The system was legalized in 1864, and is used largely in foreign transactions in Great Britain, and in 1870 the Viceroy of India was authorized to render its use obligatory in that country, containing 200,000,000 of inhabitants.

This universal system was legalized in this country in 1866, and it is making such progress as can be expected where the ignorance and prejudices of the great majority of the people have to be overcome without the aid of the Government. The introduction of the new system, if it be not made at once the sole standard, but adds another element to the confusion now existing, and since all the world has long been satisfied that this is the best system yet proposed, and nearly every country with which we have or expect to have commercial relations has adopted it, the time has come for our General and State Governments to take effective measures for its exclusive use here. Let all intelligent men satisfy themselves, as they easily can by a little consideration of the subject, that we must adopt this system sooner or later, and every day its exclusive adoption is delayed increases the inconvenience of the change. Some inconvenience must necessarily accompany a change in the weights and measures in common use, but the advantages to be gained far outweigh the temporary inconvenience in this case.

We are, therefore, utterly opposed to those timid temporizers who resist any positive action on the part of the Government to introduce the system, and who argue that, "if found more convenient, it will naturally be adopted." This argument is simply absurd, for we can see now in use in different parts of the

country innumerable weights and measures, which are retained in some districts long after the majority of the people have discarded them, and they serve to still further complicate and confuse what is otherwise bad enough. The legalizing and introducing the metric system along with the measures we now have is only adding another element to the confusion, and would be an injury rather than a benefit. The metric system has been thoroughly tried, and, as a result, has been adopted by nearly all civilized countries. There is no occasion, therefore, for inconveniencing ourselves by trying it to see if we like it. We have to adopt it if we would have transactions with the rest of the world. Let all intelligent men, then, unite in demanding of the General Government and the several State Governments that in all public business only metric weights and measures be used from this time forward.

Even without any law making the metric measures the only legal ones, the exclusive use of them by the government in all returns made to it, in the records of property, in the Land Office, in customs and taxes, in contracts for supplies, etc., etc., would soon familiarize the people with them. We would especially urge upon all new States to adopt this universal system before their books and records assume great proportions. Every year will increase the labor and inconvenience of the change, and changed they certainly will be before many years.

All public and private schools should make use of the metric measures in giving instruction, and it requires no prophet to foresee the quick general adoption of the system, if this be done; for no one familiar with it will willingly use the present measures. The American Metric Bureau of Boston, Mass., furnishes to schools, merchants, or others desiring to use them, the Metric Standards, at prices so low as to merely cover cost of manufacture. The objects of this excellent organization are as follows, and it is very gratifying to know that the success it is meeting with is very encouraging:

"The object of this Bureau shall be to disseminate information concerning the metric system, to urge its early adoption, and to bring about actual introductions wherever practicable. To this end, it will secure the delivery of addresses; publish articles, circulate books, pamphlets, and charts; distribute scales and measures; introduce the practical teaching of the system in schools; and in all proper ways, as far as the means at its disposal will allow, the Bureau will urge the matter upon the attention of the American people till they shall join the rest of the world in the exclusive use of the International Decimal Weights and Measures."—Constitution, Art. 2.

#### UNITED STATES MINING LAWS.

Staff Correspondence of the Engineering and Mining Journal.

The United States Mining Law is not by any means a perfect instrument. In fact it is susceptible of a vast amount of improvement, and, as the shyster element becomes less powerful in the legal fraternity, will gradually be altered and amended to a condition where it may be compared favorably with similar enactments in other lands. Americans are young yet in mining, and have much to learn. As in our other institutions we have copied but slightly on existing systems, and are consequently suffering to a considerable degree from imperfections and inexperience.

But were unwise mining laws the only drawback to the growth of the industry, the West would not be so badly off. Added to this trouble, however, there is a certain lawless element in some districts, and a looseness in the execution of the laws, under which the business of mining is suffering very much. It is one thing to establish a law and another to enforce it. We desire to refer briefly to a case of failure in the latter, which speaks poorly for the executive capacity of our courts, and as badly for the moral sense of the community in which the trouble has occurred.

In one of the richest Western silver districts there is a dispute between two adjacent properties. One party claims that the two are on one and the same vein. The other, that the two veins cross each other. The case is a plain one. Underground workings at the place of crossing or juncture are abundant, and while one side is perfectly willing to rest its case on its merits, the other takes advantage of every trick and technicality which the law affords. The case has dragged its length through many weary terms of court, and has experienced all the miseries, delays, and continuances that a miserable bar and a wretched bench can devise. Though both mines are good, neither has proved profitable to its owner, by reason of the frequent stoppage of work, and the enormous legal expenses both are under. Finally, one side, whom we shall call A., obtains from the court a decree granting to it all ground east of a certain drill hole. To B. is given all ground west of the same. Well and good. But by reason of carelessness on the part of the court, the decree is rendered in words which leave an open question whether the plane dividing the two mines is vertical, or whether it is perpendicular to the strike of the vein, or parallel to the line of dip. B., seeing a chance in this ambiguity to regain some rich ground from which it has just been driven, assumes that interpretation which best suits its convenience and wishes, and boldly seizes the ground desired. A. of course combats this course through the courts, and as its case is very plainly just, and at the same time a new man is on the bench, obtains a writ of restitution, armed with which the sheriff drives out the "jumpers" from B. An agreement between A. and B. is then made, by which the ground in the vicinity of the dividing line is set apart as neutral ground, until the points at issue are decided.

This would seem to have settled the whole question, at least for a time. Hardly two weeks elapse, however, before B., becoming tired of his agreement, places men in the disputed territory.

There can be but one commentary on such proceedings. It is a direct violation of commercial honor. If the principals to the transaction were common men, unknown and illiterate, though the crime against the law would be the same, the effect on the community would be less. As it is, however, the offender is a man well known in every part of the State, who has held positions of high financial trust, and from whom the public had a right to expect at least a regard for law, if not for personal honor. Laws are made by legislatures and nominally enforced by the sheriff, but the public is the true executive power. So long as a community winks at a transgression against right, hush it up, or condone it, so long will it continue. The case we have cited is one out of a hundred that are consuming the life-blood of a rich district, and disquieting each and every capitalist who has been so unfortunate as to invest money in its mines.

#### THE IDAHO AND EUREKA MINES (CAL.).

Staff Correspondence of the Engineering and Mining Journal.

The Idaho and Eureka gold mines, California, have probably the best record of any precious metal mines in the country, not excepting even the Comstock. Grass Valley, the district in which they are located, is estimated by good authorities to have produced up to date about \$70,000,000 in gold, and even after this enormous production the camp is still the best and richest in the Sierras, approachable in its productiveness by only one other gold section in the West, viz. Central City, Colorado.

The Eureka vein was located in 1851, and for several years failed to pay for crushing expenses, the ore running as low as \$2 and \$4 per ton. By 1863 the deepest shaft on the mine was not over 50 feet, and, though plenty of quartz had been taken out in sinking so far, it had paid poorly, and drew its owners into debt. Being satisfied, however, of the true worth of the property, work was pushed ahead perseveringly to the depth of 100 feet, and in doing so, so much ore was shown that early in 1866 the mine was purchased by a company of capitalists for \$400,000. From that date began the remarkable record which is almost without a parallel in the history of mining of any kind, and which a month ago ended in the final closing down of the mine. The Idaho is the east extension of the same vein. Its claim adjoins the Eureka, and developments have shown that the two are on one lode. Up to date the two have produced something over \$9,000,000 gross. The Idaho was not opened till 1869, but immediately became a prominent property, has been worked continuously since, and, now that operations on the Eureka have ceased, is the great mine of California.

The records of the two properties since their opening are given in the following table, collected mainly from the U. S. Commissioner's annual reports on the district:

EUREKA.		Gross yield.	No. of Tons.	Val. per Ton.	Divid's.
Year ending September 30,	1866..	\$531,431	10,150 1/2	\$50 00	450,000
	1867..	634,100	11,200 1/2		
	1868..	483,886	15,904	31 24	270,000
	1869..	574,963	21,526	27 80	264,000
	1870..	668,474	20,829	33 40	400,000
	1871..	562,055	17,477	30 00	360,000
	1872..	224,882	9,730	.....	20,000
	1873..	200,000	.....	.....	.....
	1874..	205,780	8,130	25 00	80,000
	1875 1/2	448,254	.....	.....	250,000
	1876 1/2				
IDAHO.					
Year ending December 30,	1869..	280,000	16,000	17 50	115,000
Year ending December 31,	1870..	187,034	9,782	19 03	37,200
	1871..	395,355	11,133	35 40	232,500
	1872..	400,465	11,407	36 20	162,750
	1873..	1,010,612	.....	.....	682,000
	1874..	669,023	28,801	23 72	317,750

The developments of the past two years have shown that the pay chimney of the Eureka, which made the mine famous, has passed eastward into the Idaho ground, and, rather than explore the lode deeper for a second ore body, the company have concluded to close down the mine permanently. The Idaho still maintains a magnificent yield, and will doubtless continue to do so for many years to come. And most probably parties will be found who will take hold of the Eureka and push its shaft downward till other ore bodies as rich as the first are uncovered.

#### NEW PUBLICATIONS.

POOR'S RAILROAD MANUAL OF THE UNITED STATES, FOR 1877-78. H. V. AND H. W. POOR. New York. Price \$5.

This admirable book contains a veritable bonanza of information on all points connected with our railroads. It is compiled with great care, and is invaluable to every railroad company and engineer, and to every one interested, or who proposes being interested, in the stocks or bonds of railroads. Indeed, the comprehensive summing up which gives the progress of railroad construction, the growth of railroad indebtedness, and some of the chief points in the economy of transportation, shows with remarkable effect the foundation for the panic of 1873, and the financial depression which has ruled since then.

We shall give copious extracts from this valuable work in a future number of the JOURNAL.

THE LOWE GAS PROCESS.

An Interesting Phenomenon Explained.

That this water-gas method has characteristics quite distinctive from its predecessors would seem to be proven by the mere fact of its complete practical success, while others have failed in some essential particular. But recent investigations have developed some points in its chemical action so remarkable as to be worthy of note. The decomposition of water by contact with incandescent carbon has heretofore invariably resulted in a product composed of hydrogen and carbonic oxide in about the proportion of 66 and 34 per cent. volumes respectively. Water-gas, therefore, when carbureted for illuminating purposes, has ordinarily shown a density of from .650 to .725, air being 1.000, and this high gravity has been considered an argument against it by gas manufacturers, who prefer to distribute an article of a much lower density, as its more rapid flow through the meter and its reduced illuminating power together result in a large increase of the revenue account. The lower density of the Lowe gas, therefore (.575), as compared with other water-gases, has been a matter of surprise, and during the examination at Utica it was assumed to be a result of obtaining lighter hydrocarbons from the petroleum employed for enrichment than had been generated by earlier processes, it being supposed that the proportions of H and CO from the water were constant. Repeated analyses of the gas made at the Manayunk Station, Philadelphia, prove that CO is present to the extent of only about 3 per cent., a fact so astonishing as to be doubted until demonstrated by a number of tests. There was present, too, and in a proportion entirely unexpected 25 per cent. of CH<sub>4</sub>, a circumstance scarcely less surprising than the other. Now it so happens that, because an incautious baker of Strasburg was stupid enough 40 years ago to let water-gas flow into his bedroom unobstructed and was in consequence smothered, the gas managers in this country had decided to denounce their new rival, beginning to show considerable vigor, "as unwholesome" because of the supposed large intermixture of CO. Of course, this argument had in reality little or no force to an expert, but served as an appeal to popular apprehension and ignorant fear. The analysis, however, utterly destroyed this favorite objection. Accordingly these gentlemen promptly denounced the analyses and assert that these cannot be correct. And this brings us to the point: Can this phenomenon be accounted for on chemical principles? It is proposed to present a solution, which, though it fail to convince prejudice that prefers not to understand, may commend itself to your more intelligent readers.

The question that first occurs is, What becomes of the O which in the decomposition of the water should, by all former precedents, unite with C and form CO, but which has disappeared entirely from the gas, except to the small extent mentioned? It must be remembered that the heats employed by the Lowe process are quite exceptional, being much higher than any heretofore known in gas-making, and this fact is probably the cause of the strange results in composition. From the moment the steam enters the combustion chamber of the generator till the gaseous product emerges from the superheater it is exposed not only to intense heat, but to steadily increasing temperatures, the outlet of the latter chamber being really the hottest point of the apparatus. The fact established in the laboratory practice of a French chemist (whose name I cannot recall) that at very high temperatures C will, despite its strong affinity for O, forsake it and combine with the due proportion of H to form CH<sub>4</sub>, is illustrated here, and accounts for the marsh gas, while the principle of the disassociation of gases is also shown, and undoubtedly holds the O in suspension until, on the reduction of the temperature, it combines with its due proportion of the surplus H to form water. The considerable absorption of water by the lime in purification noted by Prof. Wurtz may be regarded as coincidental evidence of the correctness of this theory. For this explanation of a new and seemingly mysterious transformation of gases I am principally indebted to Mr. M. H. Strong, of Brooklyn, to whose persistent and intelligent investigation of water-gas on a practical scale, I think, the industrial arts will yet be greatly indebted. G. S. D.

METALLURGICAL CAMPAIGN, HALL VALLEY, COLO.

Give Credit to Whom Credit is Due.

TO THE EDITOR: SIR—Having read with much interest Mr. Jernegan's able paper on the "Metallurgical Campaign at Hall Valley, Park County, Colorado," published in the ENGINEERING AND MINING JOURNAL of April 7th and 14th, 1877, I cannot, in the cause of truth in scientific statements, allow Mr. Henry S. Bell's reply to the same, published in ENGINEERING AND MINING JOURNAL of July 21st, 1877, to go to the public unchallenged. Mr. Bell in this communication would have us believe that the technical success of last summer's operations at Hall Valley was entirely due to him, whereas he merely allowed the two smelters, brought out from Freiberg by the company, to carry out certain suggestions made to them by Messrs. Painter and Jernegan before leaving that place the preceding autumn. Mr. Painter assured me in August, 1875, that he had informed the company that it would be impossible for him to effect any satisfactory result unless permitted to make certain alterations—alterations now claimed by Mr. Bell as original—in the blast furnace. This was refused him in spite of his assurance, only confirmed by the result. Subsequent to Mr. Painter's departure from Hall Valley, which took place in October, 1875, and previous to Mr. Bell's arrival, the two smelters effected the desired change in the height as well as in several other details of the furnace, and smelted successfully all the charges Mr. Painter had made up and left. Having disposed of all the charges, they were quite naturally at sea, and were obliged to stop. Mr. Bell's only merit lies in the fact that he profited by this experience, and contented himself entirely with making as fusible a mixture as circumstances would allow, and leaving everything else to his two Germans. He never made the slightest alteration in the furnaces. The slag he produced, instead of being a "double silicated slag," was in reality a singulo-silicate impregnated with small particles of matte similar to the Swedish skumna. It will always be a question in my mind whether a singulo-silicate slag were not preferable under the existing circumstances in Hall Valley.

The great mistake at Hall Valley is that, like so many other mining enterprises in the Rocky Mountains and elsewhere, the furnaces were built without the slightest regard to the nature of the ore they were intended to treat; in fact, in this case they were erected long before the mines which were to supply them with ore had been sufficiently developed to warrant even an opinion as to their probable production. Neither Mr. Bell nor any other man can ever make a financial success of the process followed up to the present time at Hall Valley, simply because the supply of lead ore is too uncertain. The ore from the company's own mine contains very little lead and quite a considerable percentage of copper, so that with slight and inexpensive changes in the blast furnaces the Freiberg copper matte-concentration smelt-

ing might be introduced with profit. Better by far would it be, however, to unite metallurgical and business talent, and have everything well considered before attempting to start, than to make vain and superficial spurts, the disastrous result of which must be apparent to every sane man.

As a proof that Mr. Bell's assertions have no foundation outside of his imagination, I have only to add that the mines producing the "bismuthic silver ores with silicious gangue" have never been worked to any extent, and that last summer they were entirely idle, Mr. Bell receiving only one single shipment amounting to less than a ton, and consequently hardly aiding him much in forming his "double silicated slag."

In my position as chemist for the Boston Silver Mining Company's works at Sts. John, Summit County, I was enabled to keep myself well informed of all technical proceedings at Hall Valley, and, believing, as I do, that misstatements like those of which Mr. Bell has made himself culpable should always be promptly and energetically exposed, I beg to submit these remarks through you to your readers. Respectfully, CHARLES C. GIGNOUX, M. E.

MONTEZUMA, Summit County, Colo., August 12, 1877.

ON THE THEORY OF THE CENTRIFUGAL PUMP.

By Professor R. Escher, of Zurich.

The accurate theory of the centrifugal pump gives for the relation between the velocity  $w_2$  of the circumference of the pump disk, and the relative velocity of discharge  $c_2$  of the water, an equation of the following form:

$$c_2 = a w_2 + \sqrt{\{w_2^2 [a^2 + (1 - \lambda^2) b] - 2 g h b\}} \dots (1)$$

where  $a$  and  $b$  are constants depending on the construction of the pump,  $\lambda$  is the ratio of the internal and external radii of the disk, and  $h$  is the lift.

By plotting values of  $w_2$  as abscissae and corresponding values of  $c_2$  as ordinates a hyperbola is obtained, the origin being at the center and the axes inclined to the axes of co-ordinates. The lower branch of the hyperbola has generally no significance, but one point of it corresponds with the condition curve of the pump. That is the intersection of the hyperbola with the axes of  $x$ , which has for abscissa

$$w_a = \sqrt{\frac{2 g h}{1 - \lambda^2}} \dots (2)$$

This is the velocity at which the water column is sustained by the rotation of the pump without aid from the foot-valve. For a small increase of velocity the full discharge begins, not gradually, but suddenly. It is known that a centrifugal pump will not easily give a small discharge. The latter rises suddenly from zero to a value corresponding to  $c_a$  found by substituting  $w_a$  from (2) in (1). There is discontinuity, and the condition of equilibrium is unstable. This has sometimes been ascribed, without reason, to the inadequacy of the theory, because at the moment when motion of the water column begins the pressures in the pump alter. If there is really unstable equilibrium, and the pump is allowed to decrease in speed after it has been working, then when  $w_2 = w_a$  it will not at once cease to discharge, but will continue pumping as long as the expression under the root in (1) is positive, or till

$$w_2 = \sqrt{\frac{2 g h b}{a^2 + (1 - \lambda^2) b}} = w_m$$

If  $w_2$  is further diminished, equation (1) gives imaginary values of  $c_2$ ; at that point, therefore, which still corresponds to a finite discharge, the pump suddenly ceases to lift. There are, thus, two different equilibrium points—one for the condition of rest and one for the condition of motion. Both are, according to the direction, unsteady. It is not absurd, consequently, if calculation gives positive values for the discharge for velocities less than the starting velocity. The author then mentions an experiment on a pump which started pumping at thirty-six revolutions, but in which the speed could be reduced to thirty-two revolutions before it again stopped pumping.

In Dr. Hartig's experiments,\* with a lift of 3.92 meters (12.9 feet), the speed corresponding to equilibrium was found to be 442 revolutions. Taking  $\lambda = 0.3733$ , then  $w_a = 9.453$  meters (30.6 feet), which corresponds to a speed of 480 revolutions, instead of 442, as observed. The author ascribes this discrepancy to the rotation of the water in the case surrounding the pump disk.

The author then discusses some other discrepancies between experiment and theory. He points out that when the section of the water passages in the wheel enlarges, instead of decreasing from the interior outwards, there will be irregular eddy motion of the water in the passages of the wheel.—(Civilingenieur, vol. xxii., p. 634.)—Proceedings of the Institution of Civil Engineers.

GOLD IN RUSSIA.—In a recent work by M. Bogolubsky on Gold and Gold Mining in Russia, it is stated that the area of the gold mines in that country is a little over two millions of square miles. The yield is about 80,000 lbs. in weight annually, this being equivalent to 3,000,000 sterling on an average.

COMBUSTIBILITY OF ZINC DUST.—Zinc dust, so-called, is a fine, grayish powder used extensively in dye works, and consists of 40 per cent. zinc, 2½ per cent. lead, 4 per cent. cadmium, 50 per cent. oxide of zinc, 3½ per cent. carbonate of zinc, and some non-metallic dust. Such zinc dust becomes spontaneously incandescent at the presence of moisture, and has been known to cause conflagration on ship board.—Dingl. J. 224, 344 Berg. u. Huetten Ztg.

ALGERIAN MINING STATISTICS.—From statistics published concerning Algeria, we learn that its mineral industry is regulated by the ordinary French law; that concessions for thirteen ironstone mines have been granted; that copper, lead, zinc, and mercury are mined; the total number of mines being now twenty-nine, while forty-nine mining sites have been prospected preparatory to application for leave to open them. During the first six months of 1875 were raised 293,000 tons of ironstone, 1730 tons of copper ore, 1450 tons of lead ore, 540 tons of zinc ore. The total output of minerals for the year, estimated at 600,000 tons, would be a fifth of the total mineral output of France for the same year.—Iron.

ON VAPOR DENSITIES.—M. H. Sainte-Claire Deville.—The author has shown in a former communication that the volumes of oxygen, chlorine, hydrochloric acid, and hydrochlorate of ammonia, whose weights are equivalent to 39 grams of potassium, are among the selves respectively as the numbers 1, 2, 4, and 8. It is easily shown that simple bodies represent 2 or 4 volumes; and that, lastly, we only find 8 volumes in very complex bodies, in particular in salts with volatile bases and acids. The author has never been able to understand (and many atomists are of the same opinion) why, without strict proof, an attempt has been made to erase from the number of bodies which may exist in the state of vapor those which represent 8 volumes. He gives in the present paper a summary of the arguments against this attempt.—Comptes Rendus, June 4, 1877.

\* Civilingenieur, 1875, p. 49.

## THE VALLEY OF THE COLORADO RIVER, AND ITS GEOLOGY.—IV.\*

When we arrive at a point a few miles north of Flaming Gorge, we strike the flank of this great fold, and find the rocks dipping to the north, and, as we run south, the course of the stream is against the inclination of the beds; and this is true in the main until we reach Bee-Hive Point, where the river turns to the east, almost at right angles to its former course and to the dip; then it runs nearly in the direction of the strike, but the axis is not crossed until after passing through Red Cañon. The rocks on both sides of the cañon dip to the north; that is, they incline to the river on the south, and from it on the north. Under these conditions the two walls of Red Cañon present very different characteristics; that on the south exhibits steep slopes, covered to a greater or lesser extent with forests; the north wall is a bold escarpment, often vertical, and almost treeless; high cliffs, set with pinnacles and towers, and narrow side cañons are its salient features. From the foot of Red Cañon to the Gate of Lodore, a distance of more than thirty miles, the river runs through a valley known as Brown's Park, five or six miles wide, and inclosed by mountains. It is a curious fact that the central line of this valley corresponds to the axis of the fold; that is, had the fold been made and left without erosion, the very summit would have been directly above the deepest part of the park.

When we enter the Gate of Lodore, we are in rocks dipping to the south, having crossed the axis of the fold. From here to Split Mountain Cañon, the general course is southwest, hence not directly across the dip, but passing obliquely through the formations. The great billow or wave has a rippled surface, or wavelets are formed across it, some of which have their axis nearly at right angles to that of the great fold; others, more or less oblique.

Split Mountain Cañon is cut lengthwise through one of the rock wavelets, a southward spur of the Uintas. The course of the river does not chance to be in the direction of the billow for its whole length, but, running down the wavelet for a few miles, it runs out of it to the right, where it passes through Island Park, then into it again at the head of Split Mountain Cañon, and then it divides the fold by a gorge to its foot. Leaving Split Mountain Cañon, and entering the valley below, we run into a down-turned wrinkle, or, in the language of the geologist, into a synclinal fold. The axis of the fold is parallel to the Uinta Mountains. The valley of the Uinta, on the west, and the valley of White River, on the east, mark, in a general way, the bed of this down-turned wrinkle; and still continuing to the south we pass into another upturned fold.

It has already been said that the cutting off of the fold has left the upturned edges of the formations exposed to view. Some of these beds are quite hard, others are composed of very soft material, so there are alternating beds of harder and softer rocks running in an easterly and westerly direction, both on the north and south side of the range. The soft rocks, yielding much more readily to atmospheric degradation, have been washed out in irregular valleys, between intervening ridges of harder rock, so that we have a series of nearly parallel valleys, and also a series of intervening parallel ridges, and both valleys and ridges are approximately parallel to the range. But as the great fold of the Uinta Mountains is greatly complicated by minor oblique and transverse flexures, while the general direction of these ridges is as described, they are turned back and forth from these lines in gentle or abrupt curves. These ridges are sometimes low mountain ranges.

So, if we approach these mountains from either direction, north or south, we first meet with ridges, or, as they are usually called in the Western country, hog-backs. In many places these are so steep as to form a complete barrier to progress.

Usually the slope away from the side of the mountain corresponds above with the dip of the rock, and is gentle or steep as the dip is lesser or greater. The side of the hog-back next to the mountain is composed of the cut edges of the strata, and varies greatly with the texture of the rock; but usually it is steep or broken, sometimes buttressed, sometimes terraced, sometimes columned and fluted. On the south side of the Yampa Plateau, near the head of Cliff Creek Valley, there is an abrupt, oblique flexure on the side of the great fold, by which the rocks are turned up so as to stand vertically. In the rocks at this place there are two very hard conglomerates; the intervening strata are soft sandstones and marls and have been carried away, and the conglomerates stand as vertical walls thirty or forty feet in thickness, fifty to three hundred feet in height, and several miles in length, and between these is a broad avenue, or narrow valley, beset with ragged boulders of conglomerate.

The drainage of these narrow valleys between the hog-backs is not always along their lengths, but the water is sometimes carried by channels crossing them

and cutting through intervening ridges; hence there are numbers of transverse streams and wet weather channels running across valleys and through ridges.

Now, if the great axis of the Uinta Fold was everywhere the summit of a watershed, we should find the streams heading along that irregular line running off to the flank of the fold on either side; but, as the fold is bisected by Green River, some of the minor water-courses, especially those near the river and those near the center of the fold, follow the strike of the rocks directly into that stream. On the north side, some head back near the summit of the fold, and run to the north, crossing the hog-backs in a direction with the dip, and then turn at the foot of the mountains and run into the Green, where the waters take a general southerly direction; others, again, head back on the hog-backs, or even beyond them, on the plains and the bad-lands to the north, and cut quite through the hog-backs and mountains in a direction against the dip of the rocks, and empty into the Green. This is especially true where the river has its easterly and westerly direction through Brown's Park. On the other side of the range, streams head high up in the mountains, and cut directly or obliquely against the upturned edges of the strata, and run in a general direction with the dip of the strata, until they reach the long valleys, between hog-backs, then down these valleys they turn, sometimes cutting through intervening ridges, until they find their way into the Green, where they are turned to the south, away from the mountain.

It will thus be seen that the relation of the direction of the streams to the dip of the rocks is very complex, and, for convenience of description, I have elsewhere classified these valleys, on the basis of these relations, in the following manner:

ORDER FIRST.—*Transverse valleys*, having a direction at right angles to the strike.

ORDER SECOND.—*Longitudinal valleys*, having a direction the same as the strike.

Of the First Order, three varieties are noticed:

*a*, *diacinal*, those which pass through a fold. (Fig. 12.)

*b*, *cataclinal*, valleys that run in the direction of the dip. (Fig. 11.)

*c*, *anaclinal*, valleys that run against the dip of the beds. (Fig. 15.)

Of the Second Order, we have, also, three varieties:

*A*, *anticlinal* valleys, which follow anticlinal axes. (Fig. 14.)

*B*, *synclinal* valleys, which follow synclinal axes. (Fig. 13.)

*C*, *monoclinical* valleys, which run in the direction of the strike between the axes of the fold: one side of the valley formed of the summit of the beds, the other composed of the cut edges of the formation. (Fig. 16.)

Many of the valleys are thus simple in their relations to the folds; but, as we may have two systems of displacements, a valley may belong to one class in relation to one fold, and to another in its relation to a second. Such we designate as *complex valleys*.

Again, a valley may belong to one class in one part of its course, and to another elsewhere in its course. Such we designate as *compound valleys*. It will be further noticed that valleys may have many branches, but, in relegating to its class, we consider only the stem of the valley proper, and not its branches.

A great diversity in the features of all these valleys is observed. Most of these modifications are due to three principal causes: First, a greater or lesser inclination of the rocks. Second, the texture of the beds; that is, their greater or lesser degree of heterogeneity. The third class of modifying influences is found in the eruptive beds.

The last-mentioned agencies are not found in the region under immediate discussion.

No sharp line of division can be drawn between cañons and valleys. For convenience, we designate intervening depressions, caused by erosion, cañon valleys, but all these excavated basins, troughs, and channels will be included under the general head of valleys, and the above terms will be used in describing them.

I should remark, further, that species are not found in structural geology, if we use that term as it has heretofore been used in the description of organic nature; that is, there

are no definite "hard and fast" lines of demarcation between valleys of one class and those of another, and the classification rests solely on typical examples.

With these terms before us, let us again describe the valleys of the Uinta Mountains.

INVISIBLE INK FOR POSTAL CARDS.—A German newspaper proposes the general use of what may be called postal-card ink. A solution of nitrate or chloride of cobalt, or chloride of copper, mixed with a little gum or sugar, produces a "magic ink," which is made visible by warming, either by holding against the stove or over a burning match. Potassium ferrocyanide in solution may also be used; but this requires a developer, for which either copper or iron sulphate may be employed. With the former the writing will appear in brown, and with the latter in blue color.



FIG. 11.—A CATACLINAL VALLEY.



FIG. 12.—A DIACLINAL VALLEY.

\* Extracts from Report of Major J. W. Powell on *The Exploration of the Colorado River of the West*. Washington, 1875.

## IRON ORES OF SWEDEN.

AS SHOWN AT THE PHILADELPHIA EXHIBITION.

Special Correspondence of the Engineering and Mining Journal.

Of all the countries which were represented at the Exhibition, no one probably succeeded better than Sweden in presenting a thoroughly general and, in many respects, minutely detailed *expose* of the characteristic features of the country in everything relating to its geographical, geological, and political conditions, its manufactures, railroads, canals, and mining industries. A very thorough catalogue of the exhibits, with a treatise on the condition of the country, was supplemented by a number of very valuable detailed ones relating to special displays. An impression which was likely to be formed on the mind of the critical observer at the Exhibition was that the Swedes are exceedingly thorough in what they undertake. As an example, take the exhibit of the Geological Survey. A map was shown which indicated that portion of the kingdom which is already surveyed and mapped, that portion surveyed and not yet mapped, and that portion not yet surveyed. Following this were given maps on large scales of the surveyed portions, on which were shown all the details of the surface geology; accompanying these maps was all the literature which has been written pertaining to the surveys, and in addition to that a most magnificent collection of lithological specimens illustrated the nature of the rock strata. Economic geology was represented by carefully prepared maps of the coal and some of the principal iron regions, and the Jern-kontoret, or Swedish Iron Masters' Association, contributed a splendid map of that portion of the country in which the principal mines are located, and also a very detailed map of the celebrated mines at Dannemora.

The geological formations of Sweden belong almost entirely to the Azoic period, which are covered in places by superficial Quaternary deposits. In a few provinces the Lower Silurian rocks come to the surface, and in the most southern, which is called the province of Skane, these rocks are overlaid by cretaceous formations carrying scanty coal seams. This predominance of crystalline and igneous rocks in the country has led to a very careful study of their relative positions and mineralogical differences, a fact which is very clearly shown on some of the maps, notably the one representing the principal mining districts. In this map, which embraces an area extending from the town of Gefle on the north to Norrkjoping on the south, and from the country east of Stockholm to the Wener Lake on the west, twelve different kinds of rock formation, commencing with the Lower Silurian and going downward, are represented. Among these are included the volcanic or intrusive rocks, of which granite is the most important.

The principal iron ores of Sweden are magnetic and specular, occurring almost without exception in what are classed as the Lower Euritic series. These rocks are largely developed in the northwestern portion of the territory covered by the map, and appear in varying quantities in other portions of it. The iron ores occur in these rocks in stratified beds or masses conforming to the strike and dip of the surrounding rocks. One exception to this rule has, however, been found at Taberg in Smaland, where ore has been found in beds in eruptive rocks. These beds of ore vary exceedingly both in the mode and extent of their occurrence. They vary from 0 to 150 feet in thickness and in longitudinal extent, sometimes thickening and throwing out so as to be traceable for miles in extent, or, as sometimes is the case, they occur in continuous beds for distances as great as two thousand feet without pinching out. Besides this narrowing down of the veins frequent dikes of intrusive rock cut off and have displaced many of the ore deposits.

A frequent mode in which these ores occur is in a series of parallel lenticular masses, running for some distance through belts of country, varying from 300 to 1,500 feet in width. In general the dip of all the beds is more nearly vertical than horizontal, although, owing to the contortion through which the strata have passed, they sometimes are nearly horizontal.

The Swedish metallurgists, in classifying their magnetic and hematite ores, divide them into three general classes. The first of these includes those ores which are found in euritic gneissoid rocks. The ore deposits are generally regular, and have the dip and strike of the surrounding rocks. The ore seems in many cases to have replaced the rock constituents with which it is frequently intermingled, so that the passage from the ore to the rock is frequently quite gradual. The ores which occur in red eurite are generally specular, and are characterized by consisting of bands of pure or nearly pure ore with quartzite or eurite. Specimens illustrating this class of ores from the mines of Striberg and Norberg were shown in the collection of the Jern-kontoret.

The ores belonging to this class which occur in the more gneissoid rocks are

generally magnetites, and are often associated with limestone rocks. They are otherwise distinguished from the ores found in the eurite by the small amount of silica which they contain. The hematite ores of this class are illustrated in analysis No. 24, and the magnetites in analyses Nos. 7, 11, and 16.\* It will be seen that these ores contain considerable phosphorus. This comes from apatite, which is intermingled with the ore. With the exception of quartz and feldspar almost no other special minerals are found in these ores.

The ores belonging to the second division are generally found in rocks of gray eurite, associated with interstratified beds of crystalline limestone and ballefinta. The ore is found in lenticular sharply defined masses, which, although sometimes quite broad, do not generally have great longitudinal extent. Frequently, though, a series of these lenticular masses will occur extending in a belt for miles. These ores are characterized mineralogically by the magnesian minerals which they contain. In consequence of the presence of these minerals, they can frequently be smelted without the addition of lime, but sometimes needing both lime and quartz.

Analysis No. 27 is of one of the ores belonging to this class. The percentage of phosphorus, it will be observed, is quite low.

In the third class of ores are included all those which contain considerable quantities of manganese, and sometimes metallic sulphides. These ores occur generally, like those of the preceding class, in bands of ballefinta and crystalline limestone, but they are like those of the first division in not being in sharply defined masses, but imperceptibly passing from pure ore to the rock which incloses them. These ores which carry manganese are generally magnetites. The manganese in these ores occurs in different manganese minerals, among which knebelite, hausmannite, and manganese spar are frequently met with. The Svartberg ores, which are represented in analysis No. 19, contain their manganese under the form of knebelite. They are quite extensively used for the manufacture of spiegeleisen. The contents of manganese in different specimens of ore from the same mine vary usually in proportion to its richness in iron, but where the ores are found in limestone the manganese minerals seem to be equally distributed throughout the whole mass. A particular examination of the display of ores made at the Exhibition by the Swedish Iron Masters showed that nearly all the magnetic ores were fine-grained or massive, few if any of the specimens showing the coarse granular appearance of our Lake Champlain ores. From one district, that of Gellivare, which is in the northern or Lapland portion of Sweden, granular ores containing particles of rusty quartz are found.

The fine-grained and compact ores frequently show cleavage planes, and sometimes columnar structure.

Some of these ores look much like the magnetites found in the mountains of East Tennessee. A very peculiar ore which is found in some of the Swedish mines was represented by specimens from Uddevalla. This was a dense magnetite cut in all directions by cleavage planes, the surfaces of which were black and highly lustrous, like specimens of slickensides. This peculiar appearance is produced by the presence of a small amount of graphite in the ore, as shown by analysis No. 22. Of the combined amount shown there (13 per cent.) but .80 is graphite, the remainder existing as  $CO_2$ . When the ore is broken so as to expose a surface not cut by these cleavage planes, it shows a greenish chloritic surface.

The hematite ores were all of the specular variety. Some of the specimens had a compact granular structure, while others had the distinctive micaceous plates of specular ore. The specular ore from Kangrufvan had a large columnar structure.

Besides the specimens of raw ores which were shown, there were quite a number of pieces of ore which had been calcined. The effect of this calcination on both the magnetic and specular ores is to render them more open or porous, and at the same time to sinter them more or less. Those ores which have a banded structure show it more plainly after this roasting has taken place. Many of the magnetites after this treatment show a plainly banded structure. Roasted specimens of the ores which contain graphite do not retain the cleavage surface which they had before roasting. The chemical characteristics of the Swedish ores are quite generally shown in the subjoined tables of analyses. An examination of several hundred other analyses of ores from nearly all the mines in the country shows that those pernicious elements, phosphorus and sulphur, are generally present in very small proportion, and, where the latter element is found in appreciable amounts, the system of roasting used effects its almost entire removal. A large number of analyses of the roasted ores have a contents of from traces to 0.04 per cent. of sulphur.

TO BE CONTINUED.

\* Analyses will appear in a subsequent number.

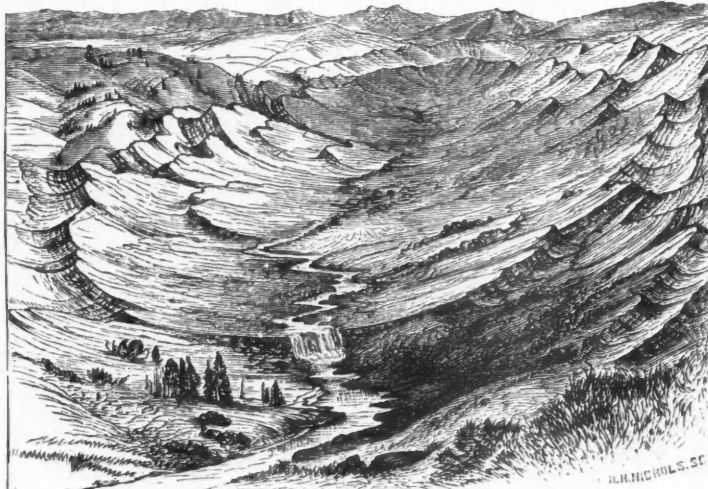


FIG. 13.—A SYNCLINAL VALLEY.—See page 148.

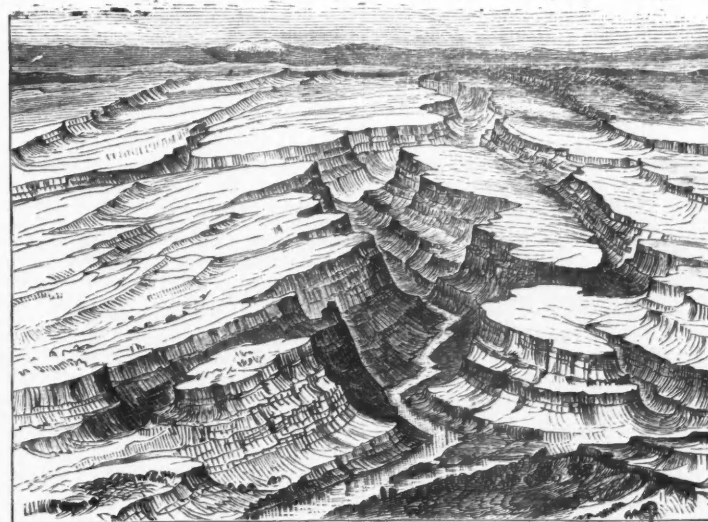


FIG. 14.—AN ANTICLINAL VALLEY.—See page 148.

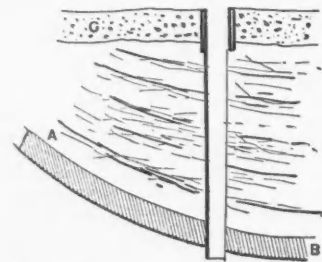
banded structure show it more plainly after this roasting has taken place. Many of the magnetites after this treatment show a plainly banded structure. Roasted specimens of the ores which contain graphite do not retain the cleavage surface which they had before roasting. The chemical characteristics of the Swedish ores are quite generally shown in the subjoined tables of analyses. An examination of several hundred other analyses of ores from nearly all the mines in the country shows that those pernicious elements, phosphorus and sulphur, are generally present in very small proportion, and, where the latter element is found in appreciable amounts, the system of roasting used effects its almost entire removal. A large number of analyses of the roasted ores have a contents of from traces to 0.04 per cent. of sulphur.

## LECTURES ON MINING.—No. XLVII.

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

It is only during the last 25 years that anything like an accurate record has been kept of the deaths from accidents in collieries; and as regards the metalliferous mines, an Act has only just recently come into operation, and it is, therefore, difficult to make a trustworthy comparison between the number of accidents in the two classes, and in different parts of the mines. It has been attempted in other countries of Europe to compare the comparative danger of traveling on ladders as against ropes and the man-engine, but so far the results have not been very satisfactory. There is very little doubt, however, that where the pits are fitted out in the best manner, and where proper attention is paid to the renewal of any part as soon as wear has been observed, the number of accidents has been comparatively very small in the large collieries of this kingdom, as well as in France and Belgium; but then when they do occur shaft accidents are very serious, from their being usually accompanied by a number of deaths. One may feel very sure that the number of accidents is comparatively slight when either of these methods is employed with proper precautions—when the ladders are placed under proper conditions, and the man-engine properly supplied with stops and catches, and made of suitable strength. When accidents occur under those conditions also they may generally be limited to individuals, but where ropes and chains are employed, the total number of accidents to individuals may fairly be expected to be more numerous, because of each being more fatal. A great number of accidents are returned as shaft accidents which are due to other sources of danger besides the actual working of the shaft, as where masons are engaged in repairing the brickwork lining, and the platform tilts, or the rope gives way; and, again, from people falling into the shaft, not so much from their walking into it at the surface as when a workman running his wagon down an incline to the shaft at an intermediate level, and overshoots his mark. The mouth of the shaft should be protected by means of gates, or some arrangement, for in thick weather the men at the surface may be precipitated into the pit, or when, for example, the smoke from a fire at the surface blows in their faces, etc. Various methods of guarding are employed; in some cases there are rack gates, or guards, round the mouth, only to be removed when a cage comes up. In our metalliferous mines it is usually the case that the top of the shaft is guarded by a strong, heavy door, with a string from it passing over the pulley to a counterpoise; an opening is left for the chain to go through, so that the winding may go on. This is undoubtedly a great stoppage to the ventilation, so that it may be very advisable to keep the door more or less open; notwithstanding, no accident is likely to occur, for no one can fall down the shaft, and the door prevents any pieces of stone from the kibble falling down. Another plan may be seen in use in Central England, where what is called a runner is employed. On either side of the shaft for a few feet back is placed a pair of rails, on which a wagon frame supporting a rectangular platform—the runner—stands. When the shaft is at work, but not having the weight raised, it can be left open, if required, for ventilation; at other times the runner is placed over it, having a slit for the chain to pass through. When the kibble has passed up the runner is placed under, and the kibble lowered gently down on to it, and it is then drawn back for the kibble to be emptied. A great number of men have lost their lives by attempting to step out of the kibble, or carriage, too soon, and setting it swinging; here they have only to wait till it is lowered on to the runner, and then can step safely out. It was found necessary, however, to guard the top of the pit during working by something which would not interrupt the ventilation, hence air frames were introduced, first in South Wales. Light frames of wood placed over the shaft are lifted up by the cage when it comes up, and let down on to the top of the shaft as the cage descends, a long elastic bar of wood forming the bottom lath, so that the frame should not suffer too much from the concussion. This has been generally replaced by the shaft door, which is a little light door, placed in grooves, to run up and down, and struck open by the cage as it comes up.

We must now turn to the subject of the extraction of water from the pits. And we have to remember that water makes its entrance into pits in a number of different and peculiar ways. Under some circumstances it will be found necessary to keep the pump going incessantly; under others, as we have seen, the expense and trouble are very great at first, but when once overcome (by tubbing, etc.) it will be kept back as long as proper precautions are kept up. Even in cases where a great deal of water may be kept out by surface drains, etc., still a great deal of pumping will have to be maintained. We have to consider the water which passes down the pit, and also that which makes its way through the joints and cracks of the seam itself. Very frequently there will be a gravelly deposit at the surface (G, Fig. 34), which will admit a great deal of water, and if this can be completely excluded by tubbing, etc., much of it will be kept out of the workings. Very frequently, in the greater number of our collieries, the bed (A B) has been worked down to a considerable distance from its outcrop (as down to A, Fig. 34), and there are more or less extensive reservoirs of water in those old workings which have to be guarded against; and from these water will ooze, as well as through the measures and the joints. If the measures are unworkable, you have to consider what will be the results of your manner of working. If the measures above, at G, are



very watery, it will be unwise to adopt any method which makes much goaf, and the same if you have above you a worked seam which contains much water.

In metal mining the adit will drain the ground down to its own level; if the ground is to be worked below the adit, then the water will have to be raised up to that. You will find the water in the shafts and the ends of the workings, and this water, instead of lying horizontally, forms a kind of inclined plane, the angle of which varies in different ground, so that in some cases you will have to drive close up to the parts you wish to unwater. In other cases, if the lode is large and open, full of joints and cavities, the sinking of a few fathoms below will unwater the ground to a considerable distance around. The consequence is that there is a difference between the quantity of water which you can take up at one point and that which you may expect to pump; there will be a number of feeders coming into the ground which you may take up into the adit level, or if you leave them they will go further down. It is, however, to be observed that the quantity of water obtained from these feeders diminishes as you go down. The important point is to make good as far as you can the damage at the surface, and then to take up all the water you can from time to time, so as to prevent it going down to the deeper workings, and you will thus gain in having to pump it from as small a depth as possible. It will generally be found that the upper pumps

have to be of much larger caliber than the lower ones; the upper ones may be 16 or 18 inches in diameter, the lower ones only 6 inches.

In working mines you not unfrequently come on very watery places, when the question arises whether you cannot keep back the water altogether, and prevent it troubling you further. For example, in a colliery where you have driven a stone drift from one district to another, it might happen that this latter was very watery; you might then require to shut it off altogether, and this you could do by putting in a strong water-tight dam. Similarly in metal mines, a cross-cut may pierce into very watery ground, and it may be necessary to dam it off. These dams are generally either of timber or stonework. A suitable spot is selected in the ground to be dammed, where the superficial area is not too considerable, where the ground is of a water-tight character and we can trust to its being free from fissures, and where a suitable bed can be cut without the necessity for blasting. A conical excavation is cut out as a bed, with a vertical shoulder, against which the timbering can abut. A series of beams is then placed in, abutting against one another, and having a piece of sheeting deal where it comes in contact with the rock, and an opening will be left in the central part large enough for a man to creep through. The door over this opening will be kept open while the men are at work on both sides; it is made to fit close against the man-hole by means of leather. The back of these beams will be calked full of wedges, just as in the case of tubbing, and very commonly the back will be supported by planks and struts abutted against vertical, or more usually horizontal, props let well into the sides. A cast-iron pipe passing through the dam is all this time conveying away the water which accumulates at the other side, so as not to inconvenience the men. Another precaution is necessary; when the dam is completed and closed, and the water begins to accumulate, it will most likely bring with it air, which will accumulate at the top of the level, and give rise to very serious pressure if means are not provided for its escape. This is done by placing a small iron pipe in the upper part, and leaving it open for a time. When all is ready the men retire, the water pipe is plugged up, and when the air has escaped the upper pipe is also plugged, and the man-hole is effectually closed by the pressure of the water on the door. The thickness of timber used will depend on the amount of pressure; if not very considerable, stout planks may suffice; if great, stout logs of wood will be taken, and set vertically side by side. The best of all these dams is formed in a conical space, where a number of beams of 4 to 6 feet long are put in, and fitted like the stones of an arch, with the convexity towards the pressure, having a cast-iron pipe in the middle just large enough for a man to get through, a small hole below for the water to flow from for the time being, and a small pipe above for the escape of the air. Such a frame, made of a thickness of 6 feet over a superficial surface not too large, may be made to sustain very heavy columns of water. A structure of this kind, made of pieces of fir well fitted together, will generally be found to move considerably at first, when the pressure comes into play, but if well made, and the conical bed well cut, the pushing forward of the mass some inches need not surprise or alarm us. Sometimes the more difficult task has to be performed of putting dams into shafts; they occur, however, but rarely, compared with those in the levels. They partake somewhat of the nature of those for levels, but require still greater attention to the cutting of the bed. They are constructed of timber, or heavy masses of brickwork, usually of an arched form, and sometimes double, with clay well rammed between. In Westphalia and Belgium, a good many shafts have been protected, more or less, in this way, and in our own colliery districts cases are not uncommon.

We come next to a very large and important part of our subject—that of pumping. It is not many years ago since pumping arrangements in parts of Europe were very deficient. The pumps of the middle ages were very ingenious, but exceedingly expensive, for we find they were mainly worked by horse-power, and sometimes nearly half the expenditure of the mine had to go to this item. In copper mines in the Ural Mountains, described by Pallas, although the deepest was only 26 fathoms, 400 horses had to be kept for working the pumps, while there were only 200 miners at work. In the eastern parts of Europe, in consequence of the much smaller rainfall compared with that of the western districts, pumps of much smaller caliber are necessary. But in our own country, and especially in the southwestern districts, many of the mines are troubled with very large volumes of water. In shallow workings, simply drawing the water in kibbles or water barrels, by means of a windlass, may be sufficient, and tipping it into a suitable channel at the surface. This is often carried out on a large scale, and when the quantity of water is not large, with great advantage. In North Staffordshire, what are called tipping barrels are largely used where the bow of iron by which the barrel is supported is fixed not far from the center of the gravity of the barrel. The barrel is kept erect by a ring of iron on this hoop being also passed over a pin at the top of the barrel, and the barrel is emptied by knocking off this ring, and then it very easily overturns. At the Ebbw Collieries barrels of sheet-iron 16 feet long are employed, each holding 800 gallons of water; they are emptied at the surface by bringing them down on to a runner, which opens a valve in the bottom, and then conducts the water away. By this arrangement as much as 1,000 gallons per minute were being raised by four ropes. One of the most remarkable cases the lecturer had met with as to the presence of large quantities of water, he had seen recently in an iron mine, where he found them lifting from a depth of 120 yards no less than 2,000 gallons per minute; in fact, they were raising about as much water every day as they raised iron ore in the course of the whole year. And it is well known in a great number of our colliery districts that they may have to raise 10 to 30 times as much water as useful mineral.—*London Mining Journal.*

## TREATING NICKEL AND COBALT ORES.

For the treatment of nickel ores, consisting of silicates of nickel and magnesia, containing variable quantities of other substances, more especially the nickel ore of New Caledonia, an improved process has been patented by Mr. E. L. Montefiore, of Paris. The ore, after having been reduced to a fine powder, is attacked by strong sulphuric acid, preferably at 60° Beaume; this can be effected either by solution in the ordinary manner, or by the mixture of the pulverized ore with the requisite quantity of sulphuric acid, according to the composition of the ore, the proportion of acid being such as is sufficient to transform all the nickel and magnesia to the state of sulphates. The mixture being put into heap gets spontaneously heated, or the sort of combustion which takes place can be provoked or hastened by the application of a burning substance; the mass becomes heated and hardens by the transformation of the mass into a mixture of soluble sulphates and anhydrous silica. The soluble sulphates are separated by treatment of the mass with hot water, which then contains the salts of nickel and magnesia and the iron partly in the state of protosulphate. The iron is peroxidized by one of the processes well known, and is then precipitated by carbonate of magnesia or by one of the known agents, but he prefers the use of a milk of magnesia. The iron may also be peroxidized partially or totally

by the calcination of the pulverized ore, either before or after sulphatization, and if necessary by the admixture of a proper quantity of nitrate of potash or nitrate of soda.

The solution being separated by decantation, washing, and filtration, contains now only salts of nickel and cobalt with magnesia, this solution being heated by steam or otherwise. A sufficient quantity of milk of magnesia (an emulsion of caustic magnesia) is added to precipitate all the nickel, or an excess of magnesia may be used, and after separation of the excess of liquid the precipitate may be treated either with a solution of sulphuric acid, or an excess of a solution of the sulphates of nickel and magnesia, which takes up all the excess of magnesia. The colorless liquid is a solution of sulphate of magnesia, which may be concentrated by evaporation, cooled, and crystallized for sale. The remaining oxide of nickel is well washed, dried, calcined, and reduced by the ordinary methods used for obtaining metallic nickel from the oxides of that metal.

The solution of soluble sulphates obtained from the ore by the above-named process may be evaporated to dryness and the residuum calcined, either alone or after mixture with the quantity of saltpetre necessary to convert all the iron to the state of insoluble peroxide, easily to be separated by washing. The solution containing nickel (and cobalt) with magnesia may either be treated by the method above described, or may be evaporated to dryness and calcined with mixture of saltpetre of magnesia, or of carbonate of magnesia, in quantity sufficient to decompose the sulphate of nickel and reduce it to the state of oxide. The mixture being now washed, the nickel remains in the state of a gray oxide, which may be washed, dried, and reduced to the state of metallic nickel by the methods generally employed.

A continuous reduction is preferred by Mr. Montefiore to any other for the reduction of the oxide of nickel to the metallic state. This consists principally of one or several pots or tubes placed vertically, and open at both ends; they are so placed in the furnace as to be easily exposed to the required heat; the upper end of each pot or tube, protruding higher than the top of the furnace, is covered by a movable cover; to the lower part of the earthen tube or pot is adapted an iron tube closed by a sliding door. The oxide to be reduced is introduced by the top into the pot or tube after being mixed with coarsely pulverized charcoal; the reduced metal is withdrawn at the bottom, mixed with the excess of charcoal, a new supply of mixed oxide and charcoal is introduced at top, and so on continuously. It is evident that the time given for the reduction can be regulated at will by the regulation of the intervals for withdrawing the reduced metal and the quantity withdrawn each time. As the work is continuous, and the pot never allowed to cool, this mode of reduction is very economical.

The essential features of the invention are the treatment of the pulverized ore, calcined or not, by sulphuric acid, and especially the rapid combination, as described, without solution; the separation of iron from its sulphates by magnesia, the separation of nickel from the magnesia in their sulphated solutions by magnesia, thereby obtaining nickel without magnesia, or with but slight traces of this substance, and on the other hand sulphate of magnesia exempt from foreign matters; the evaporation to dryness of the solutions of the mixed sulphates, and the separation successively of the iron and nickel by calcination with the mixture of saltpetre for the first-named metal, and magnesia for the second, and the use of pots open at both ends for the continuous reduction of the oxide of nickel.—*London Mining Journal.*

UTAH MINING NEWS.

Special Correspondence of the Engineering and Mining Journal.

SOME INTERESTING POINTS ABOUT THE SALT LAKE BULLION MARKET.

Even "Ziou, the city of the Saints," and the central point of a land flowing with milk and honey (and lead), feels the depression that broods over the trade of all other parts of the Union. The agricultural interests here are of no small importance, but they have become so only by years of toil and battle with the desert elements of the great Salt Lake basin, and, after all, the truly productive and money making resources of the Territory are its mines. The Utah ores being generally of low grade, carrying as an average some 40 per cent. of lead and 20 oz. of silver, any great depression in the price of lead, such as now rules, cannot fail to create a corresponding, and even sometimes greater, depression at the mines. Half a cent per lb. less for lead may rob the ore producer of all his profit. The lowest grade of ore that can be sold to the smelters here now as a rule must carry at least 30 per cent. of lead and 15 oz. of silver, and even then the miner only gets \$5 a ton for it, and how can he meet the expense of mining a ton of ore and getting it to market with that? The basis of purchase by the smelter here is mostly 35 per cent. of lead, 50 cents a unit being paid for all above this up to 50 per cent.; but if it goes above 50 per cent., from 75 cents to \$1 per unit is paid for all over the standard per cent., according to circumstances, regulated more or less by the richness of the ore in silver, its character, etc. Thus it will be seen that, for an ore carrying 40 per cent. lead and 20 oz. silver, the miner gets \$22.50. Out of this he has to pay freight charges to get the ore to the sampling works, and \$6 a ton for crushing, sampling, and assay, and the balance left for mining expenses and profit cannot be very enormous. The low price of lead, however, would not affect the miners so much, provided the smelters could stand it, and pay the above prices for ore whether lead was at 5 cents or 8 cents.

Of course the labor question is one that affects the mines very directly, and it naturally attracts great attention from every man interested in them in this country, from the owner down to the boy that drives the mule at the "whip" or handles a shovel on the dump. Mining is generally conceded to be hard work, and most mine owners look upon good men as worthy of a fitting remuneration for their laborious toil, and there is a decided disinclination to cut down wages even 10 per cent. Thus it is that the smelters, the bullion producers, and shippers are those on whom hinges at present the question of ability to work the mines or not. These gentlemen, again, are affected directly by the state of the markets and the railroad charges, matters over which they have no control, and hence they cannot be held responsible for the fiat which they are obliged by circumstances to pronounce. Were the ore market here as it is in Colorado, where buyers' "rings" are more or less possible, the miners might have some ground to complain; as it is they can only swear at the market and the railroads, and they give the latter, especially the Union Pacific, their due with a most hearty will. I might as well state right here that the mining and smelting community of Utah at large regard the Union Pacific Railroad as the great *bele noir* of their business, and that it is principally the cause of the straitened and depressed condition of mining matters here. The Union Pacific, on the other hand, claims that "wages are too high at the mines and furnaces." Perhaps if Mr. Dillon had paid a visit to the See Hospital for lead poison cases here at Salt Lake, he might change his mind as to "high wages."

Let us consider a few facts relative to freight, and see whether the miners have any cause for complaint against the road.

In the latter part of May last, the Union Pacific and other roads were asked by the mining men to put down the rates of freight, as otherwise it would not be possible to produce any lead bullion with the steadily declining market. Mr. Dillon came to Salt Lake and had a conference with the miners and smelters, and gave it as his opinion that wages here were altogether too high, that they ought to cut these down, etc., and thus meet the decline in lead. He was told that wages would not be cut down, and that it was the railroads' duty to reduce freights. The Union Pacific, after consultation with other roads, consented to reduce freight on bullion from \$32.50 a ton to New York down to \$27.50, or, if sent by water from Chicago to Buffalo, it should be \$26.50 per ton. It afterward became known that of this \$5 reduction (or \$6 as the case might be), the Union Pacific only bore \$1, making the other roads stand the \$4, while of the whole amount it received \$16! This the mining community look upon as wrong and unfair, especially in view of the fact that in 1872 when values were higher the Union Pacific carried freight from Ogden to Omaha for \$10 a ton! Taking the strikes, etc., into consideration, and what might have grown out of one on the Union Pacific, every one will concede that the road is managed by able men!

The consequence of the high freight tariff is that those smelters who are in no particular hurry to deliver their bullion at New York are shipping via San Francisco and the Isthmus at \$24 a ton, while the majority of the works that handle low grade lead ores will shut down as soon as their present existing contracts are filled, and "wait for something to turn up," either in reduced freight rates or a stronger market. Some of the larger works are even now stacking their bullion, unwilling to part with it at the ruinously low prices obtainable.

The Union Pacific's "squeeze" policy may, however, prove a blessing in disguise for Utah, much as that of the Kansas Pacific has already been for Southern Colorado, by inciting the Atchison, Topeka & Santa Fe to push their line through from Pueblo, thus affording competition, that great leveler of all monopolies.

Already are the effects beginning to manifest themselves in the fact that the coal fields of San Pete and Pleasant Valley are furnishing coke to the smelters at Sandy for \$20 and \$22 a ton; whereas, the Collinsville coke laid down here costs \$28 a ton. The above-mentioned coal-fields, located southwest of Salt Lake City some 75 miles, are quite extensive, and can supply an almost unlimited quantity of coal and coke. The coal is bituminous. Mr. Bamberger, assignee for the San Pete Coal & Coke Company, prepares his coke by crushing the coal to about 1/8 of an inch in size, then washing to clean out the slate, etc., and burning in Belgium ovens. The yield is about 65 per cent. of coke.

The Utah & Pleasant Valley Railroad Company, under the management of Mr. J. B. Lockwood of New York, purpose building a narrow-gauge road up to the Pleasant Valley coal fields, and when the road is completed Mr. Lockwood proposes to furnish coke to the smelters at Sandy for from \$12 to \$15 per ton. Thus Utah, within a year, will be producing within her own borders cheap fuel wherewith to reduce her ores, and then it will only be a question of getting her bullion to market.

In these days of narrow-gauge railroads that do not stop at mountains 9,000 feet high, what is to hinder the Pleasant Valley road, and the Denver & Rio Grande, already within a comparatively few miles of Del Norte, from extending their lines until they meet, thus affording a competitive outlet to the East over which nine-tenths of the bullion is sure to be shipped?

These are some of the questions and causes that are now affecting the Utah mining market. Some few large companies can shut down or wait for a rising market, but on the whole the mining interests here are much depressed. This, as we have seen, is almost entirely due to the low price of lead and the heavy freights.

The following is a statement of the shipments of bullion for the week ending Saturday, July 28, 1877:

Consignor.	Consignee.	No. Cars.	No. Bars.	Bullion Lbs.	Ores.
J. Billing	Hagen & Billing, N. Y. (via San Francisco)	6	1,410	125,028	
F. J. Pascoe	" " "	1	202	20,100	
B. M. Du Rell	" " "	2	465	40,491	
Flagstaff F. Company	Omaha Smelting & Refining Co.	13	3,330	274,201	Copper
Mingo	Pennsylvania Lead Co.	1	200	21,283	matte
S. O. Brown	Cross & Co., San Francisco	3			40,000
F. J. Pascoe	St. Louis Smelting & Refining Co.	7	202	20,041	
Hidden Treasure Co.	W. R. Sloan, Hilliard, Wyoming.	7			150,400
Totals		33	5,809	501,144	190,400

The decrease in shipments is very evident by comparing the last week of July with the first three. For the week ending July 9 there were shipped 71 car loads; week ending July 14, 114 car loads; and week ending July 21, 92 car loads.

The effect of the stagnation has been to close a number of the less prominent mines. I am unable at present writing to give details about the different mines and furnaces. The Telegraph is a pretty fair sample of the majority. It is now working but 75 men instead of its usual force of 150. It has closed down the three stacks it was running just to take a breathing spell, and see what is going to "turn up." Such mines as the Ontario are affected but very slightly, if at all, as, their ore being a milling silver ore, they ship their regular average of 4 silver bricks a day, weighing some 125 lb., or 2,000 oz., 750 fine. Their force is the same as usual, 90 men in the mine and 50 in the mill, with several thousand tons of ore ahead in the mill waiting to be treated. About nine days were lost last month in the mill on account of repairs, but notwithstanding this they shipped during the month \$150,000 worth of silver bullion. This is a mine that does honor to the mining business. It is worked on a large scale, is well managed, and pays.

SALT LAKE CITY, August 1, 1877.

TRIAL OF THE BRAIDWOOD, ILL., COAL STRIKERS.—JOLIET, ILL., Aug. 14.—The case chosen as a test case out of some 400 similar ones, in which the miners at Braidwood were the plaintiffs, and for which Judge McRoberts called a special jury, was given to the jury this afternoon, with instructions from the court to bring in a verdict of no cause of action. The suits were brought by the miners as partners working in the several rooms of the mines, and it is held that they cannot recover only as individuals under the contracts. This will involve the throwing out of court of the 400 cases set for trial this special term, and the new trial of some 1,300 similar cases. The coal companies made a formal offer to the men today of fifty cents on the dollar for their claim, and the companies pay expenses of the court, but the men declare their intention to go to trial.—*Chicago Inter-Ocean.*

HYDRAULIC MINING IN CALIFORNIA.\*

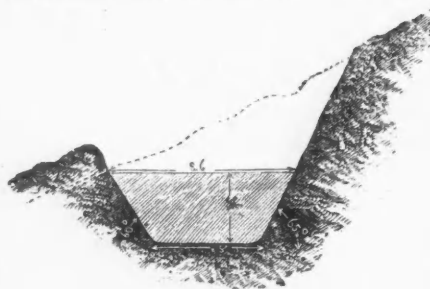
By Aug. J. Bowie, Jr., A. B., Mining Engineer.  
(Continued from page 129.)

DITCHES.

A few remarks on the water ditches will not be inappropriate. Thousands of miles of ditches have been built throughout the State for the purpose of conveying water to the mines, and in some instances are now being used likewise for irrigation. In locating mining ditches, the following general rules are usually adopted:

1. The securing of an abundant and permanent supply of water, particularly during the summer months.
2. That the source of supply is at a sufficient elevation to cover the greatest range of mining ground at the smallest expense, hydrostatic pressure being always desirable.
3. The snow line, when possible, should be avoided, and the line should be located so as to have a southern exposure, particularly in the snow regions.
4. All watercourses on the line of the ditch should be secured. Their supply partially counteracts the losses by evaporation, leakage, and absorption, and frequently furnishes an additional quantum of water during several months of the year.
5. Water-gates, at proper intervals, should be arranged so as to discharge the water, when necessary, without risk of damage to the ditch.
6. Ditches, when practicable and costs are not excessive, should always be preferred to flumes.

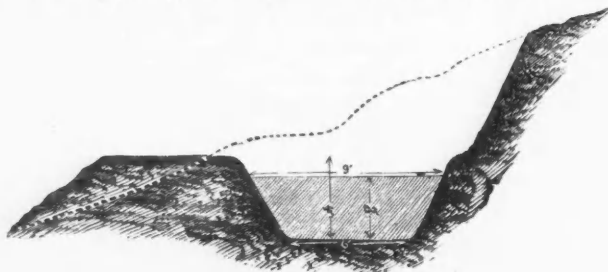
Amongst the principal ditches constructed in the State are the North Bloomfield, the Milton, the Enreka Lake, San Juan, Excelsior or China Ditch, Bouyer and Union, El Dorado, Cherokee and Spring Valley, Hendricks, and La Grange. The North Bloomfield main ditch, including distributors, is 55 miles long. Its size is 8.65 feet on top, 5 feet at bottom, and 3½ feet deep. The ditch and distributors cost \$422,106.22. Its grade is from 12 to 16 feet per mile, discharging 3,200 miner's inches. The Milton Company's ditches are 100 miles long, and their average grade is from 12 to 25 feet to the mile. The size is 4 feet on bottom, 6 feet on top, and 3½ feet deep. The main ditch will discharge 3,000 miner's inches. Cost, \$259,020.14. The Eureka Lake Ditch is 18 miles long, and has a capacity of 2,800 miner's inches. Its cost, including water rights and flumes, was \$430,250. The San Juan ditch and branches extends some 45 miles in length. The main ditch is 32 miles long, and its capacity is 1,300 miner's inches. Their cost was \$293,092. These two last mentioned ditches belong to the Eureka Lake and Yuba Canal Company. The Excelsior or China ditch, at Smartsville, is 33 miles long. Size, 5 feet bottom, 8 feet on top, and carries 4 feet of water. The grade is 9 feet to the mile, and the ditch discharges 1,700 Smartsville miner's inches. The Bouyer and Union ditches are respectively about 15 miles long. Size, 4 feet on bottom, 8 feet on top, carrying 3½ feet of water. Their grades are 13 feet to the mile, discharging each 1,200 Smartsville miner's inches. There are several minor ditches which deliver water in and around Smartsville. The total capacity of all the ditches is 5,000 Smartsville miner's inches, and the whole investment in this class of property in this locality approximates \$1,200,000.



NORTH BLOOMFIELD MAIN DITCH.

The Spring Valley and Cherokee ditch is 52 miles long, and has 3½ miles of iron pipe, 30 inches in diameter. The size of the ditch averages 5 feet wide, 3½ feet deep, discharging about 2,000 inches of water. The Hendricks ditch, † in Butte County, is 46½ miles long. Grade of the upper line of ditch, 12.8 feet per mile. Grade of the lower line, 6.4 feet per mile. Respective sizes, 5 feet wide, 2 feet deep. Total cost, including Glen Beatson ditch and Oregon Gulch ditch, \$136,150.

The La Grange ditch, ‡ including Patrickville branch, is over 20 miles in



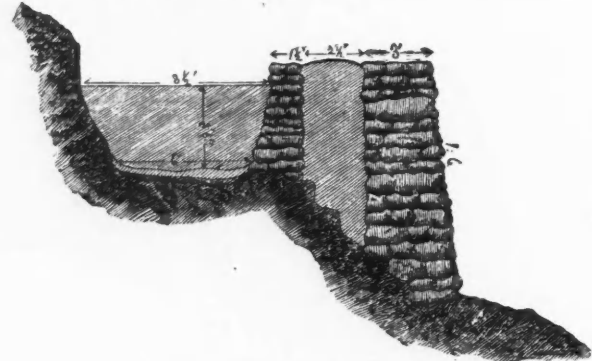
LA GRANGE DITCH.

length. Size, 9 feet on top, 6 feet bottom, 4 feet deep. Grade from 7 to 8 feet to the mile. The greater part of the ditch is cut in granite, and in places there are solid walls 50 to 70 feet high, built of stone. It discharges 3,000 miner's inches of water, and its cost to date is about \$450,000.

GENERAL OBSERVATIONS.

Ditches in California with carrying capacities as large as eighty cubic feet per second have been built, and are now in successful operation, with grades of from sixteen to twenty feet per mile. In a mountainous country where steep grades can be generally obtained by a slight increase in the length of the canal, and where the cost of excavation is large, a great saving can be effected by running water rapidly through a small channel rather than slowly through a large one. It is found to be safer and more economical, on account of the deep snows and terrific storms which rage in the mountains during the winter, to run and maintain in repair narrow and deep ditches on heavy grades than broad ones with

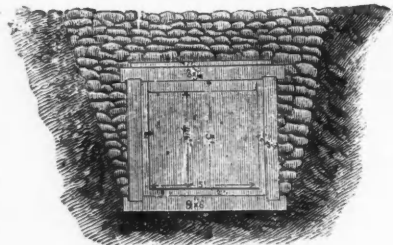
light grades. The experience of the ditch builders in this State has been highly favorable to these steep grades, but little trouble having been caused by the washing of the banks due to high velocities.\* In the valleys with ashy soil such grades, of course, would not be practicable.



SECTION OF WALL DITCH ON LINE OF LA GRANGE MINING COMPANY'S DITCH.

FLUMES.

In crossing ravines, flumes or wrought iron pipes are used. Many miners object to flumes on account of their continual cost and danger of destruction by fire. Where used and practicable they are set on heavier grades than ditches, 30 to 35 feet per mile, and consequently are proportionately of smaller area than the ditches. In their construction a straight line is the most desirable. Curves, where required, should be carefully set, so that the flumes may discharge its maximum quantum. Many ditches in California have miles of fluming. The annexed sketch will show their general style of construction.



MODE OF CONSTRUCTING FLUME.

THEIR CONSTRUCTION.

The planking ordinarily used is of heart sugar pine 1½ to 2 in. thick, and 12 to 18 inches wide. Where the boards join, pine battens 3 inches wide by 1½ thick cover the seam. Sills, posts, and caps support and strengthen the flume every four feet. The posts are mortised into the caps and sills. The sills extend about twenty inches beyond the posts, and to them side braces are nailed to strengthen the structure. This extension of the sill timbers affords a place for the accumulation of snow and ice, and in the mountains such accumulations frequently break them off, and occasionally destroy a flume.

To avoid damage from slides, snow and wind storms, the flumes are set in as close as possible to the bank, resting on a solid bed or partially so, as the general topography and costs will admit. Stringers running the entire length of the flume are placed beneath the sills just outside of the posts. They are not absolutely necessary, but in point of economy are most valuable, as they preserve the timbers. As occasion may demand the flume is trussed, the main supports being placed every eight feet. The scantling and struts used are in accordance with the demands of the work.

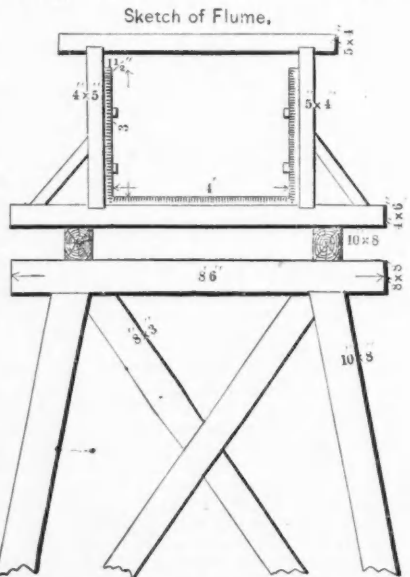
WROUGHT IRON PIPES.

The use of sheet iron pipes for the purpose of conveying water was one of the results attendant on the introduction of hydraulic mining. Their insignificant weight, coupled with their great strength (tensile), admirably adapted them for the service for which they have been employed.

The pipes used in the mines are of riveted light sheet iron, No. 16, 14, or 12 iron, made in lengths of about 20 feet, and put together in stove-pipe fashion, neither rivets nor wire being used to hold the joints in place. These pipes are light and can be readily and cheaply moved; this in hydraulic mining is of great importance, as it is often requisite to change the position of the lines of pipe. Pipe put together in this rough manner will remain tight when subjected to even as great a pressure as 250 lb. to the square inch.

At Cherokee there is an inverted siphon of wrought iron. The pipe has an approximate inner diameter of 30 inches, discharging 52 cubic feet of water per second. It has been in continuous use for 5 years, and is now in first-class order. The iron used was ordinary English plate of fair quality. The greatest pressure it sustains is 887 feet, and the thickness of the iron at that point is three-eighths of an inch.

The annexed plan, † taken from the original survey on file in the office of the



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

† See Raymond's Report, 1872, pp. 73, 74.

‡ The original ditch, about 19 miles long, is said to have cost \$375,000. Since its completion the Patrickville ditch and reservoir have been built at a cost of \$75,000.

\* These narrow ditches with steep grades do not discharge within from 25 to 30 per cent. of the amount of water given by the formulae for "the discharge of water in canals."

† Side braces and the extra extension of the sill are in many cases only an unnecessary expenditure of money.

‡ The Mining and Scientific Press of January 7, 1871, contains a detailed account of the construction of this pipe, and also gives a diagram of the line.



company, shows the line of the pipe, and different sizes of iron used in construction of the siphon. The maximum strains on the several sizes of iron used are given in the following table :

Size of Iron.		Greatest Pressure.		Maximum tensile strain on iron per square inch in pounds.
Number.	Thickness in decimals of an inch.	Feet.	Pounds.	
14	.083	170	74	13,374
12	.109	288	125	17,202
11	.012	293	127	15,875
10	.134	355	154	17,240
3-16	.187	435	188	15,080
1/4	.250	594	257	15,420
5-16	.312	842	365	17,549
3/8	.375	887	384	15,360

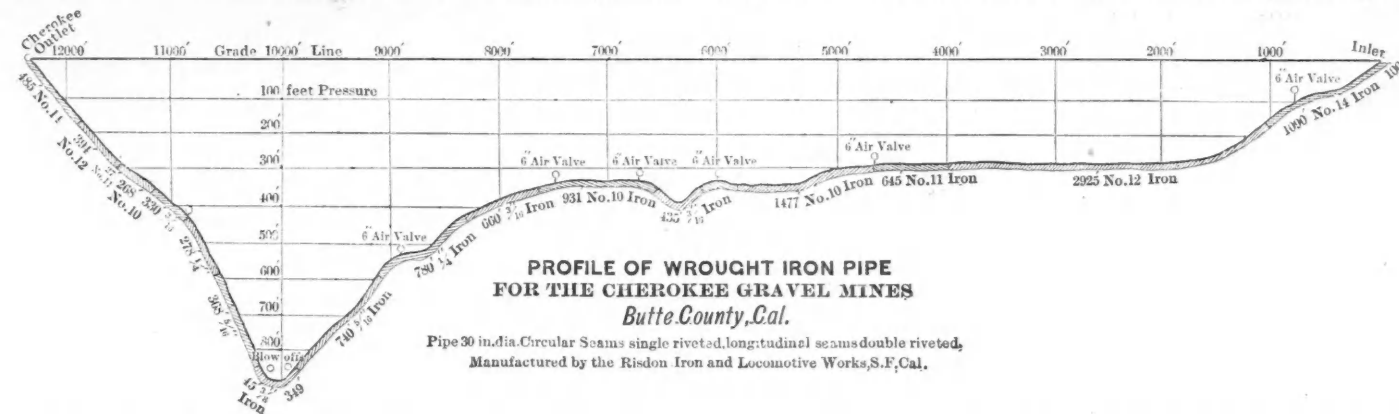
The Virginia City Water Company, Nevada, have constructed a similar wrought iron siphon, 11 1/2 inches in diameter. The maximum pressure in its greatest depression is 1,720 feet, equal to 750 lb. per square inch. The thickness of the iron at the lowest point of depression is No. 0. The pipe was hot-riveted, 5/8-inch rivets, double row on straight seam and single row on round seam. This pipe, when tested, is said to have stood a pressure of 1,400 lb. per square inch.\*

STORAGE RESERVOIRS.

When water is not taken from running streams, the mines are dependent for their supply on the winter rains and snows. Large reservoirs are built to catch the water from the rains and melting snows, and store it in the spring and summer months for use during the dry season.

The North Bloomfield Company has established a complete system of storage reservoirs. The Bowman reservoir, and the small reservoirs about it, will hold, when the main dam is completed to a height of 96 feet 3 inches, about 1,000,000 cubic feet of water. The cost of the reservoirs and dam to date is \$214,392.06.

The Rudyard reservoir, of the Milton Company, contains 535,000,000 cubic feet of water, or 3,980,000,000 gallons. The reservoir is formed by 3 dams; highest, 100 feet vertical, and its cost was \$150,000. The storage reservoirs of the Eureka Lake and Yuba Canal Company, consisting of the French, Weaver Lake, and Fancherie reservoirs, have an estimated aggregate capacity of 319,800,000 cubic feet of water. Independent of these reservoirs, all mines at a convenient distance to their works have what are called distributing reservoirs.



PROFILE OF WROUGHT IRON PIPE FOR THE CHEROKEE GRAVEL MINES Butte County, Cal.

Pipe 30 in. dia. Circular Seams single riveted, longitudinal seams double riveted, Manufactured by the Risdon Iron and Locomotive Works, S.F., Cal.

From these places water is easily distributed to the claims, or they are used to retain the surplus coming from the main ditch when the claims are shut down.

PIPES.

The water is conveyed to the claims in iron pipes from the pressure box, and by means of iron distributors on the lower end of the feed pipe it is distributed to the discharge pipe as required. The discharge pipe most generally used is called the "Little Giant."† They are portable and easily handled, having a knuckle-joint and lateral movement. The "Giants" have stream concentrators, and the nozzles used are from 4 to 9 inches in diameter, 5 1/2 to 7 inch nozzles being those most generally in use. The number of "Giants" employed in a claim depends on its size and quantity of available water. There are generally two or three to a claim.

TO BE CONTINUED.

MINING NEWS.

THE MISSOURI LEAD MINES.

With reference to the effect of the recent decline in lead on the future production of the mines, *Mines, Metals, and Arts* of the 9th inst. says:

"That our Western mines will not have to stop at 5 1/2 cents rate for lead, has been shown during the past 50 days to be an erroneous idea. It will be a hardship on the miner hereafter to sell his mineral at \$32 a ton, or less. Still, in times that we remember, \$3.50 to \$4 per hundred for lead, and \$25 to \$28 a ton for the lead ore, did not diminish lead production in the States of Missouri, Illinois, Wisconsin, and Iowa; on the contrary, the old-time miner, with his inferior tools, thought it better to try daily to dig his one hundredweight of galena out of the ground and get his \$1.40 therefor, than to work in the scorching sun on the farm at \$10 and board a month. The manner of carrying on that kind of mining is now greatly improved in every particular; and will at low prices for lead be kept up. In large establishments, such as St. Joe, Des Loge, and Mine La Motte, a want of elasticity in routine production will for a time cause a hollowness in the money-box. Nevertheless, the Mine La Motte plan of procedure with the miners will, by amplification and a sliding scale, cover the ground,

\* The Virginia City Water Company has constructed a second siphon, made of lap-welded pipe, 10 inches inner diameter, 3/4-inch iron, and placed it alongside of the siphon already built. The new siphon works well.

† French reservoir, 661,000,000 cubic feet capacity; Weaver Lake reservoir, 100,000,000 cubic feet capacity; Fancherie reservoir, 58,800,000 cubic feet capacity. See Report J. D. Hague, M. E., pp. 15, 16, 17.

‡ Other nozzles in use are the "Dictator," by Mr. Hoskins, who also invented the "Little Giant," Craig's "Globe Monitor," and the "Hydraulic Chief," an invention by Mr. F. Fisher.

and bring both employers and employes into the relation of mutual sharers of the responsibilities of the new departure that must be taken."

We take the following notes from the *Granby Miner* of different dates: "Granby Mining and Smelting Company has published a notice reducing the price of zinc ore two dollars on a ton from and after the 1st of August. We understand that the price is reduced at all points in the Southwest, and that this result is inevitable from the great depression sustained in the value of spelter.

"The zinc mines of Granby are now yielding more heavily than at any time for two or three years. We have not the figures for the amount now raised here per week, but think it cannot be less than two hundred tons. The reduction in price will bear heavily on the miners. But where can they go or what do to better their condition?"

"We learn that Mr. Boruff & Co. last week turned in one hundred tons, and this week they will considerably exceed that amount. Of course men with such grand prospects, the very richest in the Southwest, will continue to work their mines. But a good many smaller prospects, that now barely pay 'bread and butter,' are not likely to be worked until prices mend again. Besides, mines situated like the Pemberton or Corry mines, and mines like those in Webb City, where the ore has to be crushed and thoroughly cleaned, under the reduction in price, will show a great falling off in production if they are not entirely closed. The outlook for the miner is not flattering; it is almost as bad as it can be. The exorbitant charges for railroad freights from Granby have always been an enormous tax on the miner. Eighty dollars per car, or eight dollars per ton (the price charged until quite recently for the shipment of lead and zinc ore to St. Louis), for a distance of three hundred and sixty miles, looks like extortion, when compared with ten cents per bushel or \$3.60 per ton from Chicago to New York, nearly three times the distance from Granby to St. Louis. At that rate, the price of a car load of ore from Granby to St. Louis would be about \$12, or \$1.20 per ton.

"An item of great waste in zinc production, is in sending the crude ore, mixed with dirt and gravel as it is, to distant furnaces for reduction. Not 50—perhaps not 40—per cent. of Granby jack as delivered at the cars is pure silicate or zinc-blende. Eight dollars per ton is therefore paid to transport worthless rock and gravel to St. Louis. This money is thrown away. But if the ore was reduced at or near the mines, you say the cost of coal would be double what it is at Carondelet, and that it takes a ton and a half of coal to reduce a ton of blende or silicate. This is only part of the truth, however. Coal at the mines in Kansas, not thirty-five miles from Granby, sells (if it sells at all) for less than it does at the mines nearest Carondelet. With facilities for shipping, coal would

be cheaper at Granby than at Carondelet. It is sold in Joplin at eight to ten cents per bushel, we understand. It certainly seems clear to us that the present system of reducing zinc ore is wasteful and slovenly. There is little economy about it, and the price of ores must depend upon the profits of reducing and handling them, and the losses and wastage fall upon the miner.

"The Neosho Mining Co.'s shafts are down to 18 or 20 feet each, and fine mineral has been taken out of each, and was taken out all the way down from a very few feet of the surface. Nearly all the dirt taken out of one shaft is fair wash-dirt.

"There is a good deal of activity in the mines on Baynham's Branch, and some seven or eight new shafts have been started by Granby miners. The water is falling rapidly.

"The heavy rains have put a summary stop to hauling zinc ore to the railroad from the Pemberton Mines. Zinc ore, even at \$18 to \$20 per ton, will not bear transportation for long distances by wagon, particularly when roads are poor and the streams not bridged. The Dade County mines cannot be worked with profit without a railroad connection with some good market for zinc ore.

"The Granby Mining Company is surveying and laying off a large body of mining lands on Diamond Grove Prairie in the vicinity of Humburg. This tract is known to be rich in mineral; it is not more than three miles from the so-called Neosho diggings. The Company will offer excellent inducement to miners to work these mines. Gradually the gaps are filling up to make a continuous mine from Granby to Joplin. Indeed, it is now a continuous mine; all that is needed is work to develop it.

"Active efforts are being made by the Mastins, of Kansas City, to start up the Cherokee Zinc Works. These gentlemen are also interested in mines at Webb City.

"The market rates for mining tracts range about as follows: Forty acre tracts range from \$3,000 to \$5,000 for the fee. Leases for ten years, one-fourth royalty. Under leases about the same. Under sub-leases, as you can light on chaps. Big prospects at thirty to forty feet very rare, gilt-edge, \$1,000 per third, with royalties reserved. Prospects at 14 to 15 feet in demand. Holders firm, at \$1,000 apiece. Buyers unsteady at a reduced figure.

"The Joplin Railroad Company talks of extending its line through Newton County and on to the pineries of Arkansas.

"The new mines just being opened north of here, will be on the direct line from Joplin to Granby, and will traverse the principal mines of the county."

THE COMSTOCK (NEV.) MINES.

From the *Gold Hill News* of the 15th inst., we take the following summary of its mining intelligence: "The Sutro Tunnel continues its slightly upward grade toward the deep fastnesses of the mighty Comstock. It is already within the eastern confines or outskirts of the great lode, and less than 2,000 feet more

will carry it directly into the working of the Savage Mine. It was denied not long ago that the workmen in the tunnel and those at the bottom of the great Savage-Norcross-Chollar Combination shaft could hear each other letting off blasts, but this fact is now fully established. The first connection of the tunnel with any of the Comstock workings will be with this shaft, for the mutual advantage of both. What the tunnel will pass through in the 2,000 feet before it, remains to be seen, but a high degree of interest is felt on the subject by all concerned. There is plenty of room for a good-sized bonanza; and it is a very likely and eligible place for one, or even two.

"The deepest point yet attained in the practical workings of any mine on the Comstock, regardless of topographical undulations or inequalities at the surface, is in the Yellow Jacket Mine. The 2200-foot level, where all the prospecting and development work of the mine is at present being done, is 775 feet below the level of the Sutro Tunnel, or 170 feet below the level of the lowest workings of the Imperial Mine, which shows the deepest workings of any mine on the lode. It must be borne in mind, however, that the surface or top of the Imperial shaft is 200 feet higher than the Yellow Jacket.

"We hear it hinted that something good might turn up in the south part of the Belcher or the northern suburbs of the Overman. The big bonanza never looked better or showed more rich ore in sight. The 1750-foot level will very shortly be reached and its exploration commenced. The double winze from the 1650-foot level is down 105 feet, and only lacks some six or eight feet of reaching the level of the main drift coming west from the C. and C. shaft. Considerable increase of water is met with in the winze, and great heat impedes operations in the drift, but the two will come together in good time. This shaft is now down 1,850 feet. Active work is being prosecuted in the Belcher, and, in fact, in all of the prominent mines on the lode."

The Chronicle gives the following as the number of men at present employed on the Comstock:

Utah.....	46	Chollar and Combination shaft.....	110
Sierra Nevada.....	120	Bullion and Exchequer.....	50
Union Consolidated.....	25	Imperial.....	74
Mexican.....	42	Yellow Jacket.....	168
Ophir.....	222	Crown Point.....	87
Cal., Consol. V. and C. and C. shaft.....	1,160	Belcher and pump shaft.....	220
Best & Belcher.....	27	Overman.....	70
Gould & Curry.....	100	Caledonia.....	68
Savage.....	100	Justice.....	591
Hale & Norcross.....	54	Outside mines.....	150
Julia.....	32		
		Total.....	3,516

"The total daily wages of this number of men, at \$4 per day, the wages received by the Comstock miner, amounts to \$14,064. It is also stated that there are about 3,000 idle men in the region. The Ophir Mine discharged 40 men on the 3d inst."

**Yellow Jacket Shaft.**—Regarding this new shaft, which is now down 815 feet, the Stock Report of the 10th inst. says:

"The new gallows frame is an immense affair, and one of the best on the Comstock, although not yet completed. It is being constructed over the one now in use at the shaft, and does not interfere with the work of sinking. The timbers used are of the best mountain spruce. The posts are 37 feet high and stand bracing, being 24 feet apart at the top and 30 at the foot. The plates are 24 x 26 inches, and the braces used are 18 x 24. The main braces which reach toward the machinery are a little over 49 feet 8 inches in length. On the top of the frame a network of 16 x 16 timbers, 5 feet high, will support the sheaves, which are 10½ feet in diameter.

"The machinery to be put in is of the latest and most improved kind, and powerful enough to mine any required depth. The hoisting engine has two steam cylinders, 18 inches in diameter by 24-inch stroke. The engine shaft is 8 inches in diameter, with a 25-inch pinion. The pitch of the pinion is 3½ inches by 18-inch face. This hoist can be double-gearred with a pinion 25 inches in diameter on the engine shaft, working into a wheel 80 inches in diameter on a 10-inch intermediate shaft; and on the same shaft is a pinion 34 inches in diameter, working into a spur wheel 165 inches in diameter.

"The change of gear is effected by sliding the intermediate shaft in and out, by means of a screw and hand wheel, on the outer end of the shaft. The object of this gear is for raising and lowering pumps and other heavy weights. This is a new arrangement altogether, as a separate engine is used for the purpose, and the means adopted in this instance answers for both. The reel shafts are 9 and 12 inches in diameter respectively, and the reels, of which there are 2, 40 inches in diameter by 5-inch face. They can be worked together or separately, with suitable clutches. Each of the spur wheels is furnished with a powerful brake, worked by suitable levers connected with a hand-wheel gear.

"There is also a brake on each of the engine cranks—another improvement insuring greater safety. These cranks are made six feet in diameter, and very heavy, forming balance wheels for the engine. Each reel is furnished with the latest improved indicators for telling the depth. The one used is the best one yet devised. On the dial plate is a spiral thread, in which the needle or pointer works, and instead of this pointer having to indicate the depth by one revolution, the use of the spiral gives it three revolutions, thus insuring greater accuracy. In a deep mine, where a great deal of cable is out, the old way is not accurate enough, but as the depths are plainly marked on the spiral thread, space enough is given for accurate indications. The indicators are worked by suitable worm and screw wheels from the reel shaft. This machinery is all very heavy and very finely finished. All the bearings are bushed with brass and fitted with tightening wedges. Each engine is furnished with link motion reversing gear, patent balance slide valves, etc. This machinery is among the heaviest on the Comstock, weighing altogether about 90 tons.

NOTES.

**THE COAL MINERS OF NORTONVILLE, CONTRA COSTA COUNTY, CALIFORNIA,** pay fifty cents out of each \$100 they receive into the school fund of the district.

**CINNABAR DISCOVERY IN CALIFORNIA.**—A cinnabar ledge has been discovered about seven miles from Grass Valley, in the direction of Colfax. The ledge is reported to be from 75 to 80 feet in thickness, and, it is supposed, will yield 25 per cent. of quicksilver. In the course of a month or six weeks a furnace will be in operation.—*Grass Valley Union.*

**DES MOINES RAPIDS CANAL.**—The Government Canal around Des Moines Rapids, in the Mississippi River, was opened for navigation on the 22d inst. This canal is seven and six-tenths miles in length; was begun October 8, 1867, under an act of Congress; has cost \$4,281,000. It will save a large sum annually to the commerce of the Mississippi River.

**CHEAP FUEL.**—A contract for supplying certain public buildings of Pottsville, Pa., during the coming winter with about 300 tons of coal of various sizes, was awarded on the 16th inst. to F. W. Hazzard, at \$1.99 per ton of 2,000 lb. The bids, of which there were nine in number, ranged from this price up to \$2.75. The average of all the bids was about \$2.30 per ton.

**PUYALLUP COAL MINE—PUGET SOUND.**—The Seattle Dispatch says that the veins of coal of the Puyallup Mine, as we learn from one who has been there, are 6, 8, and 18 feet in width. A new vein was struck on the 17th inst. 8 feet in thickness, superior to any yet discovered. The tunnel is now 200 feet in; at the end is 200 feet below the crest of the hill. By the time the road is finished to the mine, there will be 500 tons of coal ready for shipment.

**ILLINOIS COAL MINERS RESUME WORK.**—The coal miners of St. Clair and Madison counties, Ill., have reconsidered their demand of four cents per bushel for digging coal, and have reduced the price to three cents, with a guarantee from the mine owners that that rate shall stand one year. The owners accepted the three cent rate, but refused to guarantee, whereupon many of the miners resumed work at that rate without guarantee, and it is believed all of them will return to work in a day or two.

**THE SCRAP HEAP OF THE PENNSYLVANIA RAILROAD COMPANY.**—This company invited proposals for the scrap iron made by the burning of shops, cars, etc., at Pittsburg, estimated to weigh 8,000 or 9,000 tons. A number of bids were made, among others one of \$15 per ton, spot cash, the purchaser to remove promptly, as required in the proposals. Another bidder offered even higher figures than this. Notwithstanding these liberal offers the railroad company decided to gather and remove the scrap to their own shops at Altoona, there to be reconverted and utilized.

**PROPOSED ARBITRATION BY THE TUSCARAWAS VALLEY, OHIO, COAL MINERS.**—The dissatisfied miners of the Tuscarawas Valley have addressed a letter to their employers, in which they propose that six chosen miners and six employers meet together, and choose an umpire, whose decision in all matters of dispute between the two parties shall be final. If the answer is favorable, the appointed board shall assemble at Akron or Massillon, as the employers may elect, on or before the 25th inst. In event of an adverse reply to the proposition, the miners announce that they will be forced to strike. The men claim an advance of 15 cents per ton.

**STRIKES IN THE KANAWHA VALLEY.**—The Mahanoy Valley Record says: "We have received a letter from Coalburg, Kanawha County, West Virginia, informing us that the miners of Cannelton have been on strike since last May, and that the miners of Coal Valley near by have been on strike since June. They are asking two cents per bushel for digging and loading room coal, and three cents per bushel for entry coal. The Cannelton Company have tried twice to start up their works on the old price, but have failed, and now it is rumored that they have discharged their old superintendent and have employed one who lives in Pottsville, Pa., and that he intends to employ from 70 to 100 men here and take them out.

**KANSAS COAL MINERS STRIKING.**—The Topeka (Kan.) Commonwealth of the 14th inst says: "It is known that there has been a strike at Scranton, Osage County, Kansas, among the miners for nearly a month. It occurred before the railroad strike. About five days ago the miners at Osage City struck, and no coal mining, we think, is now going on in Osage City, or but little. We are informed by Mr. Ewing that the strike is for an addition of \$4.50 per car for getting out coal. He says that this would increase their wages about 50 cents a day, and that they earned at the old rates about \$2 per day of about six hours. Mr. Ewing says he has on hand, or can control, about 500 cars of stripped coal, which is not, of course, as good as the coal from the shafts, but does very well this time of the year. He can supply all demands for 60 days with this stripped coal."

**THE GREAT POTTSVILLE, PA., BANK SWINDLE.**—At Reading, Pa., on the 16th inst., the trial of Jacob Huntzinger and J. Albert Huuntzinger, President and Cashier of the defunct Miners' Trust Banking Company, of Pottsville, for conspiracy to defraud depositors, was commenced. The charges against the accused are of such enormity as to have awakened universal interest. One year ago the doors of the bank were closed and one million and a quarter of deposits vanished. Shortly before, it is alleged, a division of \$400,000 among the Huntzinger family was made. When assignees were appointed and the affairs of the bank were investigated, a singular item of assets appeared. It was \$750,000 in notes of men, some of whom were dead and others bankrupt, while some bore date of 1856. The whole batch were not worth the paper they were written on. The Huntzingers held the largest part of the stocks, the last dividend for Jacob being \$89,000, and for his wife, \$85,000. After the bank had stopped, Jacob Huntzinger's life was in such jeopardy that he was compelled to flee from Pottsville. It is believed that the creditors will not realize 10 per cent.—*N. Y. Times.*

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ASSAYS.

LVII. S. B., Detroit, Mich.—No. 2. Sulphuret and carbonate of copper assays 39.6 per cent. copper.

LXII. E. R., North Carolina.—Stamp ore. No. 1. "Headings"—gold, 1.20 oz.; silver, 0.13 oz.; copper, 1.21 per cent. No. 2. Middlings—gold, 0.20 oz.; silver, 0.08 oz.; copper, 0.4 per cent. No. 3. Tailings—gold, 0.09 oz.; silver, 0.05 oz.; copper, 0.25 per cent. No. 4. Slimes—gold, 2.90 oz.; silver, 0.35 oz.; copper, 2.05 per cent.

LXIII. WOOD & LEMAN, New York.—Two specimens of iron and copper pyrites—one of which may contain 5 per cent. copper. Cannot give contents with any degree of approximation without assay.

**STATISTICS OF COAL PRODUCTION.**

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines. Comparative Statement for the week ending Aug. 18, and years from Jan 1st.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
<b>Wyoming Region.</b>				
D. & H. Canal Co.	1,283,899	34,800	1,097,034	
D. L. & W. RR. Co.	1,306,199	35,677	876,554	
Penn. Coal Co.	13,806	658,684	20,580	584,416
L. V. RR. Co.	3,193	585,982	26,223	571,157
P. & N. Y. RR. Co.	204	32,931	1,485	16,162
C. RR. of N. J.	10,641	867,847	24,207	715,157
Penn. Canal Co.	2,590	219,796	14,357	225,785
	39,434	4,965,338	167,329	4,086,265
<b>Lehigh Region.</b>				
L. V. RR. Co.	61,541	1,854,098	26,156	1,484,439
C. RR. of N. J.	19,142	999,237	29,766	733,805
D. H. & W. B. RR.	2,009	11,886	1,952	28,284
	82,692	2,775,221	67,874	2,246,528
<b>Schuylkill Region.</b>				
P. & R. RR. Co.	146,662	3,809,188	85,232	2,476,340
Shamokin & Lykens Val.	12,251	384,812	14,684	513,494
	158,913	4,194,000	99,916	2,989,744
<b>Sullivan Region.</b>				
Sul. & Erie RR. Co.	1,021	7,309	148	26,953
Total	273,059	11,941,868	335,267	9,349,490
Increase		2,594,378		
Decrease	62,208			

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

Receipts and shipments of coal at Chicago, Ill., for the week ending Aug. 18, and year from January 1:

	Week.	Year.
	Tons.	Tons.
Receipts	54,296	973,124
Shipments	5,460	228,179

The shipments of coal at Cleveland, Ohio, for the week ending Aug. 18 were as follows: shipped coastwise, 9,575 tons; total for year, 150,963 tons; foreign shipments, 1,625 tons; total for year, 50,481. Total of coastwise and foreign shipments for week, 11,200; for year, 201,544.

The Exports of Coal from Baltimore for the week ending Aug. 17 were 437 tons, and since January 1st, 21,547 tons as against 22,589 tons for the corresponding time in 1876.

Receipts of Coal at Boston, for the week ending Aug. 17 and year from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
<b>From</b>				
Alexandria and Georgetown		4,275		88,003
Philadelphia		20,053		636,206
Baltimore		7,532		146,287
Other places		7,355		293,045
Great Britain				4,722
Nova Scotia		994		23,610
Total		40,149		1,191,423

Perth Amboy business: Received for the week 19,836 tons; Shipped for the week 27,579 tons; On hand Aug. 18 79,085 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Pennsylvania Railroads amounts to 219,447 tons, as compared with the corresponding period in 1876.

The Receipts of Coal at Rondout, N. Y., by the Delaware & Hudson Canal for the five days ending Aug. 15 were 225 boats, carrying 28,842 tons.

Shipments of coal at Pictou, N. S., for the week ending Aug. 18 and year from January 1:

	Week.	Year.
	Tons.	Tons.
To Canada	3,206	25,029
" United States	890	15,868
" Other Provinces	4,509	35,414
Total tons	8,495	76,311

Belvidere Delaware RR. report for week ending Aug. 18: Coal for shipment at Coal Port (Trenton) 98 tons; " " South Amboy 3,423 tons; Coal for distribution 5,256 tons; Coal for Company's use 746 tons.

The production of Bituminous Coal for the week ending Aug. 18 was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Year.
Tons of 2,240 lb.	Tons.	Tons.
<b>Cumberland Region, Md.</b>		
Barclay Region, Pa.		
Barclay RR. tons of 2,240 lb.	5,939	205,986
<b>Broad Top Region, Pa.</b>		
Huntingdon and Broad Top RR.	3,216	85,090
*East Broad Top	666	31,071
<b>Clearfield Region, Pa.</b>		
*Snow Shoe	303	24,578
*Tyrone and Clearfield	35,855	793,127
<b>Allegheny Region, Pa.</b>		
*Pennsylvania RR.	3,520	115,978
<b>Pittsburg Region, Pa.</b>		
*West Penn. RR.	2,950	110,278
*Southwest Penn. RR.	526	23,475
*Penn & Westmoreland gas coal, Pa. RR.	2,237	406,490
*Pennsylvania RR.	780	204,511
*For week ending Aug. 13		

The Production of Coke for week ending Aug. 13.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR.	2,109	37,708
Southwest Penn. RR.	12,605	361,894
Penn & Westmoreland Region, Penn. RR.	42,747	42,747
Pittsburg, Penn. RR.	1,988	72,463
Total	16,942	514,812

**COAL TRADE REVIEW.**

NEW YORK, Friday Evening, Aug. 24, 1877.

**Anthracite.**

The demand for anthracite coal, compared with the limited quantity offering, is very active, but it is generally speculative, and does not represent the immediate or early wants of purchasers in most cases. During the week the Philadelphia & Reading Coal and Iron Company discontinued taking orders for a day for white ash coal. This was followed by the following circular of prices alongside this city:

Stove \$4 00 | Broken \$3 65  
Egg 3 75 | Chestnut 3 50  
Stove 3 35

Since this circular was issued prices have had an upward tendency all around. Mr. A. S. Swords quotes Pittston coal f. o. b. Newburg, as follows:

Broken \$3 15 | Chestnut \$3 15  
Egg 3 25 | Pea 2 50  
Stove 3 35

Messrs. Coxe Bros. & Co. quote "Cross Creek," Lehigh coal, f. o. b. as follows: Lump, steamer, broken, egg, and stove, at \$3.50; Chestnut, \$3.25; and Pea, \$2.50.

Messrs. A. Pardee & Co. quote Hazleton, Lehigh, as follows: Lump, steamer, broken, egg, and stove, at \$3.50; Chestnut, \$3.40; and Pea, \$2.25. This firm is now supplying 200 tons of lump coal per day to a furnace company on the line of the Delaware, Lackawanna & Western Railroad. These prices will probably be advanced in a few days.

The Lehigh & Wilkes-Barre Coal Company quotes stove coal (all kinds) at \$3.75; and Chestnut, \$3.50.

There continues an inclination to advance prices, and should the strike last much longer we may anticipate a higher range of quotations.

The position of the strikers remains unchanged. There have been no additions to the movement since our last, and no indications of further stoppages or of any of those now idle resuming work. While the resources of the miners are probably nearly exhausted by this time, it is quite possible that work will not be resumed for two or three weeks yet.

The production of Anthracite coal last week was 273,059 tons, as against 281,084 tons the week previous, and 335,267 for the corresponding week of 1876. The production from Jan. 1st to Aug. 18th was 11,941,868 tons, as against 9,349,490 tons for the like period of 1876, showing a gain this year of 2,592,378 tons. Should the strikes be continued after this month this excess would be very rapidly diminished, but should work be resumed it is very probable that it would be well maintained to the end of the year. Of all the shippers the Philadelphia and Reading Railroad Company attracts most attention for its increase of business, which so far this year amounts to 1,332,848 tons, or 54 per cent. This road will be benefited by the strike, not only by the good demand and higher prices it receives for its own coal, but by the encouragement that will be given to the individual operators on its lines to start mining again—many of them having been compelled to suspend work owing to the unprofitable prices that were realized previous to the strike. The following companies still show an increased production for the year, as follows:

Company	Tons.	Per cent.
Delaware & Hudson Canal Co.	186,865	17
Delaware, Lackawanna & Western Railroad Co.	429,645	49
Pennsylvania Coal Co.	84,268	14
Lehigh Valley Railroad Co.	401,253	20
Central Railroad of New Jersey	328,122	22
Philadelphia & Reading	1,332,848	54

The Pennsylvania & New York Railroad Company and the Geneva, Ithaca & Sayre Railroad made an advance in tolls Aug. 20. See circulars elsewhere in this number.

A telegram from Philadelphia announces that the Philadelphia & Reading Railroad Company will advance its tolls 25 cents per ton, to take effect on Monday, 27th inst.

**Bituminous.**

All of the Clearfield miners have struck for an advance of wages. It is said, however, that the operators in this region, unlike those in the Cumberland, realize the importance of resisting the demand at present, and are strongly united to do so. From the present outlook it does not appear probable that work will be renewed inside of two weeks. The Cumberland region, as we anticipated a week ago, has granted the demands of its miners, and work was fully resumed; but as an outgrowth of the companies acknowledging the supremacy of the men, the drivers, mostly boys of

14 to 16 years of age, demanded an increase in their pay from \$1.75 to \$2 per day. This has been compromised by paying \$1.90 per day. The first concession having been unwisely made, there is no knowing how many more will follow.

The condition of the bituminous coal trade does not justify an advance of wages, but rather calls for a decrease, and although the miners have taken advantage of the necessities of the companies, yet there is no doubt that these will have their turn by and by, and even lower wages than have ruled since the war will be proposed.

Prices are very much disturbed, but show no particular advance on those ruling before the strikes began.

Advices from Pittsburg to the 22d say: "The miners employed in the Westmoreland and Pennsylvania Company's mines at Irwin Station, Westmoreland County, Pa., quit work yesterday afternoon, and resolved that they would not resume until their demand for an advance was complied with. These mines give employment to about sixteen hundred men. On the 21st a force of from 300 to 400 miners organized and marched to Spring Hill, a point where the engines on the Pennsylvania Road are coaled, and induced the miners at that place to quit work. All the mines in the Irwin District are now closed. The miners had been working for forty-five cents a ton, with the slack weighed in, and have struck for an advance of ten cents a ton, which will make the price about equal to that demanded by the recent convention—three cents a bushel for all coal passing over an inch and a half screen."

AN EXTRAORDINARY PROPOSITION.—We have already had occasion to notice the fact that the strike of the boatmen on the Chesapeake & Ohio Canal, by which the business of the whole Cumberland region was stopped, and which was the initial move in the great railroad strike, was encouraged or at least connived at by the officers of the canal. Mr. Gorman, it is said, is desirous of political honors (heaven save the mark!), and has lost no opportunity of seeking favor with the striking rioters. He allowed the public highway to be obstructed for weeks by lawless men, because, forsooth, if he did his duty and promptly put an end to the blockade, he might have lost the favor and votes of a large class. Since, however, the outrage attracted such attention that it could no longer be tolerated, and Mr. Gorman had to raise the blockade. He now gets an authorization from the Canal Board, of which he is President, to reward the strikers and thus hold their votes, at the expense of the taxpayers and the coal companies. This authorization is as follows:

"Resolved, That the president be and he is hereby authorized and directed to give notice that for the remainder of this season the tolls and wharfage on coal from Cumberland to Georgetown shall be reduced to twenty-five (25) cents a ton.

"Resolved, That this reduction is made on the condition that the rates of freight to boatmen be made at the uniform price per ton of ninety (90) cents to Georgetown and ninety-five (95) cents to Alexandria, and that in the event of a violation of this understanding the president is authorized to reestablish the present rate of tolls."

It would be interesting to know what authority the Canal Board or President Gorman has to dictate to the coal companies what they shall pay for freights, or by what right the people's money—the canal being State property—is applied to paying the boatmen a gratuity in the form of higher freights than the open market rate the companies have been paying.

**New York.**

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

Prices being merely nominal this week we omit them entirely.

**Wholesale Prices of Bituminous Coal.**

Per ton of 2240 lb.	At the Shipping Ports.		Alongside in New York.
	Per ton.	Per ton.	
Westmoreland and Penn. at Greenwich.			
Philadelphia	\$4 50		\$5 50
" " at S. Amboy	5 00		5 50
Red Bank Cannel Pa. at Philadelphia	8 00		8 50
Youghiogheny, Waverly Co., at Balt.	4 50		5 65
Despard, West Va.	4 50		6 00
Murphy Run, West Va., at Baltimore	4 50		5 85
Fairmount, West Va.	4 40		5 70
Newburg Orrel, Md.	4 50		6 00
Cannelton Cannel, West Va.			10 00
" Splint " at Richmond	6 00		7 00
" Gas Coal at Richmond	4 00		5 65
Peytona Cannel W. Va. at Richmond			10 00

**Manufacturing and Steam Coals.**

These are only nominal.

**Foreign Gas Coals.**

	Stelling.	Am. cur'cy
Newcastle, at Newcastle-on-Tyne	8/6@10/6	5 50@6 00
Liverpool House Orrel, at Liverpool	25/	13 00
Ince Hall Cannel	35/6	18 00
" Gas Cannel	25/6	10@10 50
Scotch Gas Cannel, at Glasgow, nominal	25/	7 50



be \$1.19 per gross ton, between Coxtan and Waverly. On all coal transhipped at Waverly into broad gauge cars, an additional charge of 10 cts. per ton will be made to cover the expense thereof. The full rate from Coxtan to Buffalo is \$3.26; to Rochester, \$2.91.

ROBERT H. SAYRE, President.

Geneva, Ithaca and Sayre Railroad.—The rates of transportation on coal per gross ton from Coxtan, subject to regulations printed below, will be as follows:

Table with 2 columns: Port/Destination and Rate. Includes entries for East Waverly, Ithaca for C. L. Lake RR., Geneva for local, and various routes to Buffalo and Rochester.

REGULATIONS.

A charge of fifteen cents per ton will be collected of each consignee on all coal not unloaded within twenty-four hours after its arrival, and an additional charge of ten cents per ton for every twenty-four hours thereafter; Sundays and legal holidays excepted.

No allowance will be made for coal lost from cars on account of broken doors or other defects existing when the cars are loaded.

Seventeen cents per ton will be charged, at Ithaca Docks, for shipping coal direct from cars to vessels, and 12 cents per ton additional from stock, making a total charge on what is shipped from stock of 29 cents per ton.

All freights will be collected weekly, by drafts on shippers, from Coxtan to destination.

ROBERT A. PACKER, President.

SAYRE, Pa., Aug. 18, 1877.

Freights

Representing the latest actual charters up to August 25. Per ton of 2240 lb.

Large table with 4 columns: PORTS, From Philadelphia, From Baltimore, From Georgetown. Lists various ports and their corresponding freight rates.

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

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

From the Mines to Piedmont, Cumberland or State Line, 4c. per ton of 2,240 lb. per mile on distances less than 4 miles, and 3 cents per ton per mile on distances over 4 miles, and 2 cents per ton per mile on distances over 100 miles.

From Cumberland to Baltimore (178 miles), \$1.54 per ton of 2,240 lb., or \$1.37 per net ton (1/2 cent. per ton per mile for use of hoppers over C. & P. R.R.).

From Cumberland to Georgetown (152 miles) by canal, 70c. @ 90c. Tolls 40c.

From Osceola to Greenwich, Phila. (say 248 miles, per T. & C. R.R. per ton bituminous coal of 2,000 lb., less drawback, \$1.90 @ \$2.15.

From Osceola to South Amboy, N.J. (317 miles), per 2,000 lb., \$4.03, less drawback, \$1.28; net rate per ton of 2,000 lb., \$2.75; net rate per ton of 2,240 lb., \$3.08; transshipment charges 20 cents additional.

Lake Freights on Coal.

Table with 2 columns: From and To, and Rate. Lists routes from Buffalo to Chicago, Milwaukee, Toledo, Sandusky, Detroit, and from Cleveland to Chicago, Milwaukee, Detroit, Toronto, Marquette, Duluth.

For freights on anthracite coal from Newburg and Rondout we refer to our issue of July 21.

For rates of transportation on coal via the Erie Canal we refer to our issue of July 21.

Rates of Toll

For the above we refer to our issue of July 21.

Towing.

For rates of towing we refer to our issue of Aug. 4.

For freights on Lehigh and Wyoming Coal we refer to our issue of Aug. 11.

For freights on Anthracite Coal to Tide Water Ports we refer to our issue of Aug. 28.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Aug. 24, 1877.

American Pig.—The Thomas Iron Company reports sales of about 2,500 tons of Nos. 2 and 2 X iron at \$17.25 at tidewater. In addition to this, we only hear of small sales, on the basis of \$18@19 for No. 1 foundry. There is no fear expressed by the furnace companies as to securing all the coal they may want, although, should the strike continue much longer, there may be an advance in prices. The price of iron shows no change, and although the present demand does not warrant an advance, yet buyers do not anticipate lower prices at present. We quote No. 1 foundry at \$18@19; No. 2 foundry, \$17@18; and forge, \$16@17.

Scotch Pig.—This business continues as it has been for a long time—a hand-to-mouth business. Prices are unchanged and as follows: Coltness, \$26.50; Eglington, \$24.50; and Glengarnock, \$25.50.

Messrs. John E. Swan & Bros., limited, of Glasgow, under date of August 10, reported 103 furnaces in blast as against 115 a year previous; quantity of pig iron in Connal & Co's. stores, 152,089 tons (increase of 2,099 tons for the week) as against 63,200 tons at the same date in 1876. The shipments for the week ending August 4 showed a decrease of 409 tons as compared with the corresponding week of last year, while the total shipments from December 25, 1876, showed an increase of 9,455 tons as compared with the like period of 1875-6. They quoted No. 1 pig iron as follows: Gartsherrie, 62/6d.; Coltness, 68/; Summerlee, 60/; Langloan, 64/; Glengarnock, 60/; and Eglington, 56/. They quoted freights as follows: To New York, 2/; Boston, 9/; New Orleans, 5/; Baltimore, 8/; Philadelphia, 7/6d.; Montreal, 10/; San Francisco, 28/.

Rails.—We note sales of iron rails aggregating 2,200 tons on private terms, and 3,000 tons of steel rails by a Pennsylvania mill, said to be delivered at Hannibal, Mo., at \$47. We quote steel rails at mills at \$42@45, and iron rails at \$33@36.

Old Rails.—We learn of no business in these, and continue the nominal quotation of \$19.

Scrap.—We note a sale of 250 tons of No. 1 wrought on private terms. We quote nominally at \$23@24.

Baltimore, Md. Aug. 20, 1877.

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

No change to report in the iron market. Trade extremely dull with limited inquiry, and light sales at about quotations.

Table with 2 columns: Item and Price. Lists Baltimore Charcoal, Virginia Charcoal, Anthracite No. 1, Anthracite No. 2, Anthracite No. 3, Mottled and White, Charcoal C. B. Blooms, Billets, Refined Blooms.

Boston. Aug. 18, 1877.

Pig maintains the same depression. The labor troubles among the Lehigh coal miners are causing some uneasiness again.

We quote \$22@23 for No. 1, \$21@21.50 for No. 2, and \$20.50@21.50 for gray forge. Scotch pig is dull at \$24@25 for store lots. The foreign markets are cable firmer, owing to the shutting down of furnaces.

Bar is dull, quoting \$46@47 for refined, and \$37@38 for common. Nails are in light demand at unchanged prices. Sheet is selling at 3c. @ 3 3/4 c. per pound. Russia is quiet at 12c. currency. We quote English spring steel 7@8c. gold; 9@11c. for German; 9@11c. for machinery; 14@15c. for cast; 10@12c. for blister; 8c. for American spring; 13 1/2 @ 14c. for cast; 9c. for blister; and 8c. for machinery.—Commercial Bulletin.

Chattanooga, Tenn., Aug. 21, 1877.

Specially reported by J. F. JAMES, dealer in pig iron, ores, etc. The market here remains dull and unchanged.

Table with 2 columns: Item and Price. Lists Tennessee, Ala. and Ga. Charcoal, No. 1 Foundry, No. 2 Foundry, Gray Forge, No. 1 Foundry, No. 2 Foundry, Charcoal or Coke, white and mottled, Cold Blast, Old car wheels, Wrought scrap, Cast scrap, Iron Ores, Red Hematite, Brown Hematite.

Cincinnati, O. Aug. 21, 1877.

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

Below we hand the closing quotations of our pig iron market.

Table with 2 columns: Item and Price. Lists CHARCOAL, Hanging Rock, No. 1 Foundry, No. 2 Foundry, Soft Silver Gray, Mill, Tennessee, No. 1 Foundry, Mill, STONE COAL.

Table with 2 columns: Item and Price. Lists OHIO, No. 1 Foundry, No. 2 Foundry, Silvery, Mill, COKE.

Table with 2 columns: Item and Price. Lists OHIO & W. Va. No. 1 Foundry, No. 2 Foundry, Mill, CAR-WHEEL.

Table with 2 columns: Item and Price. Lists Hanging Rock, C. B. Car Wheel, Tennessee, Missouri, Alabama, BLOOMS, Charcoal, SCRAP IRON.

Table with 2 columns: Item and Price. Lists Cast, Wrought, CLEVELAND, O. Aug. 17, 1877.

Specially reported by Messrs. C. E. BINGHAM & Co. Per gross ton, on four months' time. Subject to change in market. Discount for cash 4 per cent.

Table with 2 columns: Item and Price. Lists FOUNDRY IRON, No. 1, L. S. Charcoal, Am. S., No. 1, Ch. Val., No. 2, Anthracite, No. 1, Bituminous, No. 2, CAR WHEEL AND MALLEABLE IRON.

Table with 2 columns: Item and Price. Lists No. 3 L. S. Charcoal, No. 4, BESSEMER IRON, Nos. 1 & 2, L. S. Char., FORGE IRON.

White and Mottled, \$18 00

Louisville, Ky. Aug. 21, 1877.

Specially reported by Messrs. GEORGE H. HULL & Co. Market increasing in activity, but no improvement in prices. Prospects for an improved fall trade good. The usual time, four months, is allowed on the quotations below.

Table with 2 columns: Item and Price. Lists FOUNDRY IRONS, No. 1 Hanging Rock, Charcoal, No. 2 Hanging Rock, No. 1 Southern Charcoal, No. 2 Southern Charcoal, No. 1 Hanging Rock, Stonecoal and Coke, No. 2 Hanging Rock, Stonecoal and Coke, No. 1 Southern Stonecoal and Coke, No. 2 Southern Stonecoal and Coke, "American Scotch", Silver Gray, MILL IRONS.

Table with 2 columns: Item and Price. Lists No. 1 Charcoal, Cold-short and Neutral, No. 1 Stonecoal and Coke, Cold-short and Neutral, No. 2 Stonecoal and Coke, Cold-short and Neutral, No. 1 Missouri and Indiana Red-short, White and Mottled, Cold-short and Neutral, CAR-WHEEL AND MALLEABLE IRON.

Table with 2 columns: Item and Price. Lists Hanging Rock, and Cold Blast, Alabama and Georgia, Kentucky Cold-blast, MONTREAL, Aug. 14, 1877.

The demand this week has been confined to the supply of immediate wants, and that demand has been very small; the chief inquiry has been for bars within range of our quotations. Pigs are not asked for. Our quotations remain as revised last week. We quote: Pig iron—Eglington and Clyde, \$17.30 to \$18; American,



COAL TRANSPORTATION AND GENERAL MINING STOCKS.

Table with columns: Name and Location of Company, Feet of 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 Quo. per Share in Currency (Aug. 18-24), and Sales. Rows include Coal Stocks (e.g., Consol. Coal, Del. & H. Canal) and General Mining Stocks (e.g., Alpha Cons. g. s., Am. Flag, g.).

g. Gold. s. Silver. L. Lead. c. Copper. \* Non-Assessable. Total Assessments levied to date. Total Mining Dividends disbursed to date. Total Sales of Coal Stocks for the week. Total Sales of Mining Shares for the week.

payments to bear 6 per cent. interest. The payment will be secured by the execution of a trust deed, to be held by the trustees until all the payments are made. Chesapeake & Delaware Canal Company. \$3,000 of the 6 per cent. bonds of this company were sold at auction during the week at 79 1/2 per cent. Schuylkill Navigation Company. \$1,500 of the convertible mortgage loan of this company were sold at auction during the week at 52 per cent.

Philadelphia Stocks. PHILADELPHIA, FRIDAY EVENING, Aug. 24, 1877. The week under review has been a very active one, with Pennsylvania Railroad, and Philadelphia and Reading Railroad as the features. Reading Railroad.—The sales of this stock have aggregated 51,769 shares, at 12 1/4 @ 17 1/2, steadily advancing, and closing strong under the announcement that

the tolls will be advanced 25 cents per ton on coal on Monday. This company's position is undoubtedly being very much improved by the strike, which gives it a good business at remunerative prices. The sudden demand which has sprung up for this stock comes, in part, from New Yorkers, who, in making comparisons with the quoted prices of the coal stocks on their board, have concluded that there is a good margin for improvement in Reading. And, certainly, if

the present value of the New York stocks were justified, the present prices of Reading would be low. As, however, the declared policy of the Reading is to declare no dividend till its entire floating debt, and the certificates for interest recently issued, have been redeemed, there seems no immediate reason for any great advance in price.

**Pennsylvania Railroad.**—This stock closes at 30 3/4 bid and asked. The prices show an advance of 3 points, or 6 per cent., from the opening quotations of the week. The sales aggregated 93,306 shares, a large increase on the business reported for the two previous weeks. The statement of this company's earnings and expenses for the first six months of 1877, as taken from the *London Railway News*, shows the gross earnings of the lines east of Pittsburgh for the first six months of this year, as compared with 1876, to have decreased \$1,906,137, and the expenses to have fallen off \$2,073,102, leaving the net increase \$67,765. The operations of all lines west of Pittsburgh, as compared with last year, show a decrease of \$513,500 in net earnings. Brokers and others interested complain that these statements are furnished to the English stockholders through the journals of that country, while those in this locality are unable to get at the figures in any way.

**Lehigh Coal and Nav. Company.**—This stock has advanced from 18 1/4 at the opening to 20 1/2 at the close, with sales of 6,717 shares.

**Lehigh Valley Railroad Company.**—The sales of this stock aggregated 1,855 shares, at 34 1/4 @ 36 1/2.

**Miscellaneous Sales and Quotations.**

Sales and quotations of the stocks and bonds dealt in here at Philadelphia, and Baltimore for the week ending the 24th inst. are given in the following tables. The Philadelphia quotations will have a \* affixed. The Baltimore quotations are indicated thus †.

**STOCKS.**

Table with columns: QUOTATIONS, High, Low, Closing, Sales Shares. Lists various stocks like American Coal Co., Cambria Iron Co., etc.

**BONDS.**

Table with columns: QUOTATIONS, High, Low, Closing, Sales Shares. Lists various bonds like L. & W. 7s, Conv., N. J. C., etc.

Total transactions for the week. \$334,000

**Copper Stocks.**

Reported by Wilson W. Fay & Co., Bankers and Brokers Room 7, Traveler Building, 31 State Street.

BOSTON, THURSDAY EVENING, Aug. 23, 1877.

The market during the week has been more brisk than it has been for some time, and it looks as if we were to have some lively times, notwithstanding the hot weather and long-continued dullness of the past two months. Copper Falls is quiet but strong. The assessment is being paid up finely, so the officers will be able to make a good report at the annual meeting. 3 1/2 is bid for the stock, and some offering at 3 3/4. Allouez is offered at \$4 and no bidders. There has been a demand for some large lots of Pe-

† Helfenstein Tract.

therick, but at such a small figure that few sellers could be found. Quincy has taken a little spurt and advanced to \$33 bid and \$33 1/2 asked. Ridge has been unusually active and very weak, the stock selling at \$2, and closing at \$1 1/2 bid and \$2 asked. Pewabic remains steady at \$1 1/2 bid and \$2 asked.

Calumet & Hecla has had some large transactions, but has not changed much in value, 168 being bid and 169 asked.

At the annual meeting of this company held on the 15th inst., the Treasurer made the following statement of the assets and liabilities of the company, April 30, 1877: Assets—Cash at Boston office, \$136,835 95; cash at mine office, \$19,704 03; United States bonds, \$305,962 62; loans, \$337,000; copper on hand at 17 cents net, \$1,600,447 34; supplies at mine, \$269,943 59; total assets, \$2,669,893 54. Liabilities—Drafts in transitu, \$10,769 04; bills payable at mine, \$130,456 27. Excess of assets over liabilities, \$2,519,668 23. This is an increase of about \$300,000 in the surplus as compared with that reported at the annual meeting a year ago. The product of the mine has not been quite as valuable as it was the preceding year, but the reduction of expenses makes the increase of surplus possible. The July product of this company amounted to 1,206 tons, 945 lb.

Nothing of importance has taken place in the other coppers, their prices remaining about the same, and very few transactions in any of them, and yet there is no apparent reason why some of them should not be good purchases, as they are liable at any time to spring into sudden activity, and as they can go no lower, conveniently, it looks as though they would have to go higher.

Duncan silver has had another rise and fall, the stock selling from 2 1/4 up to 2 3/8, and falling back, 2 1/4 bid and 2 1/2 asked.

International is quiet at 32 1/2 bid, and 35 asked.

**Gold and Silver Stocks.**

NEW YORK, Friday Evening, Aug. 24, 1877.

The business of the week in total differs but little from that of last week. The transactions, however, have been more largely distributed through the list. Moose has been the feature, advancing to 5 1/2 to-day, with sales for the week of 15,585 shares. Bertha & Edith figure up 14,500 shares, at \$1.25 @ \$1.30. The sales of Ontario have aggregated 2,050 shares, at \$21 1/2 @ \$21 3/4. Quicksilver, preferred, has ranged from 30 @ 35, with 4,950 shares, while common has ranged from 18 1/4 @ 20, with sales of 2,800 shares.

**The Market at San Francisco.**—The *Commercial Herald* of the 16th inst. says of the mining share market: "We notice a slight increase in the amount of business transacted in the San Francisco Board as compared with the previous week, but we cannot report that this has had a favorable effect on the market, for all stocks are more or less off, with apparently only a temporary purchasing movement, all hoping and looking for an upward start of some kind in the near future. The prolonged dullness in stocks, with no new developments upon which to base a change of prices for the better, is not enticing to outsiders to invest, and consequently everything is in an apathetic condition. Any new developments, be they ever so small, would have a marked effect on the market."

**The Jenny Glyn Gold Mine** is located in Tuolumne County, California. This company has levied an assessment of 10 cents per share, and recently purchased a 10-stamp mill, concentrators and self-feeders; also 4 mines, with about 150 tons of first-class ore on the dump. The mill is run by water-power.

**The Minnetta Belle Mine** is located in Inyo County, California. The stock of this company has recently been placed upon the San Francisco Board. We note quotations at from \$1.30 to \$1.40 per share. The mine at present furnishes ore to a 10-stamp mill. It is claimed that there is now on the dumps and in the stopes a value of \$200,000 in ore, and it is expected that \$30,000 per month will be produced for some time. The company owns three mines. The bottom of the winze on the Mt. View is 86 feet deep, and the ore assays an average of \$297. Crosscut No. 1 in South Minnetta assays \$255. This crosscut is represented to be 44 feet in ore that, it is said, will mill over \$100 per ton.

**Modoc Consolidated Gold Mining Company of Cal.**—This company has levied an assessment of 50c. per share, delinquent Sep. 4th, amounting to \$50,000.

**Leeds Mining Company of Utah.**—This company has declared a dividend of 20c. per share. There are 60,000 shares in the mine, and the aggregate declared is \$12,000. A good surplus will be carried over, and there is a fair prospect that several more dividends will be paid, as the mine is now turning out at the rate of \$30,000 per month, and over 50 per cent. is clear profit.

**The Northern Belle Mining Company** has declared the usual monthly dividend of \$1 per share. This company is shipping at the rate of \$100,000 per month in bullion. At present there are 240 miners at work in this mine alone. For 26 months \$50,000 per month has been paid in dividends.

Dividends: Black Bear quartz, 40 cents; Rye Patch, 25 cents; Empire (Grass Valley), 25 cents; La Grange Ditch and Hydraulic, 25 cents; Assessments, with dates when delinquent: Julia, \$1, Sept. 17th; Mount Hood, 10 cents, Sept. 10th; Vancouver, 10 cents, Sept. 10th; Monitor Belmont, 50 cents, Sept. 10th.

**Sierra Nevada Mining Company.**—An assessment of 50c. per share has been levied on the stock of this company, aggregating \$50,000.

**The Raymond & Ely Mine.**—The *White Pine News* says of this mine: "There are still further improvements in the quantity and quality of the ore on the 1,200-foot level, as work progresses. The ore stopes on the 1,000-foot level are looking very well and turning out well. In the other portions of the mine there is no change to report."

"Since the new management took control of this mine, last January, they have worked wonders in getting the old Pioche favorite on a sound financial basis. The mine has been constantly improving, and the ore yield is better and richer now than it has been at any time since dividends ceased. Since April 4 the bullion yield has been \$118,525.26, and the mine from June 9 to July 5—24 days—turned out \$61,000. The company now has over \$30,000 on hand, do not owe a dollar in the world, and if the mine continues to look as well as it does now, dividends will soon be in order. This mine, up to the 4th of April, 1877, has yielded bullion aggregating nearly \$10,000,000, when \$7 monthly dividends came as regular as clockwork."

This stock is gradually advancing, the quotation of \$15 1/4 per share on the 23d inst., in San Francisco, showing an advance of nearly \$5 per share within the last two weeks.

**Gas Stocks.**

NEW YORK, FRIDAY EVENING, August 24, 1877.

We have no change to report in gas stocks. The market is featureless and without a sale.

**People's Gas Company, of Baltimore.**—We note recent quotations of this stock at 13 3/4, and of the bonds at 103 per cent.

**Harrisburg (Pa.) Gas Supply.**—Owing to competition between rival gas companies, Harrisburg is enjoying gas at \$1 per 1,000 feet.

**Carthage, Mo.**—We note the statement that this place is to be lighted with gas.

**The Quebec Gas Company** has declared a semi-annual dividend of 4 per cent.

**St. John's (N. B.) Gas Supply.**—It is anticipated that the St. John's Gas Company will be in a position to again supply gas to the city by the 1st of October next.

**Cheap gas for Harrisburg, Pa.**—To meet the rates charged by its new competitor, the Harrisburg Gas Company is now furnishing gas to consumers at the low rate of 90 cents per thousand.

**The Chicago Gas Difficulty.**—At the meeting of the Chicago Common Council on the 20th inst. the following ordinance was passed. "The Comptroller and Mayor be and they are hereby directed to close a contract with the Chicago Gas Light and Coke Company for lighting our street lamps now in use, and our public buildings from May 1, 1877, to May 1, 1878, at \$1 50 per 1,000 cubic feet, and with the People's Gas Light and Coke Company from Oct. 1, 1876, to May 1, 1878, at \$1 80 per 1,000 cubic feet.

SEC. 2. The Comptroller shall report back to this Council on or before Sept. 1 next, whether or not the said gas companies accept said proposition of the Comptroller and Mayor; and the Comptroller is instructed to inform the gas companies that the city of Chicago will not pay any more than the price herein stipulated.

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

Table with columns: Companies in New York and vicinity, Capital Stock, Par., Rate per an., Dividends (Am. of last, Date of last), Quotations (Bid, As'd). Lists various companies like Mutual, N. Y., Gold Bonds, N. York, etc.

‡ Paid irregularly.



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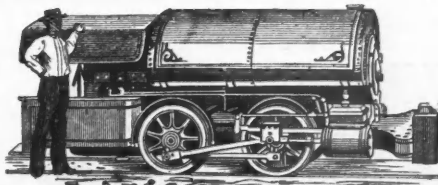
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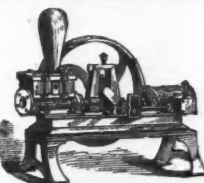
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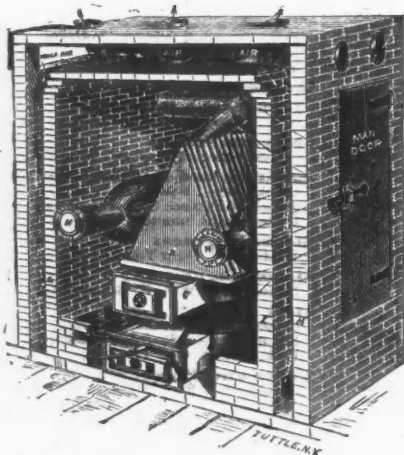
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