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ANNULAR DIAMOND-POINTED ROCK DRILLS.

Diamonds being the hardest of known substances, have been used from the earliest times for cutting other stones like the onyx, sapphire, etc., and more recently they have been found to be an efficient instrument for dressing burr millstones, and for fashioning various devices in stone. The diamonds used are those commonly known as black diamonds, or borts, and being worthless for jewelry, are comparatively cheap, varying in price from six to seven dollars per carat, gold. The first application of diamonds to rock-drilling and the miner's art was made in 1860, by M. RODOLPHE LESCHOT, a civil engineer, resident in Paris, France. He found, by experiment, that a rotating drill, armed with diamond points, could be made to bore holes in rocks to great depths, and with a rapidity hitherto unknown, by forcibly injecting a stream of water into the hole being bored, through the interior of the drill. This rapid stream of water moistens and softens the stone, prevents the diamond points from heating, and effectually washes out and carries away all the borings as fast as they are produced. He also invented a mode of arranging the diamond teeth in an annular bit or boring head in such a manner that a large hole could be produced with the detrition or cutting out of but very little rock, thus economizing both time and power as well as diminishing the cost of his drills. The general introduction of these drills was for some years retarded in this country, and their practical value lessened by serious defects in the mechanical appliances by which they were operated. Messrs. SEVERANCE & HOLT of Middlebury, Vermont, and 14 Wall street, New York, have, however, so far perfected the construction and arrangement of these drills that they are enabled to present a really valuable tool. The accompanying cuts represent the two styles of drill in most common use; Fig. 1 being a perspective view of the testing drill, and Fig. 2 a similar view of the tunnel drill. The testing or prospecting drill is so called because of its extensive use in testing the character and value of mines and quarries, although it is, of course, adapted to a variety of other work, such as shafting, draining, well-boring and surface-blasting. It consists of a small, upright boiler, to one side of which is firmly bolted the cast iron frame which supports the engine, swivel drill-head, gears and screw-shaft, as shown in the engraving, Fig. 1. The engine—an oscillator of from three to five horse-power—is shown at A. B is the screw-shaft with the drill passing through it. This shaft is made of hydraulic pipe from five to seven feet in length, with a coarse thread cut on the outside. This thread, a portion of which is shown in the cut, runs the entire length of the shaft, which also carries a spline by which it is feathered to its upper sleeve-gear. This gear is double and connects by its lower teeth with the beveled driving-gear, and by its upper teeth with the release-gear, E. This release-gear is feathered to the feed shaft, F, at the bottom of which is a frictional gear fitting the lower gear on the screw-shaft, which has one or more teeth less than the frictional gear, whereby a differential feed is produced. This frictional gear is attached to the bottom of the feed-shaft, F, by a friction-nut, thus producing a combined differential and frictional feed which renders the drill perfectly sensitive to the character of the rock through which it is passing, and maintains a uniform pressure upon the same. The severe and sudden strain upon the cutting-points incidental to drilling through soft into hard rock with a positive feed is thus avoided. The drill proper (passing through the screw-shaft), consists of a tubular boring-bar, made of common gas pipe, with a steel bit or boring-head, D, screwed on to one end. This bit is a steel thimble about three inches in length, having three rows of black diamonds in their natural rough state firmly imbedded therein, so that the edges of those in one row project forward from its face, while the edges of those in the other two rows project from the outer and inner peripheries respectively. The diamonds of the first mentioned row cut the path of the drill in its forward progress, while those upon the outer and inner periphery of the tool enlarge the cavity around the same, and admit the free ingress and egress of the water as hereafter described. As the drill passes into the rock that portion of stone encircled by the annular channel is, of course, undisturbed, and passes up into the drill in the form of a solid cylinder. The sides of the hollow bit are one-fourth of an inch thick, and the diamonds of the inner row project about one-eighth of an inch, so that the core or cylinder produced by a two inch drill (the ordinary size for testing), is one and a quarter inches in diameter. Inside the bit, D, is placed a self-adjusting wedge, which allows the core to pass up into the drill without hindrance, but which impinges upon and holds it fast when the action of the drill is reversed—thus breaking it off at the bottom, and bringing it to the surface when the drill is withdrawn. In order to withdraw the drill it is only necessary to throw out the release gear, E, by sliding it up the feed-shaft, F, to which it is feathered, when the drill runs up with the same motion of the engine which carried it down, but with a velocity forty times greater; that is, the speed with which the drill leaves the rock, is to the speed with which it penetrates it as forty to one—the revolving velocity in both cases being the same. The drill-rod may be extended to any desirable length by simply adding fresh pieces of pipe. Common gas pipe is found to serve admirably for this purpose, the successive lengths being quickly coupled together by an inside coupling four inches long, with a hole through the center to admit the water. The drill is held firmly in its place by the chuck at the bottom of the screw-shaft. The small steam pump, C C, is connected by rubber hose with any convenient stream or reservoir of water, and also with the outer end of the drill-pipe by a similar hose having a swivel joint, as seen in the picture. Through this hose a steady stream of water is forced by the pump into the drill from which it escapes between the diamond teeth at the bottom of the bit, D, and passes rapidly out of the hole at the surface of the rock, carrying away all the grit and borings produced by the drill. Where water is scarce or difficult of access, a spout is laid from the mouth of the hole to a tank or reservoir and a strainer attached to the connecting hose, so that the same water may be used over and over again with but little loss. This pump also supplies the boiler. Fig. 2 represents the most approved form of steam tunnel drill. It is light and portable, being easily wheeled about by one man, and will operate equally well whether the tunnel be three or eight feet high. It may also be quickly adapted, at a very small expense, to a tunnel twelve or fifteen feet high, and will bore holes within three inches from the top or bottom, and two inches from the side walls. It is pronounced by miners the only perfect tunnel-drill ever built. The upright frame, E E, which supports the swivel drill-head with its gears and drill, is attached by hinge-plates to the top and bottom of the driving shaft, F, and may be swung to the right or left, describing a semi-circle. This allows us to drill at any angle of the horizontal arc thus described without moving the machine,

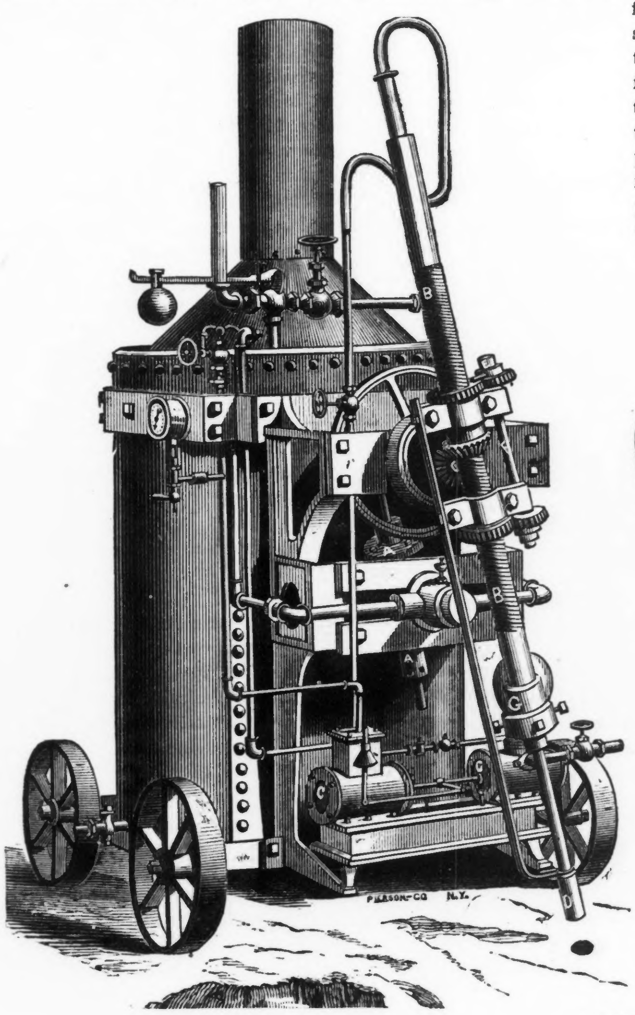

Fig. 1.

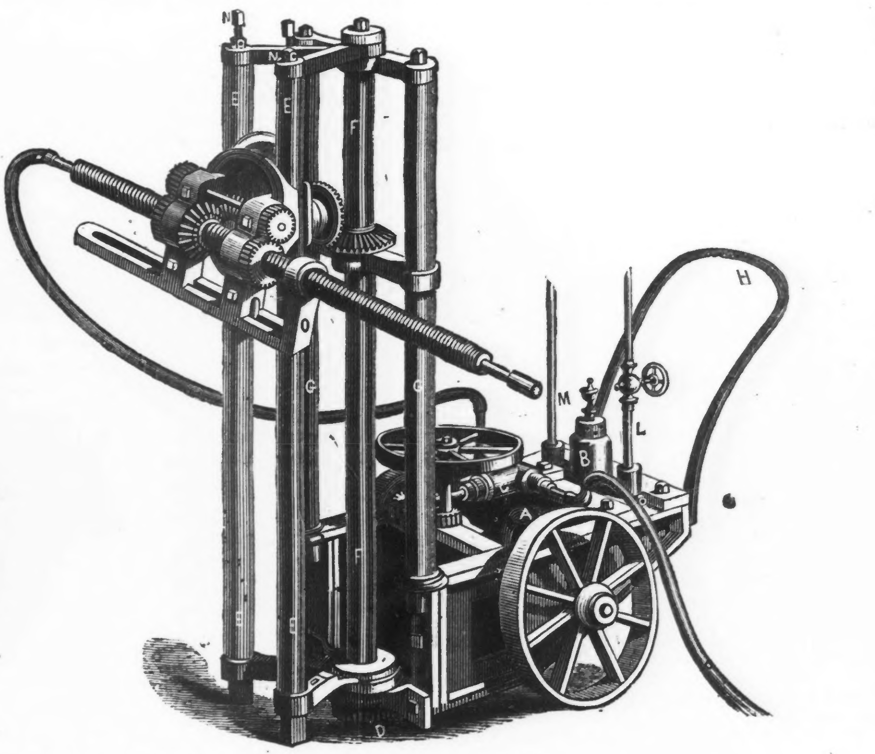

Fig. 2.

LESCHOT'S DIAMOND DRILLS.

and also to place the drill-rod close up to the side wall of the tunnel. The drill-head also slides up and down this adjustable frame E, E, enabling us to bore a perpendicular row of horizontal holes without incurring more than three or four minutes delay in adjusting the drill to each successive hole. Then the drill itself with its feed-gears and sliding guide, O, may be turned completely round by simply loosening a nut on the back of the swivel-head so that the point of the drill shall describe a vertical circle at any angle of which it will bore equally well. The two uprights, G G, are used to support the driving-shaft, F. They are made of common hydraulic pipe, and can be lengthened or shortened at pleasure, according to the height of the tunnel. The driving-shaft, F, has a sliding gear attached by feather and spline, adjustable at any position, as shown in the cut. The sliding brace just beneath the gear is used to steady the driving-shaft. Motion is communicated to this shaft by means of the gear, D. The hollow frame posts, E E, are set firmly against the upper wall by means of extension screws, N N, which may be run up two or three feet if desired. The engine, water-apparatus, feed-gear and bit, are the same as in the prospecting drill, and the mode of operation is essentially the same. When it is desired to produce holes less than one or one and a quarter inches diameter, we usually set the diamonds so as to cut out all the rock, but otherwise the annular bit is preferable. The steam or compressd air is brought through rubber hose from any convenient distance and introduced into the engine by pipe, L. M is the exhaust pipe. The drill being used to bore short holes may be run much faster than the other; 600 revolutions per minute being a fair rate of speed. The feed may be varied at pleasure, and according to the hardness of the rock from sixty to two hundred and forty revolutions per inch; that is from two to ten inches per minute. The same advantages are secured by friction feed in this drill as in the larger one. Only one man is required to operate it under ordinary circumstances. The whole thing is balanced on its axle by depressing the handles, H, and trundled about like a wheelbarrow.

The speed of boring depends, of course, upon the hardness of the rock. The maximum speed at which it is found both safe and practicable to run a two inch testing drill in rock of moderate hardness, is eight inches per minute. Greater speed than this is practicable but not economical, in view of the increased wear of machinery.

Holes two and a half inches in diameter have been bored by this drill in North River blue stone and Vermont marble, at the uniform rate of thirteen and one quarter inches per minute.

Three sets of feed-gears accompany each machine, the coarsest of which feeds the drill one-sixteenth of an inch at each revolution, and the finest, one two hundred and fortieth of an inch. From four hundred to five hundred revolutions per minute is a fair rate of speed.

The gears are not changed except with decided changes in the character of the rock—the frictional feed, before mentioned, allowing the drill to strike the hardest rock, when boring at high speed, without injury. The finest feed is used only for boring flint or rocks of greatest hardness. The same machine will carry a drill of from one to five inches in diameter, as desired.

The depth to which holes may be bored is limited only by the strength of the drill-pipe and the power of the engine. With light, steel pipe, and a five-horse power engine, a three-inch hole one thousand feet deep may be bored with ease. For holes not over four hundred feet deep the ordinary gas-pipe, and four-horse engine is found sufficient even in the hardest rock.

The peculiar shape of the boring-bit prevents the drill from running out of line; hence the hole bored, however deep it may be, is perfetly straight, and there is no friction of the drill against the rock.

By means of the swivel drill-head, the drill may be pointed in any direction by simply loosening a nut, and it bores equally well at all angles.

The diamond teeth are the only part of the tool which comes in contact wtth the rock, and their hardness is such that more than a thousand feet have been drilled by the same points with but little appreciable wear. The cost of resetting the diamonds so as to present new points is very slight, and no special skill is required for the operation.

The whole machine is so simple, both in construction and operation, that any intelligent mechanic can easily learn to operate it and make all necessary repairs.

By means of this drill, mines and quarries may be thoroughly explored to any depth, and a continuous core exhibited, showing plainly the character and value of the ore and other deposits.

But it is in the opening and working of mines, the sinking of shafts, and the driving of tunnels that the great value of this drill as a labor-saving machine is most apparent.

Its adaptation also to submarine drilling, and its great value in clearing channels and harbors cannot be overlooked. Special machinery has been devised whereby submerged rocks 20 to 30 feet under water may be drilled and blasted without difficulty.

The Rivot Process.

Since some time in the fall of 1864, experiments have been going on for the perfection of the Rivot process, for the reduction of rebellious ore. The Pioneer Mill Co., at Markleeville Cal., expended several thousand dollars for the erection of one of the Rivot furnaces, which promised such great things for the Pacific coast. So far as their experience went, the whole thing was a failure. This furnace was erected under the immediate supervision of an expert, who was a graduate of the School of Mines of Paris, and from drawings said to have been furnished by Mr. Rivot. This was nothing more than an ordinary reverberatory furnace, such as used in the Freiberg process, with the addition of a condensing chamber at the bottom of the chimney, about ten feet square, with which the flue of the furnance connected. Super-heated steam was introduced into the furnace by means of a perforated pipe, for the purpose of assisting in the oxidation of the base metals in the ore. Since that time parties in interest of that process have been steadily at work in Nevada City for its perfection, and it is now announced that Mr. Rivot will visit this country next Fall, to personally superintend the operations connected therewith. It appears that there has been a very material modification of the furnace since the first attempt at its introduction in 1864. It is now denominated, a revolving roasting furnace for pyrites, being a huge iron cylinder, measuring fourteen feet six inches in length and six feet in diameter, and weighing 21,600 pounds. This cylinder was cast on end, on New Year's day, at the Union Foundry. This cylinder is heated from the outside, and the steam conducted into it at one end and through the centre by means of a perforated copper pipe, in such a manner as to become mixed with the glowing ore, and decomposed and burned during the process. Surely, if perseverance is deserving of reward, Prof. Rivot and associates ought to meet with success.—*San Francisco Herald.*

Practical Letters.

[WRITTEN FOR THE JOURNAL OF MINING.]

VENTILATION.

REPLY OF MR. HARDEN TO MR. ROTHWELL.

(CONTINUED.)

Passing by numerous criticisms, the unfairne s of which will be evident to any careful reader of my former letters, but which the Editor of the JOURNAL OF MINING (very properly, no doubt) objects to my exposing, by the only means in my power, namely, by quoting or repeating what I have so fully set forth in these columns already, I will notice some more important points.

Mr. ROTHWELL "does not wish to defend the accuracy of Mr. WOOD'S results," though he says "his experiments are nevertheless the most valuable on the English furnaces and jets." To defend that gentleman's results would have been to agree with me, and that he could not do. Yet, not to have shown *some* approval, would have been impugning all he had said in former letters of that "eminent mining engineer" and his experiments. In fact, some of Mr. WOOD'S results are trustworthy and others are not.

In June, 1852, Professor HANN showed to a British Parliamentary committee that Mr. WOOD, in his evidence before them in 1849, had, in calculating results from an erroneous formula, underrated the drag on the mine, thereby vitiating any evidence based on those calculations. But the experiments so frequently alluded to in my letters, being made *six months after this correction*, do not involve that error, and, indeed, were carefully guarded against all mistake. Mr. ROTHWELL talks of my comparison of the machines of France and Belgium, "or rather, he should say, those the late Mr. MACKWORTH has given." Yet, when it suits his impulse he turns again and says: "These specimens of Mr. HARDEN'S figuring, as applied to fans and furnaces, render it unnecessary for me to occupy further space in reviewing his examples." In point of fact, when the figures given by me are not the experimenter's own, they are accurate deductions from the data given by the experimenter. Mr. R. deals heroically with the figures of others, but why has he not supported his animadversions with examples of his own? He does not give us the ghost of a liue of his own experience on any one point in the controversy, but prefers talking about "characteristic modesty."

Mr. COMBES, another French engineer, does not quite agree with BURAT, since he puts the proportion of fuel consumed to temperature raised and air circulated considerably lower, as will be seen in the following comparison:

Temperature of ascending air,		Volume.	Fuel consumed.	Burat gives
	86 deg. Fahr.	43.	43.	48
"	104 "	" 51.	" 102.	" 153
"	122 "	" 58.	" 174.	" 232
"	140 "	" 64.	" 256.	" 320
"	212 "	" 79.	" 632.	" 711

The last column is BURAT'S proportion of fuel consumed, placed side by side with COMBES', for ready comparison.

That there is an economical limit to the working of the furnace, and an absolute limit under given conditions to its power, none of the readers of my first letters will have failed to understand; the fact has been known since the furnace was first used. So lately as 1852, without experimental test, it was said and believed by some that 1,000 cubic feet of air per minute per foot area of shaft was the utmost the furnace could reach under any circumstances; but Mr. WOOD'S experiments in 1853 dissipated that idea. The Tyne Main shaft (see JOURNAL OF MINING, Vol. VI, page 82,) passed per one foot area per minute 2,976 feet of air, rarefied to that bulk from 2,308 feet by a temperature of 262°, Fahr., and at a cost of one pound of coal for each 6,080 feet unrarefied.

To prove that to attain an absolute limit to the power of the furnace, the temperature has only to be increased to from 420° to 600°, Fahr. (as if that were an easy thing to do in the *ordinary* working of the furnace in all cases) Mr. ROTHWELL alludes to a "rough experiment" made at the Doulais iron works, and reported on at a late meeting of the South Wales Institute of Engineers. By it, it was found that at 600° the largest volume of air was obtained, that at 700° it became less; "the enormous expansion of air producing a drag sufficient to overcome the power of the upward current." This only confirms what I have said on the subject in former letters. "Nothing is easier than by *narrowing the air returns* to produce a high temperature of the upcast column, but this is accompanied by such an amount of friction as to produce no useful result in the mine." In the Doulais experiment, the air was *so restricted;* being made to pass through bores of an area small enough to reduce the air to a given quantity, and increase the friction. Here, then, we have a limit under the particular conditions—a limit to the power of the shaft. A larger shaft, under the same resistance, would not have reached the limit of its power at 600°. Taking the "general average of furnace pits" at 170 degrees, as assumed by Mr. BATES, in another "experiment" alluded to by Mr. ROTHWELL, and to which we shall presently refer, there is a very wide margin of temperature.

Comparing the value of the work done by the fan and the furnace at the Gethin Pit, Mr. BATES said that, with 100,800 feet at the fan, they got 95,888 feet of air in the returns, by the consumption of 50 tons of coal a week; that the same quantity of coal gave them from 90,000 to 100,000 feet of air circulated by the furnace; that the consumption of fuel in both cases was the same, only that in the case of the fan 6-7 of the coal was small; the difference in economy being between the relative values of large and small coal. Here, then, the difference in favor of the fan is not so great as we were led to expect—especially considering the value of general statements in the absence of accurate experiment, not to speak of the wide interpretation to be given to the expression "small coal" close to the pit's mouth, and used for driving one's own engine.

We are told that "experiments, made by Mr. BATES on a shaft in South Wales, showed that the depth of the upcast would have to be about 800 feet, in order to realize the effective work of a STRUVE'S ventilator utilizing only 38 per cent. of the power applied."

Turning to a report of these same experiments, we find that the shaft was 480 feet deep; that 43,856 cubic feet of air per minute was circulated by the ventilator, with a resistance of 2.31 inches of water pressure. On temporarily using the furnace, 34,088 cubic feet of air per minute was obtained, with a water pressure of 1.41 inches. The quantity of coals used in neither case is given, and it was regretted that the temperature of the upcast and downcast *was not known;* but the time of the year being given, temperatures were assumed, namely, 50°, Fahr., for the down (August, the hottest month of the year) and 170° for the up. By "the use of one of the usual formulas," the weight of the columns in each shaft was obtained, when the difference was found to be 7.34 pounds per square foot over the shaft area, equalling 1.41 inches water pressure; with which supposititious figures and an operation in the rule of three, it was found that, as it took a shaft of 480 feet depth to produce a water pressure of 1.41 inches with the furnace under the conditions given, so it would take a shaft of 785 feet depth to produce a water pressure of 2.31 inches—that produced by the ventilator. And by the same rule, if it took a temperature of 170° to obtain a pressure of 1.41 inches, it would take 278° of temperature to produce 2.31 inches with the same shaft. And this is the "experiment" we are asked to receive as conclusive; that to produce the same results as a STRUVE'S ventilator, utilizing only 38 per cent. of the power applied, it would take a shaft of about 800 feet deep to utilize the same by the furnace. The same report (January, 1868) tells us that Mr. ELLIOTT, our friend's "rational mining engineer," at the same meeting said: "He had been working STRUVE'S ventilator at one of his collieries for ten years. It had been of great service, because, although in its effects *not equivalent to the furnace*, it was a substitute for it when the application of the latter would have been attended with difficulty and danger."

Mr. R.'s theory that "while with most mechanical ventilators the useful effect diminishes as the air becomes more rarefied, *an absolute limit has not been obtained,*" is practically denied in the very report from which he quotes the "rough" Doulais experiment, the observations of Mr. WILLIAMS leading to the conclusion (expressed at the meeting at which the subject was discussed) that "though mechanical ventilation *might* be capable of doing so, yet hitherto it had not given a greater amount of cubic feet of air per minute than the furnace."

With reference to the GUIBAL fan at the Homer Hill Colliery, we are told that 50,000 cubic feet of air was moved in 20 seconds. Nobody knowing the extraordinary size of the roads in the thick coal of South Staffordshire will be surprised at a rapid movement of the air. Just so fast as the fan can receive and deliver the air, just so fast can it obtain it; and that with no more resistance than is occasioned in the passage of the air through the 35 1-2 square feet area of connecting tunnel. In the accounts given of it, we read that with 65 revolutions a minute the fan produced 37,500 cubic feet of air, with a water pressure of 1.05 inches; and with 96 revolutions it discharged 51,700 feet per minute, with a water pressure of 1.75 inches. Reducing these data to a working account, we find that 65 revolutions produced 6,029 cubic feet, and 96 revolutions 3,628 feet of air per minute per horse power utilized, proving incontestably that the same principles apply to the fan in ventilation as to the furnace; in other words, that there is an economical limit in the working of the fan, and an "absolute limit" under given conditions to its power. Or, making use of the words of M. GLEPIN's theory, cited by our friend as applied to the furnace, "the ratio of useful effect to heat expended in a shaft decreases as the temperature increases." So, as to the fan, the ratio of useful effect to power expended decreases as the revolutions of the fan are made to increase.

[TO BE CONCLUDED.]

Mining Summary.

GOLD AND SILVER.

Gleanings from Mr. Raymond's Report.

Nevada.

White Pine—White Pine district was organized in 1865, but did not become the scene of successful operations until the fall and winter of 1867, when the rich mines of Treasure Hill were located. Previous to that time a company, called the Monte Cristo, was engaged, with no very flattering prospects, in the development of certain mineral veins on White Pine mountain, from which the district derives its name. It is said that an Indian, seeing the ore piled in the Monte Cristo mill, offered to make known a place where there was plenty of such material, and guided a party to Treasure Hill, sixteen miles distant, where the Hidden Treasure mine was located September 14, 1867.

The White Pine mountain, so called from the species of timber with which it is abundantly covered, is about 120 miles south of east from Austin, and 60 miles southwest from Egan canyon, a station on the overland road. It is said to be situated in latitude 39 deg. 10 min. north, and longitude 38 deg. 30 min. west. The mountain is ten or twelve miles long, and rises boldly some 2,000 feet above the level valleys, having a total altitude of perhaps 10,000 feet above the sea. On the western slope are the veins first discovered, some of which were worked by the Monte Christo Company above mentioned. They are said to have been tolerably rich, but small. Parallel with White Pine mountain, on the east, is a ridge some 1,500 feet lower, and five or six miles long, in which mineral veins occur carrying ores of silver considerably contaminated with baser metals. This is called the Base Range. Still farther east is the mountain known as Treasure Hill. It is comparatively bare of timber, about 9,000 feet above the sea, and separated by deep canyons on every side from surrounding ranges. All these mountains have a generally north and south course.

The geological formation of the district is extremely simple, resembling that of the so-called limestone districts of Nevada. An upheaval of limestone strata by porphyry, and a subsequent metamorphosis of structure by solfataric and thermal-aqueous action, is evidently indicated. My brief examination did not extend to the minute local details of the formation, but I believe this neighborhood, when thoroughly studied, will throw much light on the geology of other districts, where the effects of these agencies are more obscure and the exposures of rock less extensive and distinct.

The limestone strata of Treasure Hill have been tilted from the east, and have a general course north and south, and a dip of about 20 deg. west. The uppermost layers now remaining from the extensive denudation which has degraded all the mountains of Nevada from a rugged summit of limited area, which has been (strangely enough) described as "trap," but consists of highly fossiliferous limestone, containing mainly crinoids. Below this is a thin stratum of calcareous shales, colored yellow and red with iron, and beneath these again is the limestone stratum in which the rich deposits of silver ore occur. This limestone is highly siliceous, and contains little or no traces of fossils so far as I can learn at present. The eastern side of Treasure Hill is precipitous, and exposes the outcrops of successive strata; and here it may be seen that fossiliferous limestone appears again beneath the metalliferous layers. It is believed by many that a second stratum of ore-bearing rock will be found beneath the lower fossiliferous limestone, but this has not been proved. Across the canyon to the eastward the precipitous face of a parallel range shows the continuations of the limestone strata; but the range is of inferior height, and the upper metalliferous layer is consequently wanting, having probably been carried away by denudation. This range dips eastward, and the canyon between it and Treasure Hill probably occupies an anticlinal axis.

"The formation of the White Pine district," says an otherwise intelligent correspondent, "is an anomaly, and sets at defiance all known laws and rules of geology." This is the common expression of miners and tourists, readily adopted by speculators, who have learned by experience that "anomalies" sell best in the market. The truth is, there is nothing unusual in the formation of the district, except the enormous value of its ores. These occur in irregular masses and impregnations throughout a certain stratum of the limestone, and, fortunately for the miners, this stratum is the very one which the processes of disintegration and denudation have left uppermost. The ore consists of chloride of silver, with some enargite and stetefeldtite and (in rare instances) native silver in capillary form. Of the extent of the deposits nothing can be said at present. They are probably bounded above and below by the planes of stratification, but laterally they seem scarcely to be separated from one another—what has been considered barren rock between them being mainly low-grade ore, which will hereafter be extracted like the rest. The accompanying minerals are quartz and calc-spar. The copper-stains upon most of the ore show that this metal was a constituent of the original deposits; and I conclude that the remarkable purity of the chloride ore of the Treasure Hill mines is the result of chemical changes subsequent to their original formation, in the course of which soluble chlorides, sulphates, and bicarbonates have been removed. It is possible, therefore, that the ore deposits of Treasure Hill have a common origin with those of the Base Range, and that the present differences are due to the concentrating and purifying action of thermal waters carrying chemical reagents in solution. There is no radical distinction in nature between the filling of a fissure and that of a cavity in limestone. The metalliferous fluids, whether solfataric gases, aqueous solutions, or molten masses, find their way wherever an opening is offered, and leave their deposits wherever they are checked for a sufficient time to cool or evaporate, or wherever they meet with chemical agencies which produce in them insoluble precipitates. Experience has shown that upheavals of stratified limestone do not generally produce fissures so extensive and well-defined as occur in some other kinds of rock. The solubility of the limestone itself in carbonated waters, especially under high heat and pressure, tends both to fill up the fissure with calc-spar and to open outlets from it into irregular cavities, and, finally, to cause a general alteration (silicification, often) of the country rock, and its impregnation with the metallic contents of mineral waters. Hence the miner's maxim, that lime is a "good gangue, but a poor county."

The ore deposits of Treasure Hill are richer than any that have been discovered during the present century; but, according to all the data that have yet been collected, they are not fissure veins. These data, though they all point one way, are necessarily incomplete, since no shaft on the hill is deeper than 60 feet, and no horizontal drift longer than 100 feet.

Not long before my visit, the miners of the district held a meeting, at which they were strongly urged to adopt at once the system of "square locations," and abandon the farce of staking out claims on ledges which do not exist. This proposition was defeated; and every man on Treasure Hill now claims so many feet of a vein, running, he does not specify in what direction, and dipping, he cannot tell at what angle, from a hole which he has made at random in the neighborhood of some already exposed body of ore. If he gets down to the ore, all the better; he can then work night and day, extract a large quantity of rich chloride, and send it away, before the neighbor, who has a prior location, can prove the identity of the deposit. In the utter absence of any real distinctive features of lodes, the principle has been set up by the White Piners, that proof of such identity must consist in absolute continuity of chloride of silver from the working of the prior locator to those of the alleged trespasser. In one case, that of the Eberhardt and Blue Bell, this astonding demand was satisfied. A drift from the Eberhardt opening 30 feet to the Blue Bell shaft, passed through a mass of horn-silver, such as human eyes have rarely looked upon; and, as a consequence, the Blue Bell was united to the Eberhardt. The Keystone is, without the shadow of a doubt, on the same deposit as the Eberhardt. There is only a wall of two feet between them; but this wall is amicably let alone, and the "two veins" are therefore held by miner's law to be distinct! In another case which came to our knowledge, a claimant was endeavoring to protect himself from robbery, by tracing the ore into the works of a new-comer, close by, and had successfully arrived within a yard of his object, when the occurrence of a piece of calc-spar across his path defeated him. The intruder, protected by that bulwark, laughed his claims to scorn, and continued to extract and carry away the ore, which was, under miners' law, in a distinct vein, separated from the other by a "wall." All the "walls" thus far discovered on Treasure Hill are of this wholly indefinite and untrustworthy character—mere seams of calc-spar in limestone; and, under the present regulations, there is no such thing as security of title. Even if one had a regular fissure vein, he might be cheated out of all but a few feet of it by some accidental shoot of calc-spar across it; and when we consider that calc and limestone are chemically the same, and that a little trickling of water might deposit one of these so-called walls anywhere, we shall see what protection is offered to capital by such a rule as has been adopted in White Pine.

This is an instance of the danger of allowing the first miners in any district to make, without limitation, such laws as they please, governing the rights of property. This splendid district is now subjected to two styles of operations—grabbing on the spot, and gambling away from it. A great many worthy, honest, and industrious men are at work there; but they will acknowledge that they are merely putting off the evil day of litigation and chaos. Others are interested in claims, which they want to sell to capitalists; and they may sincerely believe their claims to be valid and well-defined. No one is accused of intentional deception in the matter; it is only to be lamented that the inhabitants did not, by adopting at once a rational basis for mining titles, introduce order among conflicting claims. To their credit be it spoken, there has been thus far little quarrelling among them. White Pine has been notably a quiet, industrious, and good-natured mining camp. But that is because there was room for all, and profitable work for all. Unless some radical change, of which I have no knowledge, has taken place since my visit in September, White Pine is a good place for men who live there, and can watch and defend their own interests, and for custom-mills, which will doubtless do a good business for months to come, in reducing the marvellously rich ores of the different deposits; but I must again repeat that I cannot find in the circumstances of the case any protection for permanent investment of capital. Some of the mines, as for instance the Hidden Treasure and the Virginia, standing a little apart from the great crowd, already extensively worked, and having moreover a semblance at least of definiteness in their deposits, are better off than others; but they all suffer under the absurd regulations of the miners.

It is the natural tendency, when men with nothing but their own industry to depend upon gather in in a new district, that that should make such laws as will favor industry, and that only. When I was in White Pine, many a man with pick and shovel, and now and then a little gunpowder, was making good wages out of his small prospecting shaft. The retail mining business suited him well enough; but capital must work on a larger scale. Insecurity of title is no trouble to one who, if he is ejected to-day, can pack up his tools, move away a rod or two, and have a new mine in full blast to-morrow; but capital requires a certain basis for the investment of its thousands in permanent works. The only cure for this evil now possible, is that which the inhabitants may themselves supply, by uniting conflicting claims, and arranging amicably their boundaries. Perhaps it is not too late to establish square locations by general agreement, and to adjust the claims for damages that may arise from such a change by means of a commission elected by the citizens.

I adopt, with such alterations and additions as my notes of personal observation suggest, the following account of different mines, &c., from the letter of a San Francisco Alta California correspondent, who visted the distrfct in November, two months after I left it:

The mines from which nine-tenths of the treasure now being produced in the White Pine district is being taken are located along the broken edge of the dolomite formation, in a line running southwards from the town of Hamilton up to the summit of Treasure Hill, and thence in the same direction over the declivity on the other side. The length of this lode or line of deposits is, so far as is known, between two and three miles—say about that of the Comstock; the Virginia at the northern end answering, for the purpose of illustration, for the Ophir and Gould and Curry, and the Aurora, Keystone, and Eberhardt, near the south, for the Crown Point, Kentuck, and Yellow Jacket. The principal claims thus far opened along this line of deposits are located in succession, as follows, commencing at the northern end: Virginia, Mammoth, Ellersly, north of the crest of Treasure Hill; Hidden Treasure, North Aurora, South Aurora, Keystone, and Eberhardt. There are numerous other localities along this line, or nearly parallel with it on the west, but these are the principal claims opened. There is an apparent break in the line of deposits, as evinced by the croppings at the crest of the hill, south of the Hidden Treasure and north of the Aurora; but from that point south the deposits crop out so near together that they may practically be said to be continuous.

Virginia.—Located at the northern end of the Treasure Hill belt, or line of deposits, half a mile south of Hamilton, and 500 feet higher. This claim is situated on the eastern side of a ravine near the top of a ridge, running north and south. It includes 600 feet north and south, and 200 feet in width from east to west. It has been but partially opened, but the ore crops out nearly its whole length, at points from 40 to 60 feet apart, east and west, and at a depth of 20 feet, solid rock, with a large, well-defined pay streak of *bonanza*, has been exposed. On the top of the ridge, above the Virginia shaft, a claim was located, and called the Aladdin's Lamp. This claim ran directly across the Virginia, and though the prior claim exhibited no evidence of a ledge, excavations on the Aladdin's Lamp ground soon disclosed rich ore in detached masses, and the whole hill appears to be full of it. The Verginia ore, though not so exceeding rich as that of the Eberhardt and Keystone, which is so near pure silver as to be hardly describable as ore, runs from $100 to $2,000 per ton, the average being probably not under $225. Sixteen tons recently crushed and worked yielded $226 net per ton.

Hidden Treasure.—This mine was discovered by an Indian, who guided white men to it, September 14, 1867. There was considerable secrecy maintained for a time, but the facts which were attempted to be suppressed soon leaked out, and the result led to the discovery of the great Keystone and Eberhardt deposits, lower down the hill, on the south, and the sudden development of the whole district. The present owners are T. J. Murphy and J. E. Marchand. It concludes 600 feet. The line of deposits has been stripped for nearly the entire length of the claim, and in places to a depth of 20 feet. The lode, if such it may be called, pitches westward at an angle of 20 degrees, and its thickness has not yet been clearly determined. Three hundred tons of ore—no rich specimens included—hauled to the Monte Cristo mill, on the west side of White Pine mountain, 16 miles by the road via Hamilton, yielded $160 per ton. The cost of reducing it was $65 per ton. Next year it will not cost over $20 per ton to reduce the same ore. The owners now have 100 tons of ore of superior quality out ready for crushing, and the lode is increasing in richness. The mine is entirely uncovered, and no work will be done on it after the heavy snows fall, until next spring. Picked specimens show horned silver in abundance, worth $1,000 per ton and upwards.

Aurora.—This mine is located on the south of the crest of Treasure Hill—the Hidden Treasure being on the north—and just east of the town of Treasure Hill. This is properly the South Aurora, the North Aurora being above it, near the summit of the hill, and being but little developed. Work was commenced on it with two men, September 22, 1868; 30 men are now worked. One hundred and fifty tons of rock from this mine, worked at the Newark mill, in the Diamond range, 90 miles to the northwest of Hamilton, yielded an average of $185 per ton—the highest being $202 and the lowest $155. The cost of hauling was $20 per ton, and of working $35. There is more quartz here than lower down the hill on either side, and the indications of a regularly defined deposit are better than elsewhere. The shaft is 20 feet deep, and the drift westward 60 feet. The entrance to the mine is roofed over, and work can be carried on all winter.

Keystone.—Descending the hill southward past a number of small claims, we come upon the Keystone, which is situated some distance below the edge of the dolomite croppings, on the eastern face of the hill. Here the chloride deposit crops out in almost incredible richness, and the developments are astonishing. The claim covers 800 feet, and the deposit was discovered by a party following "float" ore up the hill from the ravine below. At the point where the shaft now is, one of the party, a mere lad, named John Turner, struck a pick into what seemed to be a mass of dried putty. This proved to be pure chloride of silver, worth $15,000 to $25,000 per ton, and under it was found more of the same sort, and masses of almost pure metallic silver. The original location was mixed up with that of the Eberhardt, but a compromise had been effected; a neutral line, beyond which neither is to pass, has been agreed on, and on the 1st of August next the two claims are to be consolidated. At present each company works its own ground. The amount already taken out of the Keystone is not stated by the owners, but it is very large, and all came out of an opening in the hill not more than 50 feet long horizontally, and 20 feet deep. A shaft has been sunk 60 feet through successive layers of dolomite, at the entrance of this open cut, and ore is said to have been found at the bottom. Much of the wealth of this mine consists of dull yellowish brown colored dust, which is run through screens to free it from rock, and placed in bags. This is clear chloride of silver. One piece of this chloride, shown me while at the mine, weighed 143 pounds, and was worth, as it lay on the ground, over $1,500 in coin. In one pile were 100 tons of ore, which will work $300 per ton: in another, 150 tons, which will yield $300 to $500 per ton; in another, $600 tons, which will yield $100 and upwards; in another, a large pile of chloride dust, in bags, worth—one hesitates to say how much. Two lots of the ore from this mine, worked at the Newark Mill and the Manhattan mill, at Austin, yielded an average of $1,000 per ton, or $100,000 in the aggregate.

Eberhardt.—Next south, and adjoining the Keystone, is the most celebrated of all—the Eberhardt. So rich is this mine, that its name has become almost synonomous with that of the cave entered by Aladdin. The location was made in December, 1867, and covers 800 feet north and south.* At a depth of 20 or 30 feet from the surface drifts have been run in several directions through solid masses of chlorides, and other ores of silver for 20 to 50 feet, and the end is not yet reached. The entrance of the tunnel has been closed, and admission to the mine can now only be gained by descending the vertical shaft in the company's building. Descending the shaft on a rope, we found ourselves among men engaged in breaking down silver by the ton. The light of our candles disclosed great black sparkling masses of silver ore on every side. The walls were silver, the roof over our heads silver, the very dust which filled our lungs and covered our boots and clothing was a gray coating of fine silver.

From a chimney in the Eberhardt ground, $85,000 worth of silver was taken in a few days, and the party taking it out then compromised with the company, being allowed to hold all he had taken out and release to the Eberhardt company the ground in dispute. The silver is now piled up in a cabin at Treasure Hill. The proprietors have $50,000 worth of similar specimens piled up in another place. One of the owners of the Eberhardt, but recently a poor man, values his interest at $1,000,000, and we presume the others would refuse to sell for less money.

Down the long canyon a road leads to Silver Springs, where the Oasis mill, now owned and run by the Eberhardt company, is situated. This is the old Keystone mill, which was burned at Austin last summer. Mr. Page, after settling with the underwriters, took the machinery to this place and rebuilt it. It has ten stamps, eight Varney pans, and three settlers. No roasting, chlorination, or other expensive process is employed; the wet process of crushing and direct amalgamation, known as the Washoe process, being found for the present sufficiently remunerative. Mr. Page erected the mill on a contract to work the Eberhardt and other ores; but the company soon found it for their advantage to purchase the establishment. The mill cost $30,000, and the mill and contract were sold to the company for $75,000.

Chloride Flat is a slope comprising from five to ten acres on the western side of the hill, adjoining the town of Treasure Hill.

* Or, according to White Pine law, in any other direction which the locators may subsequently choose. The present assumed course is nearly east and west, I believe.—R. W. R.

It is perforated like a sieve with shafts, sunk often within from 10 to 30 feet of each other. The holders claim 700, 600, or 1,000 feet each, and the claims, being located on the old ledge theory, run into each other, cross and interlace in every direction. At present the lucky holders of claims in which metal has been struck are too busy getting out rich horn silver and other forms of the metal to quarrel with each other, but as soon as they work out the horizontal deposits, and run into each others' claims, as they soon will, shooting and lawsuits will be the order of the day in what is now a peaceful and highly prosperous community. The great mistake of organizing the district on the perpendicular ledge theory—each claimant being allowed 200 feet on the ledge, "with all his dips, spurs and angles," and the discoverer 200 feet in addition—was made at the outset, and it is now too late to remedy it. Had the location been made by the square yard it would have been all right, and many a lawsuit and shooting affray saved. Already difficulties are arising in the vicinity of the Eberhardt, and more must follow. From 10 to 30 feet through the limestone brings the prospector on Chloride Flat to his deposit of silver, or to the certainty that he has missed it and must seek elsewhere. The owners of the Robert Emmet mine, on Chloride Flat, who are taking out rich horn silver, reject as base rock, unworthy of being worked, all yielding less than $50 per ton. This deposit is at least seven feet thick, and not yet worked through. The Genesee, Stonewall, Delmonico and other mines in the vicinity, are among the richest on the Flat. There are 1,500 locations recorded in this district, and of this number 500 at least are within rifle shot of the above named mines.

There are three towns in the district, Hamilton, north of Treasure Hill; Silver Springs or Shermantown, south of the hill, and Treasure City in the midst of the mines upon the hill itself. Chloride City is a part, I believe, of Treasure City.

Hamilton, the town which has grown up in the canyon at the entrance of the hills on the north, contains perhaps 600 inhabitants. From thence a graded road winds up the hill to Treasure City, which stands below the crest of Treasure Hill, within the line of rich mines named on the east and Chloride Flat on the west. Here the principal mining population is congregated, the inhabitants (regular and transitory) numbering from 800 to 1,000. The distance from Hamilton to Treasure City is not over one and one-half miles in a direct line, though two and one-half by the toll road, and the difference in altitude is estimated at from 1,000 to 1,200 feet. The town of Silver Springs, sometimes called Shermantown, is located at the southern end of the Base Metal Range, two miles southwest of Treasure Hill, the road winding down a deep canyon to reach it. It is probably 1,500 feet lower than the town of Treasure City, or 7,500 feet above the level of the sea, and containing 400 or 500 people.

Hamilton has a supply of water, and is the stage and express depot, and the primary depot for supplies for the district. Treasure Hill is exposed to the full sweep of the winds on the summit of the mountain, and has no water save what is hauled up there from Hamilton or Silver Springs and sold at eight cents per gallon, but it is the heart of the mineral deposits, and must be an important place despite its unpleasant situation.

Silver Springs is sheltered from the winds, and is the more desirable—rather endurable—place of residence. Hamilton was first called Cave City, from a number of caves below the town in which the people first found shelter. It consists of board and cloth shanties, tents, and brush, rock and earth cabins. Treasure Hill ditto. Silver Spring has two or three good brick buildings, and is generally better built than either of the others. There is a saw mill, quartz mill, brick yard (not now in operation), and large slaughter-house, at Hamilton; two banks and several assay offices at Treasure Hill; and a quartz mill, smelting furnaces, assay office, and saw mill at Silver Springs. The entire population of the district may be put down at 2,500 or 3,000 at this time, and increasing at the rate of 50 per day. A very few women have found their way into the district, but as yet there can hardly be said to be anything like female society there. The wages paid in the mines are $5 per day, coin, and those not at work for themselves get employment easily at something, if so disposed. Lots which sold at $25 in Hamilton and Treasure Hill two or three months since are now in many cases worth $600 to $1,200, and "jumping" is as lively as in San Francisco, though attended as yet by no bloodshed. Nearly every building spot along the road, from Hamilton up to and through Treasure Hill and down to Silver Springs, is already claimed by somebody, and holders always ask an advance on yesterday's prices.

The climate—Necessary outfit.—The peculiarities of the climate of White Pine are not so well known as they will be when the district shall have been inhabited for a few years, instead of less than a year. Treasure Hill is from 8,000 to 9,000 feet above the level of the sea, and exposed to the full sweep of the winter winds, which are fearfully severe at times between the Rocky Mountains and Sierra Nevada. Spring is late, cold and wet; summer short, dry and tolerably pleasant; autumn long and pleasant, with fine days and cold, frosty, freezing nights. It is reported that snow falls to a depth of 15 feet on the White Pine Range in winter, but this story is not well authenticated, and the vegetation and general appearance of the country would lead to the belief that the annual fall is not extremely large. Up to the 20th instant there were but a few inches of snow on the highest peak of the White Pine Mountains, and only an inch or two, in scattered patches, on Treasure Hill and the Base Range. It was snowing on the 20th and 21st on the Toiyabe and other ranges south and southeast of Austin, and probably also at White Pine, but the storm did not appear to be of long duration. The winter, however, must be intensely cold, and those who propose to remain there until spring must be well provided with good heavy woollen underclothing, heavy pilot, beaver or blanket cloth outer clothing, and at least two pairs of the heaviest and best San Francisco and Oregon blankets—the best are the cheapest in the end, and will always find ready sale.

It is difficult to get goods over the railroad at this time promptly, owing to the pressure of material for extending the line, which must go forward whether or no; but parties intending wintering in the mines must either take over a stock of provisions, and have them hauled from Argenta, or go provided with means to purchase them at Hamilton day by day for four or five months, probably at an advance on the prices quoted below as the present ruling rates. The climate appears to be exceedingly healthy, but owing to the great elevation of the country, and consequent rarefaction of the atmosphere, no person with weak lungs should attempt to winter there. Colds, rheumatism and fevers will doubtless prevail to some extent before spring, as the result of exposure, neglect and carelessness.

*Present cost of living.**—At present the necessaries of life are high-priced, but of good quality and abundant. At Hamilton and Treasure Hill are quite a number of restaurants at which a tolerably good meal may be obtained. The price per meal is $1, and board by the week is $12. There is no hotel in the district, and but one or two places where a bunk to sleep can be rented. The price of a single bunk bed, with a mattrass and blankets, at the store of Wakefield & Wheeler, in which Wells, Fargo & Co.'s office is kept, in Hamilton, is $1 per night. This is the general resort of all new-comers, and a man who is in season to be booked for a bunk is looked upon as a favored mortal. Others, less fortunate, sleep in their blankets on the floor of the store, in saloons, restaurants, tents, hovels, or in the open air, as they can catch it. The prices of various articles of food for man and beast are as follows: Flour, $16 per hundred pounds; potatoes, (grown in Nevada and of superior quality,) 12 1-2 cents per pound; onions, 15 cents per pound; sugar, (brown) 3 1-2 pounds for $1; crushed sugar, 3 pounds for $1; coffee, (ground,) 75 cents per pound—(no facilities for grinding it in the district;) bacon, (sides,) 37 1-2 and 40 cents; shoulders, 35 cents per pound; beef, fresh and of good quality, 25 cents; pork, 37 1-2 to 50 cents per pound; eggs, from Salt Lake, (so-soish,) $1 to $1 25 per dozen; eggs, (fresh,) $2 per dozen; tea, $1 25 per pound; candles, 35 cents per pound; barley, 10 to 12 1-2 cents per pound; hay, $150 per ton; drinks, 25 cents each, and no credit at the bar.

Wood of good quality is abundant, and can be had for the cost of cutting and hauling. All the woodland in the vicinity is being claimed by parties who propose to cut wood for the mills and to supply the miners. Lumber costs $150 per 1,000 feet for ordinary, $175 per 1,000 feet for choice at Hamilton, where there is a little steam saw-mill with a single circular saw constantly engaged in cutting lumber from the "bull pine," (or "nigger pine," as it would be termed in the south,) which grows on the White Pine mountain proper, in considerable quantities, and of sufficient size to afford saw logs 20 to 25 feet in length and two feet thick. At Treasure Hill $200 and upwards per 1,000 feet is charged for boards, which are hauled from Hamilton or Silver Springs, or from remote districts by heavy teams. Half a dozen men clubbing together could in a few days put up a shanty of cedar posts chinked with stones and mud, and roofed with cedar boughs and earth, which would afford comparatively comfortable quarters for the party through the winter. Those erecting buildings of sawed lumber at present line them with cotton cloth to exclude the wind, then shingle or tin the roofs. A horse will "eat his head off" in a week or two, and parties coming into the district at this time will do well to send them off to the lower valleys, 20 to 50 miles away, where they can winter on-bunch grass and white sage in the open air, only requiring the attention of a herder. Clothing and blankets cost about 50 per cent. more than in San Francisco.

There are, as yet, no agricultural developements in the district itself. Some fine ranches on the road to Austin produce hay and grain, and considerable coarse hay is cut in the next valley eastward. Teams from Salt Lake via Egan canyon have found their way in great numbers to the White Pine cities, and their owners have done a flourishing business in grain, vegetables, etc.

Mills and reduction works.—The Oasis mill at Silver Springs, (10 stamps,) the White Pine mill (10 stamps,) and the Monte Cristo, (5 stamps), are, I believe, all running, The old Butte mill (5 stamps), from San Francisco canyon, Reese River district, has been transported to White Pine, and will soon be in operation. There are also two smelting furnaces, which will start in the spring, for the treatment of the richest ores, and of ores from the base range. The product of White Pine for 1868, including the value of the ore extracted, but not yet reduced, may fairly be estimated at a million of dollars, perhaps more.

At present there is but one route by which the White Pine district can be reached from San Francisco, viz.: via the Central Pacific Railroad, Argenta and Austin. The distance from San Francisco in round figures is about as follows: San Francisco to Sacramento, by rail or steamer, 100 miles; Sacramento to Argenta, by rail, 400 miles; Argenta to Austin, by stage, 97 miles; Austin to Hamilton, by stage, 120 miles—total, 717 miles. The cost of the trip for passage alone, only 25 pounds of baggage being allowed, is as follows: To Sacramento $5, to Argenta $40, to Austin $15, to Hamilton $25—total, $85. After passing Reno, meals are $1 each along the whole route, and $15 is a moderate allowance for expense of eating on the way, which would bring the cost of the trip to $100 in round figures, providing one has no extra baggage, does not stop to sleep on the way, and indulges in no luxuries. By purchasing a through ticket at Sacramento for Austin $10 can be saved on the above estimate, but the stage by which one engages passage from Argenta to Austin may be filled in advance, in which case it may be necessary to remain for days at the former point. If no detention occurs, and traveling is kept up night and day, the trip through from San Francisco to Hamilton may be made in five days. There are two regular stage lines, Wells, Fargo & Co.'s mail line, and Miller, Wadleigh & Co.'s passenger and freight line, running between Argenta and Austin. Between Austin and Hamilton there are two regular stages, viz.: Len Wine's (connecting with Wells, Fargo & Co.'s) and Shannon's and half a dozen guerilla lines, which make about half as good time as a man can make on foot. Fare the same all round.

In a few weeks—the weather permitting—it will be possible to reduce the staging on the trip by one-half. From Hamilton to the nearest point at which the railroad can be reached—near Fort Halleck, east of Gravelly Fork—the distance is not over 110 miles, possibly not more than 100. The new road will leave Austin far to to the westward, and passing down an open valley country directly northwards, will present no heavy grades. It can be constructed cheaply, and must be opened immediately. It may run through Ruby Valley, or it may leave it to the right, and pass to the westward. There are now probably 3,000 people in White Pine district and vicinity wholly without mail facilities, and dependent solely on Wells, Fargo & Co. for their letters, papers, etc. A mail route should and probably will be opened between the railroad, near Fort Halleck, and Hamilton, immediately on the cars reaching the former point.

The future productiveness and importance of this district cannot now be foreseen; but much may be expected from the active explorations of next season, in a broad belt of country as yet comparatively unknown. As for the deposits of Treasure Hill, they are certain to yield large amounts of silver before they are exhausted; and the prospects of the mines would be most encouraging but for the confusion and waste which an injudicious system of titles will be certain to generate.

* Since this chapter was written, in November, 1868, the great influx of prospectors and speculators into White Pine may have enhanced these prices still further.

Montana.

Our exchanges—which, by the way, have been delayed for a week or more on the way by the snow blockade—come to us with an unusual amount of interesting mining news. We cull from the Helena *Post* the following items:—"Prof. Swallow's mill at Highland has been for some time and still is engaged in a run upon rock from Forest Queen lode, which gives promise of a good and satisfactory yield. The work on the great tunnel, perhaps the finest in all Montana, which is at present being run to strike the Forrest Queen, is being vigorously prosecuted. Three shifts of experienced miners are at work in it, and the sound of the drill, the pick and the shovel reverberate from Monday morning until Saturday night. All these who own lodes in Highland are actively engaged in developing them, and are as full of that abiding faith that is a corollary of a good quartz lead....The flourishing little burg of Silver Star from a few log cabins, inhabited by the unwearying prospector, has grown into a thriving hamlet of some hundred or more inhabitants, presenting streets laid out with regularity, and neat cottages and beautiful gardens. The Everett mill is day and night employed in crushing rock from the Green Campbell lode, and as the past clean-ups have been very satisfactory, the present run is pregnant with abundant success. The Stevens & Trivett mill is at work on the Broadway and the Iron Rod lodes, and the past record of similar runs predicate splendid results from the one now being carried on. The Broadway is a new lode, so far as reputation is concerned, but it is said that the quartz is very rich. The Iron Rod is firmly established as a first-class lode. Numerous arastras are constantly in progress of operation during the summer months, when the brooks are running, and even from their feeble means of extracting gold, reward the devoted and hardy miner. A large number of persons are busily engaged in sinking upon their leads and getting out rock for trial runs by either of the two mills in constant operation...The Boulder diggings—the first discovered in the Territory, and the center every year since of a new excitement—again looms into importance. The bars originally discovered (on the north side of the creek, about eight miles above Burkins' ranche), have been constantly mined, yielding from $8 to $10 a day to the hand, and good prospects—though not considered paying—have been obtained on the opposite side of the creek. Then, five or six miles lower down, are several small gulches prospecting well for hydraulic diggings, if a supply of water could be got into them; besides the bars on Deputy Marshal Burkins' place, which are to be developed the coming spring. Now, it is reasonable to suppose, gold having been found in encouraging quantities on both sides of the creek, that its channel is fabulously rich. To eventually turn the stream from the upper bars across to the Little Boulder, thus draining or turning off several miles of the Big Boulder that it may be prospected thoroughly, is, we believe, one of the projects of Messrs. Burkin & Co., in constructing a ditch to cover the bars on Mr. B.'s ranche. The Big Boulder may prove another Feather River in richness. We shall await results with interest. ....Negotiations have been perfected insuring the early erection of a first-class twenty-stamp quartz mill at Tucker Basin. Prominent among the lodes in Tucker Basin are the Uncle Sam, Granite Mountain, Levi Blossom, Ocean Wave, McClellan, Munson, Merritt and Winscott. The Holmes Mining Company have run a tunnel 200 feet long, which will shortly tap the Uncle Sam at a depth of 150 feet. The Granite Mountain Company have run a tunnel over 300 feet in length on the Granite Mountain lode, and extracted a large quantity of rich pay quartz. Another tunnel 210 feet in length, has tapped the Levi Blossom at a depth of 70 feet. Shafts respectively 60 and 75 feet have been sunk in the Winscott, Munson and Merritt ledges, and developed true and permanent veins. As high as $2 50 to the pan has been repeatedly panned from a single panful of the crevice dirt. On the discovery claim of the McClellan lode a shaft and two tunnels have been excavated. The vein exposed in their workings is 12 to 15 feet wide, with well-defined walls. Actual milling results as well as numerous assay returns have shown that every portion of the vein matter contains free gold in large paying quantities. Numerous runs made on the quartz from this district in the mills at Unionville have yielded as high as $78 60, and none less than $15 per ton. No district in the Territory is more promising than Tucker Basin—none offer a more inviting field for the profitable employment of capital....It is a subject of much congratulation to our citizens that the attention of the 'solid' men of the country is being called to this Territory. The gentlemen who have united in the enterprise, which forms the 'Watseka Mining Company,' are those who count their wealth by the hundreds of thousands, and some tell of millions. This company is composed of Judge M. G. Leonard, President; J. C. Wyman, Geo. Opdyke, H. A. Sherrell, Secretaries; —— Smith, of Wall street, Treasurer, and Charles Hendrie, General Manager. We look for a vigorous prosecution of work on the part of this company; for with the wealth of the gentlemen composing it, the experience, sagacity and energy of Mr. Hendrie, and the rich character of the Watseka rock, nothing can retard the full and complete success of this company financially, and in a manner that will redound to the credit of the Territory throughout the eastern States, whence we must look for the capital to come for the working our mines. The Hendrie mill is busily engaged at work crushing ore from the Watseka lode....Messrs. Dance & Stewart have become interested in that locality, and are busily engaged in prospecting and developing a lode called the Julia Holmes, which adjoins and is supposed to be a continuation of the Watseka. It is their intention to locate a mill upon this lead if it will warrant the enterprise, and the indications are such as seem to justify it....The McAndrew & Wann mill is also busily engaged crushing rock from the Watseka. Rochester district is rapidly growing into importance as a gold producing one, the richness of whose quartz justifies the most sanguine anticipations for its future prosperity. ....Mr. Cunningham, of the Lindsley Mining Company, is sinking the shaft of this company—the prospect improves as the work progresses....Mr. Brookie is on his way to Argenta with the intention of immediately commencing taking rock out of the lodes owned by the Tootle, Leach & Co. Mining Company, with which the Major is connected. This company intend running both their furnaces next summer, and it is their intention to have rock sufficient above ground to keep them in full blast till the snow of next winter flies.

Correspondence.

[To insure insertion of correspondence in our columns, the full name and address of the writer must be given.]

The Schoolmaster Abroad.

New York, March 10, 1869.

Editor Journal of Mining:

Sir: Allow me to suggest the insertion of an editorial note, to the following effect, in the next number of the Journal of Mining:

"We regret that we were betrayed, quite inadvertently, into giving what may have seemed a sort of editorial endorsement, or at least a complacent acquiescence in the mechanical theories of the inventor of a new system of propelling vessels, by giving room to his views, and conspicuously illustrating his plans in a recent number. Fully aware that our journal is mainly read by men whose pursuits qualify them, as a class, to be considered and recognized, to a greater or less extent, as experts in mechanics, we honestly intend to exercise a wise discrimination in the admission of articles describing new inventions, and setting forth the views and claims of their promoters—and although it is not, of course, to be expected that we should pre-judge the merits of every new scheme, or the soundness of every inventor's premises, as a preliminary to publication, we may venture to promise our intelligent constituents, that our columns will be reserved for something better than a pictorial display of mechanical follies, or the iteration of propositions or theories, which, like those of the article in question, defy all the laws of dynamics, all established facts, and all common sense."

It is barely possible that you may have promised some one of your deceased relatives never to make a *retraction*. In such a contingency, the shortest way out will be the insertion of the following at the top of the editorial column:

"Desirous of placing the JOURNAL in the front wing of subversive, as opposed to what may be styled dogmatic mechanics, we have decided to put the first page at the service of mechanical free thinkers and inventors, whose projects have failed to gain a hearing in the papers of our more timid and orthodox cotemporaries. To render a contribution eligible to this department of the paper, *novelty* will be regarded as the sole qualification. No writer need hesitate on account of the possible absurdity of his schemes, facts, or theories, if he believes in them himself.

"As an example of the kind of writing which we have now particularly in view, we refer to an article entitled "A New Method of Propelling Vessels," which appeared in a recent number, and from which may be inferred the kind of catholic tolerance which we are willing to extend to all shades of opinion and heresy. If anything more preposterous can be found in the annals of mechanical literature, it will be only necessary to send a copy to this office to insure its publication."

N.

[Our sportive correspondent offers us the lively alternative of admitting that we were deceived by the claims of the invention to which he takes exception, or else proclaiming that we look for novelty only in the subjects illustrated on our first page, and that merit is rather a drawback than otherwise. If he will reconsider his dilemma, he will find that there is an easy way out of it. We do not editorially endorse the claims of inventors who may desire to have those claims stated on the first page of the JOURNAL OF MINING. Utterly absurd and impossible conceits we may indeed exclude, but we do not pronounce our own opinions except in our editorial columns. The articles on our first page, accompanied by illustrations, are almost invariably only impartial statements of the *alleged* merits of inventions.

It is often quite as interesting to our readers to see the drawings and read the claims of men who set up "preposterous mechanical theories," as to be confined altogether to those well-known subjects which experience has already trodden smooth. As for adding to our other editorial duties that of censorship over everybody's new inventions, we beg to be excused.

Concerning Mr. PIKE's "new method of propelling vessels," we decline to express any opinion whatever. If it ever strikes us as worthy of an editorial discussion, we shall examine its claims further. Otherwise, we shall leave it to the columns of other scientific journals, which have already published some arguments in its favor.—ED.]

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

COPPER AND ITS USES IN THE ARTS.

BY DR. LEWIS FEUCHTWANGER.

Having explained the principal processes by which the metal is obtained from its natural combinations, it may be well to describe a few interesting haloids and oxysalts obtained therefrom.

1. The suboxide of copper, or red copper, which also occurs native, and which has already been alluded to, is one of the most abundant and beautiful minerals distributed over the globe. It is prepared artificially, either by calcining metallic copper in a strong muffle-heater, or by heating five parts of black oxide of copper with six parts of copper filings in a close crucible. The result is a fine powder of brownish red color, which is a most valuable ingredient in the manufacture of *ruby glass*, so much used for signal lanterns; the suboxide of copper imparts to glass a deep, rich, ruby red color, equal to that obtained from the oxide of gold or purple of Cassius.

2. The black oxide of copper, which is also found native, and is called black copper, is abundant in the Lake Superior region. It is prepared artificially, either by heating in contact with air, to an intense heat, the copper scales obtained by rolling sheet copper, or merely by igniting the carbonate, hydrate or nitrate to a moderate, or the sulphate to an intense heat. This oxide is easily soluble in acids, and forms all the usual salts of copper. It is likewise much used in *glass making*, for obtaining a beautiful green color, and to make a peculiar *greenish brown* color in combination with manganese.

3. The hydrated oxide of copper is formed by precipitating a dissolved cupric salt in the cold, with a slight excess of dilute caustic potash, quickly washing the blue precipitate with cold water, and drying at the ordinary temperature of the air; when dry it remains undecomposed, even at 100° C., but at a somewhat higher temperature, it is converted into anhydrous black oxide. The *blue verditer* obtained by the gold and silver refiners, as a secondary product, and much used in common and fine painting, as also the *Bremen green*, are all hydrated oxides of copper, and are often purposely prepared by precipitating a solution of sulphate of copper with caustic potash of 15° Baume, washing the precipitate, and again treating it with caustic potash of 15° Baume, and lastly, washing it thoroughly and drying it carefully.

The *cupric oxygen salts* have a strong affinity for acids, dissolving in them easily and with evolution of heat, even after ignition. The anhydrous cupric salts are mostly white, the hydrated salts have a blue or green color; are for the most part soluble in water, and the solutions have a metallic taste and redden litmus.

The *ammonio-cupric oxide.*—The cupric oxide unites with ammonia in more than one proportion, but the ammoniacal sulphate of copper is the most important preparation, and is formed by crystallizing a mixed solution of the two salts, which forms a light blue liquid, and when the saturation is performed, by very concentrated solutions and gentle evaporation, or strong cooling, or by adding alcohol, the ammoniacal sulphate of copper is found in deep blue prisms, which are soluble in 1 1-2 parts of water and decompose in the air, and if heated to 700 C. become apple green. The ammoniacal sulphate of copper is much used in pyrotechnics as a blue color. Among the salts of black oxide of copper or oxy-salts, is to be mentioned *sulphate of copper*, or *blue vitriol*, which is also found native, but is manufactured largely for use in the arts, and is chiefly obtained from the sulphuret of copper by roasting, and rarely by the combination of the metal with sulphuric acid.

By subjecting the copper matte, which was mentioned previously in the metallurgic treatment of copper ores, in a reverberatory furnace to a moderate heat, a sulphate of copper is formed, which is extracted by lixiviation, and then by adding oil of vitriol and lixiviating again more blue vitriol is obtained. The gold and silver smelters furnish the trade with it, obtained in the course of their operations. The chemist prepares the blue vitriol, by adding to each pound of copper scales, procured from the rolling mills, 3 pounds of oil vitriol, and allowing the solution to crystallize, which is easily effected, if the solution was concentrated. If it is important to have the blue vitriol free from iron, which is more or less combined with it, the salts must be heated to redness in an iron vessel, by which process all the iron salt is left insoluble, together with a little of the copper, the rest of which may be extracted with boiling water. The insoluble residue, treated with sulphuric acid, yields the residue of the copper and much iron, from which the copper may be thrown down either by cementation with iron, or may be added to a fresh portion of mixed vitriol. The blue vitriol is azure blue, and in oblique rhombic crystals, and has a specific gravity of 2.274; it is much used in dyeing and calico printing, and of late years by the farmers, who soak their cereals in a solution, to poison insects and destroy fungi.

The *nitrate of copper* is easily obtained by dissolving copper, its oxides, hydrate or carbonate in nitric acid. It is of greenish color, and deposits, at very low temperatures, crystals containing much water, and at high temperatures forms prisms with 3 equivalents of water. The crystals deflagrate on ignited coals, and detonate when mixed with phosphorus and struck with a hammer. When powdered and rolled up in tin foil, spontaneous ignition results after a short time; paper dipped into its solution and dried, takes fire readily below a red heat and burns with a green flame.

The nitrate is used by calico printers, dyers and pyrotechnists, for preparing some copper salts. The *chloride of copper* is a haloid salt, obtained by dipping oxide or carbonate of copper in hydrochloric acid, or by mixing equal parts of blue vitriol and common salt with a little water at 125°; sulphate of soda will separate, on cooling by slow evaporation; the chloride separates in crystals, which are four-sided prisms. They are green, deliquescent, soluble in water, alcohol and ether, and may also be sublimed. A celebrated green paint, called Brunswick green, is obtained by digesting hydrated oxide of copper in a solution of chloride of copper.

As the object of this article is to describe the practical uses of copper, and its application in the arts, the writer has not entered upon the various theoretical explanations regarding the combinations of copper with all acids, etc., and he will conclude this subject by enumerating the many pigments obtained from the salts of copper.

The green pigments used largely in the arts, where copper forms the base, are the following:

1. Bremer green is a beautiful pale green; prepared by precipitating blue vitriol and sulphate of copper with carbonate of soda, or by precipitating a hydrated oxide of copper with caustic soda.

2. Brunswick green is prepared by exposing copper foil to the air, and moistening it repeatedly with hydrochloric acid or sal-ammoniac. It is an oxychloride of copper.

3. Paris green is an arsenite of copper, and is the favorite green pigment used by painters in this country for blinds, window shades and fine work; it is prepared by precipitating a solution of blue vitriol with a solution of white arsenic or arsenious acid.

4. English green is likewise an arsenite of copper, with the addition of either sulphate of barytes, commonly known as barytes or terra alba, ground sulphate of lime.

5. Mineral green is synonymous with Scheele's green, an arsenite of copper, but is also a mixture of 2 parts Scheele's green, 6 parts white lead, 3 parts malachite or carbonate of copper and 1-2 part of verdigris.

6. Mitis or Vienna green, is an arsenite of copper prepared from sulphate of copper with the prepared arsenite of potassa or soda.

7. Mountain green is a carbonate of copper.

8. Schweinfurth green is an aceto-arsenite of copper.

9. Veronese green is also an arsenite of copper.

10. Cendres bleues, verditer and Antwerp blue, are all precipitates from blue vitriol, with chalk or carbonate of soda.

11. Verdigris, or subacetate of copper.

12. Verdigris distilled, crystallized, a neutral acetate of copper.

The common verdigris is mostly imported, and is prepared by exposing thin rolled copper to the fermenting marc of the grape, or wrapping it in cloths dipped in acetic acid. The manufacture of verdigris is practised in France on a large scale, and may here be briefly described thus: In Grenoble, they merely moisten their copper plates of 1-24th of an inch in thickness with vinegar; in England, they form alternate layers of the copper sheets and cloths, dipped in acetic acid, in wooden boxes; the cloths are moistened with the acid every three days, and after twelve days small crystals appear. This operation lasts from five to six weeks. In many countries the rolled sheet copper is put in pots containing vinegar, as in the manufacture of white lead; the coat of verdigris is scraped off and kneaded into a mass and stuffed in leathern bags, dried in the sun, whereby they lose from 40 to 50 per cent. in weight.

The neutral acetate of copper, or distilled crystallized verdigris, is the above product, re-dissolved in boiling water, and left to crystallize on strings. Verdigris is much used by hatters, very extensively also, in dyeing and calico printing, as resist paste in the blue vat dyes. The crystallized verdigris which comes into market in oblique four-sided prisms, used by painters only as a fine pigment, was formerly used for preparing the glacial acetic acid.

Aluminum.

Forty years ago a few grains of this metal were prepared by Professor Woehler, at the University of Goettingen. He sealed the little pellets in a glass tube, and it was not thought that the metal could ever have any useful applications. The discovery rested dormant for thirty years, when attention was called to it by the eminent French chemist, Deville.

The circumstances were as follows: The Emperor Napoleon, anxious to display some interest in scientific matters, appropriated fifty thousand francs to defray the expenses of researches into the properties and uses of aluminum, and Henry St. Claire Deville was authorized to make the experiments. We happened to be in Paris when this took place, and were one day invited by Professor Deville to witness the preparation of the metal in the presence of the Minister of War, Professor Dumas, and of other celebrities. Deville, who is the most genial, popular, and successful of the French chemists, received his guests with great cordialty, and explained, in the clearest possible manner, every step of the operation. He extracted a silver-white metal from a lump of clay. The way he did it was very simple. Chlorine gas was passed over heated clay mixed with charcoal, and the chloride of aluminum thus produced was driven over melted sodium. The chlorine first extracted the metal from the clay, and was in turn decomposed by the sodium. In chemistry, might makes right, and every compound can be attacked and forced to capitulate, if the proper weapons are brought to bear upon it. The aluminum was first seduced from its strong citadel of clay by the chlorine, and was then attacked and captured by the sodium.

The experiments, in a small way, having proved successful, extensive works were established in the neighborhood of Paris, where aluminum was manufactured on a large scale. At the Paris exhibition of 1867, Mr. Paul Morin exhibited numerous objects manufactured from pure aluminum and from its alloys.

The specific gravity of the metal is 2.67. It is tin-white, fusible at a red heat, brilliant, malleable, ductile, sonorous, an excellent conductor of electricity, insoluble in dilute sulphuric acid, and in concentrated nitric acid; easily soluble in hydro-cloric acid and the alkalies. It does not decompose water, as was at first supposed, and does not oxidize materially in the air.

Professor Henry Wurtz, of New York, has recently discovered that if it be rubbed with mercury it oxidizes so rapidly as to produce great heat. It was at first found impossible to solder the metal, but this difficulty has been at length overcome. When fused with iron it forms a crystalline mass not malleable. Mixed with copper in the proportions of ten parts of aluminum, and ninety parts of copper, it forms a beautiful alloy, possessed of the color and many of the properties of gold. This alloy is called aluminum bronze, and is now frequently employed for the manufacture of watch cases, watch chains, and imitation jewelry. Nearly all the aluminum now manufactured is converted into the above alloy and the interest in it, which at one time began to flag, is once more revived, and several new establishments have arisen for its manufacture.

Four hundred pounds a month are now manufactured in France, and sold at twelve dollars a pound. It is largely produced in England.

Aluminum is one of the most abundant metals on the earth. It is found in brick and porcelain clay, in feldspar, in cryolite, in granite, in slate rocks, in the ruby and sapphire. When iron rusts, it turns to a red powder, which can be washed away. When aluminum rusts, or is fused at a great heat among the crystalline rocks, it gives to us the precious stones called the ruby and sapphire.

As soon as the metal is required in large quantities, some method will be devised for producing it at a cheap rate; and when that time arrives we shall not have to fit out expeditions to go and search for the ore in remote regions, but we can dig for it under our feet, nearly everywhere, and make a mine of every stone quarry.

The beautiful tone of the metal has suggested its use in the manufacture of bells, and a successful application of it for this purpose has been made.

Aluminum has been employed by chemists as a reducing agent in the preparation of some of the rare metals, and we may have to record a more extensive use of it for this purpose.

There have recently been introduced into use in Paris two new alloys of aluminum. The first is called alumiuum silver, or third silver (tiers argent), and is composed of one-third silver and two-thirds aluminum. It is chiefly employed for forks, spoons, and tea service, and is harder than silver and more easily engraved. The second is called minargent, and is made of one hundred parts copper, seventy parts nickel, five parts antimony, and two parts aluminum. It is a very beautiful, permanent, and brilliant alloy, capable of replacing silver for many purposes.

It must be acknowledged that the applications of aluminum in the arts are not so numerous as was at first predicted, and its manufacture, as compared with other metals, can, at the present time hardly be called a metallurgical one. The metal is so light that a little of it will go a great way. A cubic foot of it weighs one hundred and sixty-eight pounds, whereas a cubic foot of gold weighs twelve hundred pounds, and silver weighs six hundred and fifty-six pounds, iron four hundred and fifty pounds, and even granite weighs one hundred and eighty-six pounds to the cubic foot.

If the price of it were the same as that of silver, it would still be much cheaper, as only one-fifth as much would be required to cover the same space.

So abundant is this metal, that it is safe to predict that the day is not far distant when our houses may be built of it instead of bricks, and we shall use it for many purposes now unknown—Prof. JOY, in the *New World*.

MARKET REVIEW.

FRIDAY EVENING, March 26, 1869.

Gold and Silver Stocks.—To-day being Good Friday, there was no business done at the Mining Stock Board. The report of yesterday quotes Combination Silver at $3 50, a marked advance since our last. Manhattan Silver, although said to be held at $100, is considered by buyers worth only $25. Owyhee has declined to below $20. In gold stocks better prices are noticeable, especially in Consolidated Gregory and Smith and Parmelee. The following are the quotations:—Benton Gold, 15; Consolidated Gregory, $2 75 @$2 85; Grass Valley, $1 10@$1 25; La Crosse Gold, 16@18; Mariposa, 19@19½; Mariposa Pref'd., 34½; Montana Gold, 33@45; Quartz Hill, 89@90; Smith & Parmelee Gold, $1 50@$1 55; New York and Eldorado, 43@49.

Copper and Other Stocks.—As the Stock Boards were not in session to-day, we omit the reports usually published in this column.

Foreign Exchange.—There has been a moderate amount of business in Foreign Exchange. Prime bankers' 60 days' sterling has ranged at 108⅜@108⅜, and sight, 109. Telegraphic transfers on good names have been made at 108⅜@108⅞.

Gold 131⅛@131⅜.

Petroleum.—There was a good business yesterday, with sales largely for export. Prices are higher. The transactions footed up 11,000 bbls. at 32@32½c. for spot and balance of the month, closing at 33c.; also, at 34½c. for April, May and June delivery. For Philadelphia delivery 18,000 bbls. were sold, of which 3,000 bbls. for March at 32c.; 4,000 bbls. for March at 32½c.; 3,000 bbls. for April at 34½c.; 500 bbls. for first half April at 33½c.; 2,000 bbls. for April on private terms, and 3,000 bbls. for April, May and June, at 35@35½c. Crude, for New York delivery, was sold at better prices, but closed quietly; bulk lots held at 19½@20c., with sales of 600 bbls. at the latter price—shipping order, 24c.

* Canal not open this time last year.

Receipts for the week ending March 23	pkgs	
Exports for the week ending March 23	galls.	572,032
Exports from Jan. 1	galls.	9,336,209
Exports same time last year	galls.	9,720,171

The following is the quantity exported from other ports, Jan. 1 to March 20.

	1869.	1968.
From Boston.......galls.	618,862	521,852
Philadelphia	8,703,303	4,224,128
Baltimore	81,777	286,957
Portland	....	6,800
Cleveland	....	....
Total	4,406,942	5,039,737
Total exports from the United States	14,034,145	14,881,034
Same time in 1867		9,014,044
Same time in 1866		11,413,249

Copper—Quite a large business has been done at irregular prices. Sales for the week 1,000,000 lbs., at 25@25½c. It is about impossible to give a quotation to-day. For future delivery end of May 300,000 pounds Lake have been sold at 25c.

The English market is steady at £72 10 for Chili Bars.

Tin.—The London market is firm at £130 for Straits.

Spelter is dull at 6⅛c., gold, for Silesian.

Lead.—At $6 30 to $6⅜ for ordinary foreign, with a retail business only.

Steel.—New is in moderate request at our quotations—20 tons old Spring sold at 8½c. ℔ ℔, currency, cash.

THE IRON TRADE.

NEW YORK, March 26, 1869.

The American Pig Iron Market remains quiet, with but little inquiry; prices, however, remain firm at $40@$42 for No. 1; 5,000 to 6,000 tons have been reported of Crane iron at $38@$40 for Nos. 1 and 2, now held at $42—b No. 1. Sales of 1,500 tons of Grey Forge at $35 50@36 60.

Scotch Iron remains quiet with but little inquiry, with small stock; prices are firm. We note sales of 300 tons Glengarnock, to arrive, at $41 50.

Scrap Iron remains quiet. We note sales of 400 tons No. 1 on private terms.

Old Rails remain quiet, inquiry small and stood light, now held at $36, gold.

From store, most descriptions are reduced about $5 ℔ ton. Bar by the invoice is very dull, dealers offering less than cost, laid down.

BOSTON, March 20, 1869.

The market for Pig Iron, says the *Commercial Bulletin*, is very firm, but though large contracts in domestic are being made by heavy dealers, the demand for immediate consumption is very moderate. This is owing to the fact that the late advance in pig metal, not having been followed by a corresponding rise in products, has absorbed the margin and checked the operations of manufacturers.

The stocks of foreign pig have been reduced to a very small compass, and holders are rather indifferent to sales at current rates. In New York there have been considerable sales of Scotch, to arrive, at higher prices. American is very firm, and, in view of the contracts lately made with Pennsylvania smelters, who are likely to govern the market for the coming season, the article is held at shipping points at relatively high rates. No. 1 is scarce and largely ordered ahead of production, while holders are not offering freely at quoted prices.

Manufactured iron, of all descriptions, is firmer in sympathy with the rise in pig metal. But the demand is moderate, except for a few seasonable articles of hardware and building materials. Manufacturers are moving cautiously in the absence of a fair margin of profit.

Scotch Pig is firm, with small sales of Gartsherrie and other brands No. 1 in lots for consumption, at $43@$46 ℔ ton, the outside rate for Coltness. American is in moderate demand, with sales of retail lots at $41@$46 50 ℔ ton, for the different numbers. Charcoal Pig is selling at $50@$60 ℔ ton, as to brand. Bar Iron is firm and tending up, with sales of English and American, from store, at $87@$90 ℔ ton for common, and $93@$95 for refined. Rails are firm and in steady demand, with sales at $55@$56 ℔ ton, gold, for English, and $81@$82 ℔ ton, currency, for American. Cast Steel is selling at 18@23c. ℔ ℔ for English, and 21@23c. for American. Anchors are selling at 8@8½c. ℔ ℔; Chain Cables, (¾@2 inches thick), 8@7½c. ℔ ℔; Coil Chains, (½@1½ inches thick), 12@8½c. ℔ ℔. Boiler Plates are selling at 7½c. for flanges, 5½c. for C No. 1, and 5½c. ℔ ℔ for common and tank. Russia Sheet is in reduced stock and firmer, with sales at 11½@18½c., gold, as to number. English and American do. is quiet and selling at 5½@9c. ℔ ℔. Nails are quiet and steady, with sales at 5c. ℔ ℔ for assorted sizes. Old Iron is scarce and higher, at $1 50@$1 75 ℔ 100 ℔s for Cast, and $2 10@2 10 for Wrought Scrap.

Market Prices.

NEW YORK, March 26, 1869.

DUTY.—Bars, 1 to 1½c. per lb.; railroad, 60c. per 100 lbs.; boiler and plate: 1½c. per lb.; sheet, band, hoop and scroll, 1½ to 1½c. per lb.; pig, $9 per ton, polished sheet, 3c. per lb. Payable in gold.

			STORE PRICES.		
Am. pig, fy. No 1, best,	$40 00	@42 00	Bar, Swedes, ord'y sizes	— —	140 00
" " 2x frdy,	38 00	40 0	Bar, Eng. and Am., rf'd.	92 50	
" Grey Forge	36 00	38 00	Bar, Eng. & Am., com.	85 00	92 50
White and Mottled	32 00	35 00	Scroll	120 00	150 00
Pure white for Cal. mar.	32 50	— —	Ovals and half round	117 50	142 00
Scotch Pig, No. I, best bd	40 00	42 00	Band	117 50	— —
" " " outside,	40 00	— —	Horse Shoe	117 50	— —
Wt. No. 1Scrap f'm yd.	....	50 00	Rods, ⅜@3-16 inck	100 00	155 00
Ex ship	45 00	....	Hoop	125 00	180 00
Bar, Ref., En. & Am...	90 00	95 00	Nail Rod, per lb	8½	9½
Bar, Sw's, as. sizes, gold	82 50	87 50	Sheet, Rus., as'd. Nos. (gold)	11½	13
Old Rails	47 00	....	Sheet, s'gle. D & T. com	5½	7
R.R. Iron, For., fm Stock gold	54 50	55 50	Rails, Eng., gold, ton.	55 00	56 00
R. R. Iron For., to imp.	55 00	00 00	Rails, American	74 00	76 00
" " Amer. at wks. currency	75 00	76 —	STEEL.		
			English, cast 2d & 1st qual.	18	@22
R. R. Iron, Am., deliv'd	78 00	80 00	Eng. Spring 2d & 1st qual	9	11½
Stl rails of any pattern at works, currency			Eng. Blister 2d & 1st qual.	11½	19
			English Machinery	12½	15
Solid Steel rls. For., gd.	95 —	— —	Eng German 2d & 3d qual.	14	16
Street Rails at works..	85 00	— —	Am. Blister, "Black Diam'd,"	10½	16
Light rls. for mines &c.			American, Cast, Tool "	19	—
at works	$85 00	@— —	American, Spring "	10	18
Do. delivered here	....	— —	American Machinery "	—	18
			American German "	10	18

LONDON, Eng., March 5, 1869.

In Staffordshire, says the *Mining Journal*, there have been rather more orders given out for home consumption during the week, but the demand for export is rather dull; as the Baltic, however, is now open, we may look for more orders from the Continent. The prevalence of short time at the mills and forges is affecting the demand for pig iron and prices are hardly so firm as they were, though at present there is not much doing. In Welsh the exports have rather increased during the week, owing to the arrival of several vessels of heavy tonnage. For bars there is a moderate continental demand. In Swedish iron there is still considerable activity, and a very good amount of business is being done, the demand being still lively. In Scotch pig iron the market has been dull throughout the week, and prices have gradually declined, the last price received from Glasgow being 53s. 8d., cash.

Iron.	Per ton.		Iron.	Per ton.	
Bars, Welsh, in L'n	£6 12 6	£6 15 6	Pig, No. 1, in Clyde.	2 14 5	3 2 6
Bars, W., to arrive.	6 10 0	6 12 0	Pig, f o b in Tyne or Tees	2 9 6	....
Nail Rods	7 0 0	7 2 6	Pig, Nos 3, 4, f o b in Tyne or Tees	2 6 6	2 7 0
Do., Staff's'e, in L'n	7 12 6	8 10 0	Railway Chairs	5 10 0	5 15 0
Bars, in London	7 10 0	9 10 0	Railway Spikes	11 0 0	12 0 0
Hoops, in London.	8 2 6	9 15 0	Indian Charcoal Pigs, in London	7 0 0	7 10 0
Sheets, single	9 2 6	11 0 0	Steel.		
Pig, No 1, in Wales.	3 15 0	4 5 0	Swede, in k's (rol'd)		....
Ref'd metal, in W's	4 0 0	5 0 0	Swede, in k's ham'd	15 5 0	15 10 0
Bars, com'n, in W's.	6 0 0	....	Swede, in fagots	16 0 0	 0
Bars, Merchant, Tyne, or Tees	6 10 0	....	English spring	17 0 0	23 . 0
Bars, railway, in W's	6 0 0	6 0 0	Quicksilver, bottle	6 17 0	
Bars, Swede, in L'n	10 00 0	10 7 0			
To arrive	10 7 6				

THE COAL TRADE.

NEW YORK, March 26, 1869.

WHOLESALE—Trade during the past week has been very active, and everything in the way of coal has been bought up—20 to 25 cents advance is now offered by purchasers, but no cargoes are to be had. There are said to be some 125,000 tons of coal at Elizabethport, mostly belonging to the Scranton Company. At Boston and the East there are possibly about 75,000 tons, and in the market 50,000 tons, making in all 250,000 tons. Our table this week shows an increase of 414,000 tons over the shipment to the same time last year. What has become of the difference, some 200,000 tons, it is difficult to say. Certain it is that it has not reached tide water, otherwise Philadelphia and the various shipping points would not be in short supply. The way trade for furnace use must have been heavy, and thus they have it stored in view of the impending strike.

"That Committee" has not as yet come to any conclusion in their deliberations, and from what we can learn are not likely to do so. We fear that each member thinks himself the most important, and wants his particular company to have the lion's share. Nevertheless, from the fact that the committee has not yet disbanded, we still draw hope for some good results.

A private dispatch from Hazleton states that the Workmens' Committee of that district have issued a circular calling a conference with the operators for April 3d, in hopes that some amicable settlement of their difficulties may be arrived at without resorting to a strike. We have an idea that this also will end in smoke. A strike there will be, as all hands acknowledge. The drawbacks on the Philadelphia & Reading R. R. have at last been telegraphed us. They are, Lump and Steamboat 90 cents, Broken, Egg, and Chestnut 70 cents, and stove 50 cents. This is a reduction from last year's opening tolls of 35 cents on Lump, 25 cents on Steamboat, 30 cents on broken, 5 cents on Chestnut, with an advance of five cents on Egg, leaving stove unchanged. This will not save Schuylkill County coals in this market, but will favor them at the East, if freights are not kept at too high a figure by the Captain's Association.

The Lehigh Canal tolls will, we understand, be promulgated April 5th.

The 721 Scranton sale is advertised in our columns this week. Eighty thousand tons of coal are to be sold, of the usual sizes. If the present state of the market should remain until Wednesday next, the day of sale, there will be an advance of from 40 to 50 cents per ton. We are in hopes, however, that dealers who may think themselves in want of coal because of their being unable to fill orders during the past week, will not get excited and run the price up to an unwarrantable figure, as has been frequently done heretofore on occasions when for a short period the supply had fallen off. As soon the canals come fairly into working order there will, no doubt, be all the coal in this market that will be called for.

FREIGHTS are lower again; vessels coming from their winter quarters are in plentiful supply. We quote, Boston $1 75, New Haven $1.

RETAIL—The trade has been good during the past week.

BOSTON, March 20, 1869.

The wholesale market is dull, and prices for domestics, says the *Commercial Bulletin*, continue to shade. Foreign descriptions are scarce and not much wanted. English Cannel is selling in large and small lots at $18@$20 ℔ ton. Pictou and Sydney are nominal at $8 25@$8 75 ℔ ton by the cargo. Cumberland is selling at $9@$9 25 ℔ ton. Anthracite is in fair demand for household and manufacturing purposes, and large lots are selling at a further concession, with rather full stocks for the season. Cargo prices are nominal at $7 75@$8 ℔ ton. The article is selling by retail at $8 50@$9 ℔ ton, as to size and quality.

The following table exhibits the amount of Coal that was passed over the various routes of transportation from the Pennsylvania Coal districts for the week ending March 20, 1869, and for the season to that date. A comparison is also made with the amount transported the corresponding week in 1868, showing the increase or decrease, as the case may be:

	1868.		1869.		INC. OR DEC.	
COMPANIES.	WEEK.	TOTAL.	WEEK.	TOTAL.	WEEK.	YEAR.
Phil. & Read. R. R.	56,104	604,806	63,548	617,426	i 7,441	i 10,440
Schuylkill Canal	....	...	6,851	7,789	....	[illegible]
Lehigh Valley R. R	37,174	549,136	38,842	611,924	d 952	i 38,750
Lehigh & Sus. R. R	9,475	61,579	16,379	189,670	i 1,904	i [illegible]
*Lehigh Canal	....	....	....	...	....	
Scranton North	5,984	82,581	9,119	108,133	i 3,135	i 25,552
Scranton South	19,261	218,713	27,367	327,377	i 8,106	i 105,664
Penn. Coal Co. rail.	....	99,115	....	149,575	....	
*Penn. Coal Co. can.	....	....	....	....	....	
*Del. & Hud'n Can.	....	....	....	....	....	
Shamokin	5,818	71,958	5,581	70,788	d 284	d 1,170
Trevorton	341	3,961	828	4,386	i 487	i 425
Short Mountain	1,879	8,980	1,729	8,931	d 150	d 049
Lykens Valley Co.	1,699	18,429	1,219	8,621	d 450	d 9,628
Hunt'g'n & B'd T'p	....	27,431	....	56,935	....	
*Wyoming South.	....	....	....	....	....	
*Wyoming North.	....	....	....	....	....	
Williamstown Col.	3,071	25,658	3,623	29,233	i 552	i 3,574
Total	140,676	1,774,167	175,033	2,188,608		
1868			140,676	1,774,167		
			i 34,357	i 414,441		

*Closed.

PHILADELPHIA, March 25, 1869.

The market is quite, with some business in Special Coals for the past few weeks. Freights are firm, $2 50 to Boston. The Reading Railroad Company have arranged the drawbacks from March 1st until further notice. Lump and Steamboat 90 cents, Broken, Egg and Chestnut 70 cents, Stove 50 cents. It is the opinion of some shippers here that the rates will be changed on the 1st of April.

Schuylkill Coal Trade.

BY RAILROAD AND CANAL, FOR WEEK ENDING MARCH [illegible]

	RAILROAD.	CANAL.
St. Clair	26,130	
Port Carbon	5,770	
Pottsville	2,637	[illegible]
Schuylkill Haven	18,890	[illegible]
Auburn	728	
Port Clinton	995	
Company's use	311	[illegible]
Total for week	55,470	17,28[illegible]
Previously this year	617,246	7,78[illegible]
Total	672,716	25,07[illegible]
Same time last year	663,587	
Increase	9,159	

Report of Coal Transported over Lehigh Valley Railroad

For the week ending March 20th, 1869, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt
WYOMING REGION.		
Franklin Coal Co	....	13,895 18
Andenried	....	
Lehigh and Susquehanna	....	
Germania Co	....	
Wilkesbarre Coal & Iron Co		595 15
Warrior Run	475 04	5,495 06
Parrish & Thomas	51 17	3,062 13
New Jersey	361 01	4,334 10
Union Coal Co	....	....
Wyoming Coal & Transportation Co	54 15	11,044 03
Newport Coal Co	....	....
Morris & Essex Mutual Coal Co	....	....
Consumers		
Everhart Coal Co	....	....
Plymouth Coal Co	....	....
Hillman & Son	379 05	5,473 16
Bowkley, P & Co		44 18
Mineral Spring	247 09	8,404 03
Valley Coal Co	....	....
Enterprise Colliery	1,991 08	25,961 07
Burroughs	485 09	9,524 16
Washington Coal Co	....	....
West Pittston	....	180 16
Barclay Coal Co	....	....
Shawnee	492 12	5,273 17
Consumers Coal Co	99 10	4,890 02
Chas. Hutchinson	157 12	242 05
Harvey & Bro	157 17	1,367 17
Wyoming Valley	596 19	6,557 17
Henry Colliery	....	
Fall Creek		....
New England	571 13	6,434 19
Delaware & Hudson Coal Co	46 10	4,804 04
Maltby Colliery	....	1,323 09
Gaylord Colliery	....	
Butler, H S M		
Tompkins	28 09	627 19
Chauncey Colliery	75 01	5,083 04
Ravine Colliery, P & E	....	
Maryland Anthracite		415 11
Rough & Ready		291 06
Rock Tunnel		
Butler Colliery	54 15	3,835 09
Other Shippers	....	29 06
Total Wyoming	6,307 05	129,195 02
Same time last year	4,865 07	72,727 13
Increase	1,441 18	56,467 09
Decrease	....	
HAZLETON REGION.		
Central Coal Co	....	....
Ashburton Colliery, R. R. Carter	227 12	4,974 08
Mount Pleasant	572 18	5,203 16
Hazleton	4,583 07	62,814 09
Stockton—East Sugar Loaf	3,408 15	45,680 09
Mount Hall	....	....
Latimer (A Pardee, Jr., Bro & Co.)	1,674 00	24,521 15
Stout Coal Co	925 15	13,008 07
Harleigh	1,948 06	28,982 06
Evervale Coal Co	1,896 05	22,861 17
Jeddo, (G B M & Co)	8 05	38,364 04
Woodside, J C Co	258 03	4,986 15
Highland Coal Co		4,347 07
Cross Creek	705 15	11,341 03
Council Ridge	2,355 15	37,381 05
Buck Mountain	518 10	21,004 05
Other Shippers	....	114 10
Total Hazleton	19,083 01	325,586 05
Same time last year	17,917 07	260,820 18
Increase	1,165 14	64,765 14
Decrease	....	.. .
UPPER LEHIGH REGION.		
Upper Lehigh Coal Co	285 04	5,708 05
Same time last year	882 19	19,207 13
Increase		....
Decrease	587 15	13,499 08
B. M. REGION.		
Spring Brook	1,676 05	13,180 15
Honey Brook	1,141 17	22,871 02
German Pa. Coal Co		5,659 09
Spring Mountain	1,510 08	26,928 18
Coleraine	1,884 15	17,599 03
B. Meadow, D. W		61 01
John Connery		
Lehigh Zinc Co		
Stafford D W		594 06
Other Shippers	11 06	170 10
Total B M Region	6,271 11	87,059 04
Same time last year	6,403 06	93,094 18
Increase	....	....
Decrease	131 15	6,035 14
MAHANOY REGION.		
Mt Rose Coal Co		300 01
Mount Etna		
Mahanoy Colliery	1,061 17	5,937 02
Coplay Colliery	1,314 10	11,779 15
Glendon Colliery	225 05	4,993 04
Primrose Colliery	....	6,968 19
E S Silliman	1,438 15	7,801 14
McNeal Co		1,605 07
Knickerbocker	222 18	2,859 19
Thomas Coal Co	....	
Mammoth Vein	....	997 18
New Boston Coal Company	654 04	6,402 11
[illegible]	178 14	613 16
Shamokin Coal Company		
Caledonia [illegible]	1,753 15	3,927 18
Richards & Humphreys	35 00	35 00
Other Shippers	....	9 17
Total Mahanoy	6,884 19	54,173 00
Same time last year	6,990 05	94,986 08
Increase		....
Decrease	105 06	40,813 08

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.	PREVIOUSLY Tons. Cwt.
Total Mahanoy	6,884 19	54,173 00	47,288 01
Total B. Meadow	6,271 11	87,059 04	80,787 13
Total M. Chunk		82 08	82 08
Total U. Lehigh	295 04	5,708 04	5,413 01
Total Hazleton	19,088 01	325,586 05	306,503 04
Total Wyoming	6,307 05	129,195 02	122,887 17
Total	38,842 00	601,753 19	563,911 19
To L. & S. R., at Penn Haven for r'l.		4,174 00	4,174 00
Do. for Canal		4,184 06	4,184 06
At Mauch Chunk for canal		2,259 07	2,259 07

Total Anthracite	38,842 00	612,371 12	573,529 11
Susquehanna region Bit. Coal, F. C'k.		552 03	552 03
Total by rail and canal	38,842 00	612,923 15	574,081 15
Same time last year	37,074 04	549,136 00	512,061 16
Increase	1,767 16	63,787 15	62,019 12
Decrease			....
Forwarded east from M. Chunk by r'l	36,107 13	579,587 00	543,479 07
Same time last year	37,059 04	540,837 03	503,777 19
Increase		38,749 17	39,701 08
Decrease	951 11	....	....
RECAPITULATION.			
Forwarded east from M. Chunk by r'l	36,107 13	579,587 00	543,479 07
Delivered at Mauch Chunk	16 08	453 02	436 19
Del. on line of r'd above M. C'k	293 17	3,585 06	3,291 08
Del. ab. M. C. for use of L. V. railr'd.	599 09	15,184 00	14,584 11
To L. & S. r'd at Penn Haven for rail		4,174 00	4,174 00
Do. for shipm't by canal.		4,184 06	4,184 06
At Packerton	182 11	1,854 07	1,671 16
At M. Chunk for shipment by canal.		2,259 07	2,259 07
To N. C. R. R., at Mt. Carmel	1,642 07	1,642 07	
Total	38,842 00	612,923 15	574,081 15

Lehigh and Susquehanna Railroad.

Report of Coal shipped for week ending March 20, 1869.

WHERE FROM	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt
WYOMING REGION.		
Newport Coal Co	....	
Albrig'ton, Roberts & Co	....	385 18
New England Coal Co		21 07
Morgan Mines	....	
Warrior Run Mining Co	....	
Parrish & Thomas	....	3,579 01
New Jersey Coal Co	291 14	3,169 11
Gaylord Mines	....	
Delaware & Hudson Canal Co	1,818 03	13,943 16
Lehigh & Susquehanna Coal Co	....	
Germania Coal Co	816 04	4,572 02
Franklin Coal Co	....	
Andenreid Improvement Coal Co	....	
Wilkesbarre Coal & Iron Co	5,329 07	50,266 08
Union Coal Co	....	
Mineral Spring Coal Co	188 17	3,441 05
H. B. Hillman & Son	317 13	1,395 05
Bowkley, Price & Co		682 19
Wyoming Coal & Transportation Co		1,108 08
Henry Colliery	567 06	3,309 10
J. H. Swoyer		
Everhart Coal Co		5,923 16
Morris & Essex Mutual Coal Co	....	
Shawnee		1366 13
Pine Ridge Colliery		3,256 09
Lances Colliery		200 07
Consumers Coal Co		
Harvey Brothers	....	
Lehigh & Luz. Coal Co	943 03	10,201 09
Other Shippers		
Total Wyoming Region	10,253 18	107,285 13
UPPER LEHIGH REGION.		
Upper Lehigh	2,745 18	34,391 03
Other Shippers		
Total Upper Lehigh Region	2,745 18	34,391 03
HAZLETON REGION.		
A. Pardee & Co	143 19	430 16
Linderman & Skeer		25 05
Sharpe, Weiss & Co		205 17
Wm. Taggart	11 07	254 11
Harleigh Coal Co		127 05
G. B. Markle & Co	25 10	182 12
Ebervale Coal Co		99 01
Stout Coal Co		99 13
Buck Mountain Coal Co		
Coxe Brothers & Co		83 03
Ashburton Coal Co	....	
Highland Coal Co		
Pardee Brothers & Co	37 03	63 05
Jeddo Coal Co	14 18	133 15
Mount Hall (J. S. S.)	....	
R. R. Carter	16 10	33 14
Other Shippers	....	73 14
Total Hazleton Region	256 06	1,606 13
MAUCH CHUNK REGION.		
Lehigh Coal & Navigation Co	....	
Summit Mines	3,114 03	40,391 17
Room Run Mines		5,994 17
Other Shippers	....	
Total Mauch Chunk	3,114 03	46,386 14
" Mauch Chunk Region	3,114 03	46,386 14
" Hazleton	265 06	1,606 13
" Upper Lehigh	2,745 18	34,391 03
" Wyoming	10,253 18	107,285 13
Grand Total	16,379 05	189,670 03
Corresponding week last year	9,475 09	61,579 08
Increase	6,903 16	128,090 15
Decrease	....	....
Forwarded South from Mauch Chunk by Rail	15,030 03	171,115 13
Delivered on line of L. & S. R. R. ab've M'ch C'k.	756 05	7,651 19
Delivered to Lackawanna & Bloomington Railroad at Plymouth Bridge	535 19	6,004 10
Delivered to L. V. R. R. Co, at Sugar Notch	56 18	4,898 01
Delivered at Coal Port for shipment by canal		....
Total	16,37905	189,670 08

At Philadelphia, March 24, 1869.

Lehigh L'p and St'mb't.	7 00	" Egg and Stove.	
" Broken and Egg.	6 50	" Chestnut	
" Stove	7 00	Locust Mount Lump	4 75
" Chestnut	6 25	" Steamboat.	4 75
Schuylkill R. A		" Broken	4 75
" Chestnut		" Egg	4 75
" W. A. Lump		" Stove	5 00
" Broken		" Chestnut	4 50

SPECIAL COALS.

Lorberry Coal	5 00	5 50	Burnside R. A. Egg & St.		5 00
Shamokin	4 75		Powelton Coal Co	5 00	
Franklin, (Lykens Val.).		5 25	Hill & Harris, Egg & St.		4 50
Broad Top		5 00	Henry Clay, Egg & St.	4 50	4 75

Dealers in these coals may be found in our advertising columns.

Powelton Coal at Philadelphia, March, 1869.

Powelton Egg and Stove	$5 00	Powelton Gas	$7 80
Powelton Semi Bituminous	5 00		

Scranton Coal at Elizabethport, March, 1869.

(Corrected weekly by D. L. & W. R. R. Co.

Lump	4 75	....	Egg	4 75	....
Steamer	4 75	....	Stove	5 00	....
Grate	4 75	....	Chestnut	4 25	....

Prices for Pittston Coal at Newburgh, March, 1869.

(Corrected weekly by Penna. Coal Co.)

Lump, per ton, 2240 lbs.	4 50	Egg " "	4 60
Steamer, " "	4 50	Stove " "	4 90
Grate " "	4 50	Chestnut " "	4 40

70c. Freight to New York.

Lackawanna at Rondout, March, 1869.

Lump	4 60	....	Egg	4 70	....
Steamer	4 60	....	Stove	4 90	....
Grate	4 60	....	Chestnut	4 00	....

65 cents Freight to New York.

Lehigh Coal at Mauch Chunk.

March, 1869.

Lehigh L'p and Steamboat	$3 50	Stove	$5 25
Broken and Egg	3 50	Chestnut	4 75

$2 35 Freight to Philadelphia.

Lehigh Coal at Elizabethport, March, 1869.

Lump	6 00	....	Stove	3 75	....
Steamboat and Broken.	5 00	....	Chestnut	3 25	....
Egg	5 00	....			

50c. Freight to New York.

Wilkesbarre Coal at Hoboken, March, 1869.

(Corrected by Wilkesbarre Coal & Iron Co.)

Lump	4 75	....	Egg	4 75	....
Steamer	4 75	....	Stove	5 00	....
Broken	4 75	....	Chestnut	4 50	....

45 cents Freight to New York.

At Baltimore, March, 1869.

Wholesale prices to trade.			Trevorten R. A.	$6 25	6 50
Wilkesbarre by cargo or car load	$6 60	@6 80	By retail, per ton of 2,240 lbs., delivered	8 75	9 25
Pittston and Plymouth.	6 25	6 75	Georges C'k & Cumberland f. o. b. at Locust Point for shipping	....	5 00
Shamokin R., or W. Ash	6 25	6 50			
Lykens Valley, R. A.	....	6 85			

At Havre de Grace, Md.

Cargo prices for shipment *south* of Patapsco River, (drawback allowed of 10 per centum.)	Shamokin R. or W. Ash. $.... @....
Wilkesbarre and Pittston W. Ash $.... @....	Lykens Valley R. A. ....
	Trevorton R. A. ....

At Georgetown, D. C. and Alexandria, Va.

George's Creek and Cumberland f. o. b .... @4 75

Prices of Gas Coals.

March, 1869.

PROVINCIAL. Duty, $1 25	Coarse. Gold.	Slack. Gold.	AMERICAN.	Coarse. Currency.	Slack. Currency.
Block House	$1 75 @$	75	Westmoreland Co	$8 50	$8 00
Gowrie	1 75	75	Despard Coal Co	8 50	8 00
Lingan	1 75	75	Penn	8 50	8 00
Sydney	2 13¾	71¼	Newburgh Orrel Gas.	8 50	8 00
Pictou	2 13¾	1 18¾	West Fairmont Gas Coal		7 00
Little Glace Bay	1 75	1 00	Powelton Gas Coal.	8 00	7 00
Caledonia	1 60	75			

Prices of Foreign Coals.

March.

Duty, $1 25 per ton.

Corrected weekly by PARMELEE BROS., 32 Pine Street, N. Y.

Liverpool Gas Caking	$ 9 50	Liverpool House Cannel	18 00	19 00
" " Cannel	14 00	" " Orrel.	16 00	18 00

Per ton 2240 lbs., Ex. ship.

PRICES FROM YARD.

Liverp'l House Orrel, scr'd..$16@18 | Liverp'l House Can'l, scr'd $18 00 20 00

Per ton 2000 lb., delivered.

Coal Freights.

(Corrected Weekly).

Freights on Coal Sea-borne from Port Richmond, Philadelphia.

March 18, 1869.—From Philadelphia and Reading R. R. Wharves, Phila., to

Bangor	....		New London	— —	1 80
Boston	2 00	2 50	Dover	— —	2 50
Providence		2 00	Cohasset Narrows	— —	2 50
Lynn and discharging		2 50	Cambridgeport	— —	2 75
Portland	2 00	2 50	Dorchester	— —	2 50
Fall River	2 00		Fair Haven	— —	2 00
New Bedford		2 00	Gloucester	....	2 75
Salem	....	2 50	Lawrence	— —	3 00
Newport	— —	2 00	Old Cambridge	— —	2 53
East Cambridge	— —	2 50	Saco	— —	2 75
Newburyport	— —	2 50	Roxbury	— —	2 75
Portsmouth	— —	2 50	Salisbury	— —	2 75
Charleston	1 75	2 00	Greenport	— —	2 00
Danversport and discharging		2 50	Norwich	— —	2 00
Amesbury	— —	2 75	Harlem	— —	1 45
Beverly	....	2 50	New Rochelle	1 80	1 40
Charlestown	....	2 50	Sag Harbor	— —	1 50
Hingham	....	2 50	Spuyten Duyvel	— —	1 35
Marblehead	....	2 50	Williamsburg	— —	1 35
Nantucket	— —	2 50	Jersey City	— —	1 35
Plymouth	— —	2 50	New Brunswick	— —	1 20
Provincetown	— —	2 25	Alexandria	— —	1 25
Washington	— —	1 40	Fredericksburg	— —	2 00
Calais	— —	2 75	Wilmington, Del	— —	75
Machiasport	— —	2 75	Bath	....	2 50
Hoboken		1 35	East Greenwich	....	2 00
Hyannis		2 25	Albany		1 95
Malden		2 75	New York		1 35
Nahant and discharge		2 50	Troy		1 95
Weymouth and towing		2 50			

Provincial Freights.

TO NEW YORK.		TO BOSTON.	
Sydney	$	Sydney	$
Lingan		Lingan	
Cow Bay		Cow Bay	
Port Calidonia		Port Calidonia	
Little Glace Bay		Little Glace Bay	

From Elizabethport and Port Johnson.

Albany	$....@	— —	New London	$1 25	— —
Boston	1 75	2 25	Newport	1 40	— —
Bridgeport	1 15	— —	New York	50	— —
Fall River	1 40	— —	Norwalk	1	— —
Hartford		— —	Norwich	1 30	— —
Hudson		— —	Pawtucket and towing		— —
Wareham		— —	Portland	1 75	
Middletown		— —	Portsmouth	2 00	
New Bedford	1 55	— —	Providence	1 40	— —
Newburyport	2 00	— —	Salem	1 75	— —
New Haven	1 15	— —	Augusta	3 00	— —
			New Orleans	2 70	2 80

Foreign Freights.

New Castle and Ports on Tyne....£15@£18 keel.

Liverpool....12s. 6d.@15s. ton.

Australian	9 50@10 00		Lehigh	15 50@16 00	
do. Wallsend	10 00	10 50	Liverpool	13 00	....
Bellingham Bay	11 00	....	Pittston, ton	14 50	15 00
California	7 00	9 00	Scranton	14 00	15 00
Cumberland cks	30 00	32 00	Scotch	13 00	....
do bulk	28 00	..	Vancouver Island	12 50	....
Chili	10 00	..			

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

At New York, March 10, 1869.

Schuylkill R. A., choice	$....	$....	Schuylkill Chestnut	$....	....
" Ordinary	....	....	Lehigh W. A. L'p old Co.	....	6 05
" W. A. Lump	....	...	" Broken	....	5 25
" Steamboat	....	....	" Egg	....	5 25
" Broken	....	....	" Stove	....	5 25
" Egg	....	....	" Chestnut	....	4 70
" Stove	....	....	Shamokin	....	4 75

SPECIAL COALS.—DEALERS' QUOTATIONS.

Diam'd Vein R. A., Sch'kill	....	....	Old Co.'s W. A. Lehigh.	6 00	5 25
Locust Dale W. A., "	..	..	Mt. Pleasant	6 00	5 25
Honey Brook " Lehigh	5 25	6 00	Buck Mountain		
Harleigh " "	5 25	6 00	Fulton	5 50	6 50
Spring M'n " "	5 25	6 00	Stout	5 50	6 50
Sugar Creek " "	5 25	6 00	New England Red Ash.		....
Sugar Loaf " "	5 25	6 00	Wyoming	6 00	....

Dealers in these Coals may be found in our advertising columns.

Rates of Transportation to Tide Water.

[BY RAILROAD.]

To Port Richmond, Philadelphia.

Philadelphia and Reading Railroad, from Schuylkill Haven....$2 00

The following are the drawbacks allowed on all coal shipped East of New Brunswick and South of Cape Henry, until further notice.

	Drawback.	Freight.	Nett
Lump	90	$2 ..	$1 10
Steamboat	90	2 ..	1 10
Broken	70	2 ..	1 30
Egg	70	2 ..	1 30
Stove	50	2 ..	1 50
Chestnut	70	2 ..	1 30

From Port Carbon, 8 cents per ton more.

To Elizabethport.

L. V. Railroad from Mauch Chunk to Easton	$ 1 04
C. R. R., N. J., Easton to Elizabethport	1 55
	2 59
Shipping Expenses at Elizabethport	25
Total	2 84

To Port Johnson.

L. V. R R	$ 1 04
C. R. R. of N. J	1 68
Shipping Expenses	25
Total	2 92

To Hoboken.

L. V. R.R	1 04
Morris & Essex R.R	1 68
Shipping Expenses	25
Total	$2 91

London Copper Trade Circular.

Messrs. Vivian, Younger & Bond, under date of March 5, write:—"There has been more animation in West Coast produce, and a fair number of transactions have been effected. About 1,200 tons of Chili bars were sold, the bulk of which were at 72l. cash, and 73l. arrival; also 225 tons of Lota ingots, reported at 74l. About 900 tons of ores of 18 per cent. to arrive in Liverpool fetched 14s. 7½d. per unit, whilst one cargo (400 tons) of regulus was done at 14s. 9d., and two cargoes (together 800 tons) at 14s. 6d. per unit. The market closes with a better tendency, and there are strong buyers of good brands of bars at 72l. cash, without any holders being found to meet the price. English raw and manufactured, also fine foreign, have been in small demand."

Something Like a Rope.

Aris's *Gazette* says: "Some time ago, we noticed, from an American paper, the manufacture of the largest rope in the world. If we remember rightly, that rope weighed just twenty tons. A rope is now being manufactured at the Universe Works, of Messrs. John and Edwin Wright, Birmingham and London, which completely eclipses all previous achievements, literally speaking, in the same line. It is round wire rope, 5 1-4 inches in circumference, 11,000 yards long, and weighing upwards of sixty tons. The rope consists of six strands, ten wires in each strand, and each wire measuring 12,100 yards. The whole length of wire is 726,000 yards, or 412 1-2 miles; the six strands surrounding a hemp centre of 27 threads of rope yarn being made from Petersburgh clean hemp, each thread measuring 15,000 yards, or a little over 230 miles. On the completion of the manufacture the rope finally receives a good coat of composition of Stockholm tar and boiled linseed oil.

The rope is made from Messrs. Webster and Horsfall's patent charcoal wire, manufactured at Hay Mill, near Birmingham. The wire is all tested, and is guaranteed by the contract not to stretch more than six per cent. at furthest, without breakage.

The samples which we saw tested, after a tremendous strain, broke just at four per cent. The hempen portion of the French Atlantic Cable is now in process of manufacture by the same firm, Mr. Horsfall supplying a large portion of the iron wire."

—Baer, an eminent German physician and oculist, says that blue eyes are capable of supporting a much longer and more violent tension than black ones. The strength and duration of the sight depend on the different color of the eyes, and that depends upon a greater or less degree of clearness of the pupil, as the defects of the sight depend on a color more or less dark.

It results that in this point of view blue eyes are infinitely better than black. The former, therefore, possesses in a more eminent degree than the latter the perfections adapted to their functions. The same author has also remarked that black eyes are more subject to cataracts; and he also observes, that out of twenty persons with black eyes, you find not one that is perfectly satisfied with them. In this particular, then, it must be admitted that blue eyes are better adapted to their purpose than black ones. Baer, we think, must be blue-eyed.

—The La Salle *Press* says: Messrs. Matthieson & Hegeler, of La Salle, Illinois, consume one hundred tons of coal every twenty-four hours, at their zinc works. We understand that these gentlemen intend to sink a coal shaft for their own express use. They are enlarging their works by building new furnaces, and will soon put up a foundry, machine shops, and other buildings, which are needed to accommodate them in the immense business they are carrying on. The zinc works of these gentlemen are destined to be the most colossol of any manufacturing works in the West.

— When writing by common ink has become faded by age so as to be nearly or quite illegible, it may be restored to its original hue by moistening it with a camel's hair pencil or feather dipped in a tincture of galls, or a solution of ferro-cyanide of potassium, slightly acidulated with hydrochloric acid. Either of these washes should be very carefully applied, so that the ink may not spread.

— A good varnish for maps, charts, engravings, etc., is made from two parts of spirits of turpentine with one part of Canada balsam, when the paper has been sized over with a solution of gelatine in water, to prevent the varnish from striking through.

— The largest school of applied science in the world is the Ecole Centrale des des Arts et Manufactures, in Paris. It has 500 pupils, and the number of applications is always twice as large as the number of vacancies. The period of study occupies three years. It is thoroughly adapted to industrial science. The heads of the subjects of the first and second years are applied mechanics; the construction and erection of machinery,; analytical industrial, and agricultural chemistry; natural philosophy in application to the arts: metallurgy, mineralogy, geology and mining.

Among 2,000 young men who have left this school, the career of 1,394 has been recently traced, and the issue was this: 247 had died, while of the others 480 were engineers or superior officers of railroads; 54 were mechanical engineers; 124 were iron iron masters; 280 manufactures of considerable eminence; 55 architects; 35 contractors for public works; 42 professors of the applied sciences. The rest filled honorable posts in trade or in the service of the French or foreign governments.

Special Notices.

Globe Gold and Silver Mining Company.

The reader will find published elsewhere the advertisement of this company, offering a portion of its stock for sale. The mines of Alpine County, California, have attracted considerable attention of late, and the Globe Company—one of the most recent organizations in that locality—is particularly distinguished for the enterprise of its management.

We see by the *Alpine Miner*, published in that locality, that the work is being vigorously pushed at the mine, and definite results may soon be expected.

AMERICAN

Journal of Mining.

WESTERN & COMPANY, Proprietors

ROSSITER W. RAYMOND, Editor.

OFFICE, 37 PARK ROW, NEW YORK.

By publishing contributions, the JOURNAL OF MINING does not necessarily endorse the positions assumed by contributors.

Published Every Saturday Morning.

TERMS.—SUBSCRIPTION, $4 00 per annum, in advance; $2 25 for six months. Single copies, Ten Cents. New York City subscribers are required to pay 50 cents a year extra for delivery. ADVERTISING: Twenty-five cents per line of nine words for each insertion inside, and forty cents outside. Terms invariably cash in advance.

DESIGNING, LITHOGRAPHING
WOOD ENGRAVING, and JOB PRINTING

Executed in elegant style, on reasonable terms.

NEW AGENCY.—GEO. E. CUMMINGS has been appointed our sole agent in Philadelphia, Pa., for the AMERICAN JOURNAL OF MINING, our new paper, the MANUFACTURER AND BUILDER, and our Spanish paper, EL CORREO HISPANO-AMERICANO. His address is 154 South Fourth street, Philadelphia, Pa., where all information respecting communications, subscriptions and advertisements for these papers will be gladly given to those who may wish to favor us with a call.

In making remittances for subscriptions, always procure a draft on New York, or a *Post Office Money Order*, if possible. Where neither of these can be procured, send the money, *but always in a registered letter*. The registration fee has been reduced to *fifteen cents*, and the present registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail *All* Postmasters are obliged to register letters whenever requested to do so.

☞ Correspondents, exchanges and others addressing us should be *extremely careful* to write "JOURNAL OF MINING," instead of "MINING JOURNAL," and to give the number of our Box at the Post Office, which is 5969, to ensure safe carriage. Communications intended for publication should be plainly written, and on one side of the paper only.

NEW YORK, SATURDAY, MARCH 27, 1869.

CONTENTS OF THIS NUMBER.

NOTICE TO CORRESPONDENTS.

In consequence of a new regulation recently adopted by the Postmaster of this city to facilitate the early delivery of mail matter, we have to request our correspondents, in addressing us, to give the number of our post-office box, No. 5,969, in lieu of, or in connection with our business office address.

SPECIAL NOTICE.

We learn from the publishers of the private edition of Mr. RAYMOND'S Report to the Secretary of the Treasury on the Mines of the West that the price of the book is $1 75, instead of $1 50, per copy, as was erroneously announced in our editorial columns last week. We are ready to send the report, post-paid, to any part of the country, on receipt of the above price.

WESTERN & COMPANY,
37 Park Row, N. Y.

PERPETUAL MOTION—FORCE, ENERGY, ETC.

We remarked lately, in speaking of the proper use of the words weight, force and power, that the majority of all attempts at perpetual motion originated in the confusion of *pressure* with *force*, and the consequent conclusion that simple pressure could produce a force which could be used to drive machinery. A correspondent (A. F., of N. Y.) in a letter published in a recent number, protests against this remark, and says that "people who have studied and who understand the works of RANKINE, will never be led into such an error as the one quoted, and will not be caught in search of perpetual motion." To this we reply that the seekers after perpetual motion do not belong to the class of people who have thoroughly studied mechanics. The latter will, of course, not be so foolish as to be misled even by the improper use of terms to which they have become accustomed; but it is the ignorant who take words for things, and on the supposed authority of RANKINE and others, imagine that a certain number of pounds, or a spring, because they exert a pressure, really constitute a force—in other words, that they can drive machinery by simple pressure. We have been personally consulted, during the last ten years, by eleven different persons, who supposed they had discovered perpetual motion; and, of these eleven, no less than nine had based their inventions on his fundamental error, imagining that simple pressure or attraction would produce the perpetual force. Our statement was, therefore, founded on experience.

What we desire is simply that the word force should always be used in the same sense. As the matter now stands, this word is employed in books on mechanics in two very different significations: first, in its common acceptation, as, for instance, "force driving machinery;" and secondly, as synonomous with pressure, as our correspondent uses it when he says: "the force most convenient for measuring other forces is gravity. A pressure, the tension of a spring or rope, the attraction of a magnet, etc., are not 'matter,' although they can be expressed and measured in pounds." To this we reply that pressure, tension of springs or magnetic attractions, strictly speaking, cannot be numerically expressed and measured in terms of matter, but rather in terms of the pressure exerted by a certain amount of matter, acted upon by gravitation.

We have then either to drop the use of the word force in the common acceptation of the word, and speak no more of "force driving machinery," or we have to drop its use as a measure of simple pressure and speak no more of a "force of 20 pounds." We have chosen the latter alternative.

Our correspondent further gives an illustration of "work," instancing 500 bags of flour to be lifted 40 feet, as a "fixed amount of work, which may be expressed in foot-pounds, independent of time." According to his previous communication, he prefers, with RANKINE, the term energy for foot-pounds, and therefore he would say, "I have some *energy* to do, 500 bags of flour to carry up 40 feet high." Now, we maintain that time is a necessary element here, its amount may be undefined, left *ad libitum*, but it enters in the idea of work performed, and cannot be made infinitely long. Therefore, the "eminent Professor" we mentioned would decidedly say: "I have some *work* to do," or "I want a certain *power* to do the job."

It may be useless to argue about words, but when words convey ideas not well defined, it is very useful to settle, once for all, what we have to understand by them. The existing books on mechanics were mostly written before the late discoveries of the conservation of force (or, as perhaps our correspondent would prefer, "conservation of energies,") and this defective use of language is therefore retained in them. We are not "attempting to overthrow a a perfectly consistent system;" we wish only that in cases where the word "force" is used in another than its ordinary sense, the words "weight, pressure," or any other which more correctly expresses the idea to be conveyed, might be substituted. We would retain the expression "paralellogram of forces" as correct; but the expression "mechanical powers" should be rejected, as we shall show in another article.

ROASTING AND SMELTING ORES IN CAKES.

The *Societe Coignet* of Paris has patented in France and England a process for treating ores which have to be roasted or smelted, by reducing them to powder and moulding them, together with the necessary carbon, lime, fluxes, etc., into blocks or cakes, by a method similar to that employed in the manufacture of COIGNET'S well-known *beton* or concrete blocks.

We doubt the originality of this idea. There is nothing new in the general plan, though there would be something very new in its economical, not to say metallurgical, success. For the purpose of roasting ores, similar attempts have been made both in Germany and in this country. An inventor by the name of MCCULLOCH, if we remember rightly, introduced something of the kind ten or twelve years ago in California. More recently, Prof. KENT'S process for desulphurizing ores was based upon a similar idea; and the same thing was tried and rejected in Germany. It seems to be well settled that nothing is more effectual in roasting than a free supply of air; and this is not secured by caking the mineral. Kernel roasting is notoriously imperfect; and the only advantage it can claim is the saving effected in the avoidance of pulverization and the substitution of cheap kilns or heaps for the more expensive reverberatory and skilled labor. But when an ore is once pulverized, the reverberatory, or, still better, the terrace furnace, would be preferable to a process which deliberately sacrifices the advantage of the pulverized condition by reconstructing the lumps which have been laboriously destroyed. The plea that in this way an intimate mixture with fluxes, etc., may be effected, is not sound. The mixture of materials used in roasting is already intimate enough in the reverberatory, and in such chloridizing furnaces as STETEFELDT'S.

For purposes of actual smelting, this process may be found useful, though we must deny it the merit of novelty, unless there is some original feature in the furnace proposed, of which we have at present no knowledge. But every practical metallurgist will doubt the economy of crushing ores simply to have the pleasure of sticking the pieces together again, when the heat of a smelting furnace will secure, under the management of average skill, all the mechanical objects desired.

THE ELLERSHAUSEN PROCESS.

This new method of reducing iron ore to pigs, without puddling, is attracting considerable attention in western New York and Pennsylvania. The Messrs. SHOENBERGER, of Pittsburgh, Pa., have arranged for the treatment of the product of their two furnaces on the Ellershausen plan, and expect great improvement in the quality of their iron. The iron is run from the blast furnace into a large ladle or "shank," the capacity of which varies from eight to twelve tons. After the iron ceases to flow from the furnaces, the contents of the ladle are run out into moulds, situated on the outer edge of a circular revolving table. During the running of the iron into the moulds, pulverized iron ore (Port Henry, Lake Champlain ore is used) is mixed with the iron in layers, alternately of ore and iron, until the moulds are full. The result is that the iron becomes generally decarbonized, and only requires heating to prepare it for the squeezer or hammer, previous to being rolled into bars.

We incline to the opinion that whatever there may be of economy or practicability in the Ellershausen process, will depend largely, if not entirely, upon the quality of the ore used. The ore of Lake Champlain is magnetic, and perhaps quite pure in comparison with others that we might name. The separation of the component ingredients of the ore, its decarbonization, the effects of sulphur and phosphorus in its texture, are matters which, in the absence of the puddling furnace, it may become difficult to manage; but if the experiment of the SHOENBERGERS shall demonstrate the practicability of the new method, it will be good news to iron-masters. Meanwhile, we should be glad to hear of experiments with the Iron Mountain, Lake Superior, or Herkimer (N. Y.) ores.

WHITE PINE.

Our private advices confirm the frequent statements in the public press, that the "White Pine fever" is on the increase. The coming summer is to witness a mining excitement far surpassing that which attended the discovery of Washoe, or Frazer's River, or anything save the original rush to California in the days of the first gold diggings. It will be of no use for us to cry, "Keep cool!" How can people keep cool when other people are getting rich? Thousands upon thousands will crowd into the White Pine country; there will be some dazzling successes and many brilliant failures. Probably every adventurer will come away either a "made" or a "busted" man. The enormous richness of the White Pine deposits is ascertained and abundantly confirmed; but the size of Treasure Hill, on which they occur, is ludicrously inadequate to the population which is hastening to mine upon it. The probable result will be a scattering of thousands of hardy and experienced prospectors over the vast belt of virgin territory of which this district forms but a small part. If the explorations of this summer result in the discovery of one or two more Treasure Hills—and there is a fair chance of such a result—the impulse given to the now somewhat languishing mining industry of the Pacific slope will be incalculable.

SULPHUR AND MERCURY.

Our neighbor, the *Scientific American*, in speaking under this head of the well-known fact that sulphur is an antidote to mercurial vapors, and will, when present, absorb them from any atmosphere in which they may exist, forming on its surface a coat of sulphide of mercury, looking like iron, recommends the casting of "statuettes, friezes, mouldings, flowers and so forth of sulphur, and the exposure of them to the vapor of mercury, and so obtain a number of articles, all wearing a metallic appearance, which may be found useful for ornamental purposes." This suggestion is unfortunately rendered useless by practical facts, as it is well known that sulphur casts can serve but a temporary purpose, as moulds for electrotyping, etc. The strongly crystalline structure adopted by the sulphur in cooling makes sulphur casts so very brittle that sooner or later they fall to pieces by the natural changes of temperature. Often the simple touch of the warm hand is sufficient to cause a statuette of sulphur to fall in fifty pieces. This may be obviated to a slight degree by careful annealing, but even then the material is exceedingly fragile.

Tribute to Science.

The nomination of Professor CHARLES W. ELLIOTT, of the Massachusetts Institute of Technology, to the Presidency of Harvard is a strong proof of the power of the new movement for the introduction of natural science into the curriculum of a "liberal education." Prof. ELLIOTT, being a young man, will be all the better qualified to command the sympathy and arouse the enthusiasm of the young men under his charge. Yet, after all, this nomination strikes us as a strange one. We are not aware that Professor ELLIOTT'S eminence, either among the scientific men of the country or among those of his own State, is such as to entirely justify this great distinction; and, while we cordially rejoice that the choice of the corporation has fallen on a member of the class to which he belongs, and congratulate him upon his nomination, we cannot help feeling that the world, or even the United States, or even Massachusetts, or even Boston, contains many votaries of science and masters of the philosophy of education, whose appointment would have seemed more natural. Perhaps the future will prove that this, like many another "irregular promotion," is justified by success. The responsibility of final choice now rests upon the overseers.

The Channel Bridge.

M. BOUTET's plan for connecting Europe and England by means of a bridge across the British Channel has been severely criticised by *Engineering* and other papers, and as warmly defended by the friends of the inventor. We have not meddled hitherto with the discussion; but we note with interest the statement that a practical demonstration of the soundness of M. BOUTET's theory is about to be undertaken in the construction of a viaduct from the French coast to the insular town of St. Malo. Of course neither the depth of the water nor the length of the viaduct would be such in this case as to present a complete analogy to the Channel Bridge; but we believe the point most vehemently assailed in M. BOUTET's plan is the mode of construction; and this might be very well illustrated by the enterprise now proposed.

NEW PUBLICATIONS.

THE MINERALOGY OF NOVA SCOTIA. *A Report to the Provincial Government*, by HENRY HOW, D. C. L., *Professor of Chemistry and Natural History, University of Kings College, Windsor, N. S., etc., etc.* Halifax: CHARLES ANNAND, 1869.

This report contains in 217 octavo pages much clearly arranged and valuable information concerning the minerals of our neighbor province. Among the incidental benefits conferred upon the world by the Paris Exposition must be included the great number of works on special scientific or practical subjects to which it has given rise. The Commissioners of the United States have presented a series of valuable papers as the result of their observations abroad; and this report of Professor How to the Nova Scotia Government may be cited as an example of the opposite class, being, mainly, a record of observations at home, called forth by the interest awakened abroad. The Honorable Mention awarded to the Professor's "Sketch of the Mineralogy of Nova Scotia, as illustrated by the specimens sent to the Paris Exhibition," aroused the home government to employ him in a more extended work, of which this volume is the very acceptable result. The report bears date June 1, 1868, and constitutes the most recent trustworthy exhibit of the subject.

VAN NOSTRAND'S ECLECTIC ENGINEERING MAGAZINE, for March, is fully equal to the numbers that preceded. Mr. HOLLEY shows himself no less skillful in his editorial work than in his original publications. Not every one has the gift to select, condense and arrange with judgment the materials of an interesting and valuable magazine. Mr. HOLLEY's success in his new sphere is well deserved. His design for the cover of the magazine is fanciful, but not effective.

TREATISE ON THE POWER OF WATER AS APPLIED TO DRIVE FLOUR MILLS, AND TO GIVE MOTION TO TURBINES AND OTHER HYDROSTATIC ENGINES. By JOSEPH GLYNN, F. R. S. *Third Edition. Revised and Enlarged.* New York: D. VAN NOSTRAND, 1869.

It is a pleasure to see an old and valued friend, like this little work by Mr. GLYNN, maintaining its well deserved popularity, and reaching a third edition besides an American reprint. The range of subjects treated in this volume is very wide, and almost all the data required in calculations relating to the flow of water; sources of supply of water; horizontal water wheels; turbines; undershot, overshot and breast wheels; water-pressure engines, and water-rams, etc., are given very fully, and in such a shape that they can be readily used by the practical man. The publishers have certainly laid both students and practical men under deep obligations by this reprint.

ANSWERS TO CORRESPONDENTS.

W. S. T., OF ILL.—Superintendent of works employing steam power, says he has tried every advertised means or substance to prevent incrustations in his boilers (the water being limey) without avail until he used white oak bark, or rather poles of that wood, and since that time he has had no trouble. He advises others using water impregnated with lime to do likewise. The connection is evident. The oak bark contains tannin and quercitic acid, which acids are well understood to combine with lime as a base, when lime is put in solution, and this compound will not attach itself to the boiler, or scale as the lime does, but remains in suspension, and may be blown off as mud. It acts on the same principle as the gum catechu, which enjoys great reputation for the same quality, also due to an acid which it contains. This acid, by boiling, is converted into tannic acid, and forms in hard water a tannate of lime which does not adhere to the vessels.

T. W. H., OF IOWA—Asks "What is the expansive force of steam when cut off at half stroke, the pressure being 80 pounds per square inch?" When cut off at half stroke the pressure at the end of the stroke would be 40 lbs. (as the steam has doubled its volume), but as expansion cools the steam the reduction in pressure is more than that, and leaves only about 30 lbs. at the end of the stroke, which gives for the mean pressure of the second half of the stroke one-half of 80 by 30 or 55 pounds; and this combined with that of the first half gives one half of 80 by 55 or 67.5 pounds. This includes the attenuation of the steam: this number, however, must be further reduced for reasons explained in some of our editorials on the cut-off valves in former numbers of this paper.

J. W. H., OF MINN.—Asks if a belt running at a speed of 2,400 feet per minute will transmit more power than the same belt running 1,600 feet per minute? We suppose that you mean that this greater velocity is obtained by using a larger pulley in the ratio of 2:3; in this case, the power transmitted will be less, namely, the power of your water engine, minus the increase of resistance due to the greater velocity; but as this increase of resistance is but small, the power transmitted will be practically about the same. If, however, you run your belt on the same pulley with greater velocity by running your engine more rapidly, of course you use more power and transmit more power. In general, a belt transmits the power of the engine, whatever that power be, and it is best that pulleys, etc., should be so arranged that the engine may run at a moderate speed.

W. M., OF CONN.—Asks if we know of any steam engine without "dead points," (single engine referred to) and if constructed simple in its parts and certain in working, would it be valuable? We have often seen such engines. Many rotary engines are without dead points, but if you can build such an engine, reciprocating as you suggest, "simple" and "certain," etc., do so by all means.

M. E. H., OF IOWA—Says he has "4,000 feet of two-inch pipe from a spring which is 30 feet higher than the delivery end, but the water rises at that point 15 feet. The pipe runs in a straight line, having a descent of 18 feet the first 1,000, the remainder level to the upright delivery." If your measures of heights are correct, and your pipe without leakage, attach a suction pump to your delivery pipe to start the water to the level of your supply. This will remove all air which may be entrapped in accidental bends of the pipe, which is the usual cause of the trouble of which you complain. When once it has reached this level you may remove your suction pump, as the level will be maintained when all air is removed.

J. H., OF N. Y.—You cannot brown your gun-barrel well with diluted nitric or sulphuric acid. The first acid will simply produce an unequal rusting; the second will not affect it at all, except that when your barrel is not clean it will merely remove the rust. The best material for browning gun-barrels is butter of zinc. It is made by dissolving zinc in hydrochloric acid, and evaporating till a drop solidifies on cooling. Three parts of this chloride of zinc is mixed with two parts of olive oil, and, after the barrel has been cleaned and warmed, it is rubbed with this ointment. Or, a mixture is made of chloride of zinc, sulphate of copper, water and a little hydrochloric acid, and this is repeatedly rubbed on the barrel.

J. B., OF PA.—Asks how many horse-powers are required to drive an 8 or 10-inch circular saw, running entirely in wood? That depends on the hardness of the wood, the thickness of the board, and the rapidity with which you wish to do the work. It may be done with a fraction of one horse-power, and it may require ten horse-power. We have seen a caloric engine, which successfully drove several printing presses and turning lathes, entirely stopped by the throwing on of one circular saw. This fact illustrates the amount of power which such a saw requires, compared with many other mechanical machines.

N. O. H., OF MINN.—The soluble glass made by melting together sand with an alkali, as soda or potash, or both, is worthless, when the sand is not in excess of the alkali; when there is more alkali than sand, it is readily soluble in 5 to 6 times its weight of boiling water, and is entirely unfit for lining cisterns. A good so-called water-glass must contain an excess of silica or sand, and be only soluble in water under high pressure in a steam boiler; but even then it has never fulfilled the high expectations once entertained concerning it.

E. M. S., OF LA.—Common blue ink is simply a solution of Prussian blue in water, to which about one-tenth part of oxalic acid has been added to prevent its settling. Aniline colors of different shades of blue, dissolved in vinegar or water and alcohol, produce divers other blue inks, which are preferable, as they do not attack metallic pens like the Prussian blue and oxalic acid inks.

C. H. P., OF ILL.—Alcohol does not answer to preserve mucilage made of gum, starch or glue, as it is soon lost by evaporation. If you use acid, it is by no means immaterial what acid you employ. Most mineral acids destroy the mucilage; acetic acid is the kind most commonly used, but carbolic acid is the best. If the odor is objectionable, any ethereal oil, as that of cloves, bergamot, etc., is effective and more reliable than alcohol.

T. T., OF N. Y.—There are now 70 substances known which are positively simple or elementary. Every new discovery in chemistry tends to prove more and more that the noble metals are elementary as well as common metals, and that none of them can be produced by the combination of other known or unknown elements.

J. E. B., OF IND.—Steam engines weighing only 16 pounds per horse-power have never yet been heard of. Such machines could drive a flying machine and carry doubly their own weight. If you have such a machine, bring it out. You have solved the great problem of flying through the air without the aid of balloons.

T. B., OF ILL.—The less the specific gravity of coal oil the more inflammable it is. There is an exact relation between the specific gravity of such oils and the temperature at which they ignite. Dr. VAN DER WEYDE, of this city, has published these facts in regard to petroleum oils in the transactions of the American Institute, and in the *Scientific American.*

N. O. H., OF MINN.—According to Dr. STENHOUSE, the deodorizing and decolorizing effect of charcoal may be considerably increased by saturating it with a very diluted solution of salt of platinum, and igniting it afterwards. The platinum is reduced and adheres to the charcoal in a very purely divided state.

I. D. S., OF IND.—It is easy to find the actual horse-power of a turbine wheel, by simply multiplying the weight of water in pounds falling every minute with the height through which it falls in feet, dividing the product by 33,000, and substracting from 10 to 15 per cent. for loss.

Original Papers.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

THE CHEMICAL OPERATIONS—XII.

BY PROF. G. HINRICHS, OF THE IOWA STATE UNIVERSITY.

19. COMBUSTION.

There are many bodies which *burn* when exposed to a more or less intense heat in the atmosphere. This process is called *combustion.*

The combustion of illuminating gas, oils, tallow, wood, coal, etc., is familiar to all; so is the combustion of sulphur and of phosphorus. But that even most metals burn is not so well known. Of those, the now common metal, magnesium, is particularly noted for the dazzling white light which it emits when burning. It is sold in the shape of ribbons or flat wires. A piece of it held by an iron wire in the flame of an alcohol lamp, or a candle, or even a single match, very quickly commences to burn. If this light is to be used for the illumination of skating ponds or public squares, the wire is, by means of a clock-work, C B, regularly pushed forward from its coils in the vessel, G, through the tube, A, where it burns in the focus of the reflector, E; the *white* metallic ash (or oxide) produced drops into the basin, F. Even iron burns with great splendor in a powerful galvanic current; the scales flying off from the white-hot iron under the hammer of the blacksmith are likewise burning iron; and steel watch-springs are burnt in the ox-hydrogen flame (which see).

98. If the magnesium is burnt very carefully, all the ashes being collected, it will be found that the ash (oxide) produced weighs two-thirds *more* than the metal burned; or three grammes of magnesium gives exactly five grammes of the oxide. Hence we see that in the combustion of this metal something is *added* to the same; and as the combustion takes place in the air, it cannot be anything but a part of the air which unites with the metal. The iron ashes likewise weigh more than the metal consumed. In the combustion of coal and sulphur the result of the combustion is a gas. We shall show afterwards that the combustion in these cases is also a *synthesis*, an addition of a part of the air to the carbon or sulphur.* We shall very soon investigate this process a little closer (see LAVOISIER's Experiments).

99. Lead, when heated in a current of air, is converted into a yellow substance called *litharge*, or, if it has been fused, *massicot*. This product must, therefore, be considered as burnt lead or *lead oxide*. The heating is performed in large *flame furnaces* (Fig. —) or reverberatories, *i, e.*, furnaces in which the flame passes from the fireplace, F, over an elevation, G, called the *bridge*, to the substance on the hearth, m m, and finally out at K. Through the openings, AA, a powerful blast is thrown in the hearth by means of bellows.

100. Silver and gold do not burn in the air—this is one of the reasons why they are called noble metals.

Much of the lead smelted from lead ores contains a small amount of silver; a few hundreths of one per cent. This *argentiferous lead* is heated as described above and subjected to a strong blast; it is thereby slowly converted into litharge, which fuses and runs off, or sinks into the porous hearth. But the silver contained in the lead, being not combustible, remains finally perfectly pure on the hearth. This process of extracting the silver from argentiferous lead is called *cupellation*; it is evidently similar to the combustion of wood—the remaining non-combustible ashes corresponding to the remaining non-combustible silver.

101. This very same operation is performed on a small scale for the purpose of ascertaining the amount of silver in ores and coins. These are first smelted for lead, or, if coins, smelted with pure lead, and the resulting mass heated on a porous *bone-ash cupel* (Fig, 46) in a so-called muffle. The weight of the silver bullion remaining and the known weight of the ore or coin taken gives the percentage of silver in these bodies.

20. DEFLAGRATION.

102. Combustion may also be produced by heating the combustible with certain solids, like nitre. Since in this case the action usually is much more energetic than when the combustible is heated in air, being mostly attended with noise or detonation, this peculiar mode of combustion is called *deflagration.* The simplest case of this kind is observed when small fragments of nitre are thrown upon a red hot piece of charcoal.

103. One case of deflagration is made use of in our modern firearms and for blasting; it is the ignition of gunpowder, which is even attended with most powerful explosion when taking place in a confined space.

Gunpowder is usually an intimate mixture of one part of sulphur and one part of soft charcoal with six parts of nitre. The mixture of sulphur and charcoal would burn gently in the air; but mixed with nitre, so as to constitu gunpowder, the combustion takes place with the well-known evolution of sudden force.

104. In the laboratory, deflagration is often performed for the peaceful purpose of converting an insoluble substance into a soluble one, and for several tests.

21. REDUCTION.

105. This is the reverse of combustion, or the reproduction of the metal from its oxide (the burnt metal). It will be remembered that reduction in the wet way was produced by the insertion of a *more soluble* substance into the metallic solution; here we will similarly have to mix the metallic oxide with some substance being *more combustible* than the metal. Cheapness and the formation of a gaseous product of combustion make *carbon* (charcoal or coal) the most universal agent of reduction in the dry way. Still it cannot reduce all metallic oxides; for example, since magnesium is more combustible than charcoal, the latter cannot reduce the white magnesium oxide to metallic magnesium.

Fig. — (omitted) represents the so-called *blast-furnace* used for the reduction of iron from those ores which correspond more or less to the product obtained by burning iron (and which will be described under the head of the native oxides). The iron blast-furnace is a double cone, 18 feet in diameter at the widest part, B, and 50 feet high, built of the best fire-brick. The ore and charcoal are thrown in at the top, D, so as to form alternate layers in the furnace; a powerful blast is blown into the mixture through the tuyeres, C, in order to produce the necessary heat. On the hearth, G, the *metal* and *slag* collect. The impurities of the ore and a proper *flux* (see operation 15) added with the ore, produce an easily fusible slag, which is continually flowing off. The heavier metal being under the slag, is at intervals tapped from near the bottom of the hearth. Here the carbon (coal) reduces the iron oxide (ore) to iron.

The iron thus obtained contains about five per cent. of

* The ashes remaining after the combustion of coal are merely the incombustible impurities of the coal.

carbon, and is called *pig* or *cast iron*, being used for casting purposes.

106. That iron really is much less combustible than carbon is now practically demonstrated on an immense scale in the Bessemer process for the manufacture of steel.

Steel is iron containing about two per cent. of carbon. Hence, in order to *convert* the cheap pig iron into the expensive steel, we need only to remove about three per cent. of its carbon. For this purpose, BESSEMER smelts several tons of pig iron (often taken directly from the blast-furnace) in large iron retorts, A, called *converters*. When molten, he forces air through the fused iron from a pipe, P; at the high temperature of the fused iron, the air will *burn* all the carbon and also a part of the iron, together with any of the impurities. When all the carbon is burnt out, enough of the same pig iron is added to introduce again sufficient of carbon to make steel of the proper quality. By means of machinery the converter is now turned over in the direction of the arrow, the steel poured into an iron bucket, B, and cast into the forms desired. By this process six tons of cast iron can at one operation be converted into excellent steel in about twenty minutes, making steel sufficiently cheap to be applied for rails on railways, for boiler-plates, bridges, etc.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

THE EFFECT OF LIGHT ON MINERAL OILS.

BY DR. A. OTT.

HERR GROTOWSKY, of Halle, on the Saale, contributes some interesting communications to a German periodical on a new property of hydro carbon oils, which he has discovered. Exposing various kinds of oils in glass flasks to the rays of the sun for a period of three months, he found invariably that they absorbed oxygen and converted it into ozone. The air was ozonized even in well corked vessels, the effect being, however, to some degree dependent upon the color of the glass. The respective results were noted after the lapse of three months. Before enumerating them, it is perhaps appropriate to remark, that by the term "photogen," oils from peat or bituminous coals are meant, which distil between 212 and 552 degrees Fahr., and possess a specific gravity of from 0.795 to 0.805. The term "solar oil" is given by the Germans to oils having a specific gravity of from 0.830 to 0.835, and distilling above the temperature of 550 degrees Fahr. The former is burned in lamps adapted for that object, while the latter is burned in Argand or Carcel lamps.

The observations of Herr GROTOWSKY are as follows:

1. Photogen and solar oil stored in barrels and cisterns, which were lined inside with iron, remained free from ozone and burned faultlessly.

2. Photogen and solar oil which had been kept in balloons of white glass wrapped in straw, showed traces of ozone, but otherwise burned well. In this case, both the color of the oil and that of the cork were found to be slightly changed.

3. Photogen and solar oil in balloons of white glass which were painted black outside, showed only traces of ozone. The oils were still less changed than in experiment No. 2. The corks were not bleached.

4. Solar oil and photogen, which had been kept out of doors in unwrapped white glass balloons, gave strong indications of ozone. They burned very badly, charred the wicks and nearly extinguished the flame after burning for six or eight hours. The solar oil was strongly colored yellow, and showed an increase of 0.003 in specific gravity.

5. Solar oil which had been exposed to the light in unwrapped balloons of green glass, gave also strong indications of ozone. Nevertheless, though the wick was charred it burned well. The color has been but little changed.

6. Solar oil, kept in green balloons, painted black, was found to contain some ozone. It burned, however, perfectly well.

7. Solar oil in green balloons, wrapped in straw, showed only traces of ozone. It burned like the foregoing. Color slightly changed.

8. American kerosene, from petroleum, which has been exposed to light in white unwrapped glass balloons, had become strongly ozonized, so much so, that it scarcely burned. The originally bluish white oil had assumed a vivid yellow color, and the specific gravity was found to have increased 0.005.

9. American kerosene, which had been kept in the dark or three months, did not show any ozone at all, and burned satisfactorily.

The oils were exposed from April to July, 1868. Those which had become strongly ozonized, had also suffered a distinct change in odor, and the corks were bleached as if attacked by chlorine, while the other oils had remained unchanged in these particulars.

AMERICAN INSTITUTE.

Proceedings of the Polytechnic Association.

PROF. S. D. TILLMAN, IN THE CHAIR.

DEODORIZERS, DISINFECTANTS AND INSECT DESTROYERS.

Mr. MASON was introduced by the chair and gave a minute description of the modern compound of carbolic acid and camphor, which was mentioned at the last meeting. The formula for its preparation is: 2 oz. camphor; 1 oz. carbolic acid in crystals. The mixture becomes liquid, and in order to produce a dry powder 13 oz. of prepared chalk are mixed with the above quantity of the other ingredients. One pound of dry powder is thus produced. This powder is a very efficient deodorizer and disinfectant, and is also valuable as being destructive to insects. It might be used by ladies for preserving furs, and a little of it might be sprinkled under the cushions of our city car seats with good results.

Several gentlemen here examined the material, and thought that they could still perceive the odor of both camphor and carbolic acid. The chair remarked, however, that both were very much diluted.

Dr. PARMELEE wished to caution the meeting against too free a use of camphor. It is rather a dangerous substance. He could see no advantage in using crystals of carbolic acid. Why go to the expense of first reducing the carbolic acid to crystals and then dissolving it. Why not use a solution at once?

Mr. STETSON asked if there was any known substance which was poisonous to noxious insects, and yet did not harm the higher animals? We have frequently heard of poison for bugs, etc., which is harmless to man, and also of poison for rats which will not destroy our domestic animals. Does any one know if there is anything true in this?

Mr. PHIN.—In regard to ordinary poisons, we believe it is pretty well settled that what will kill a rat will kill any other animal of its size. The phosphorus paste used for poisoning rats, and said to be harmless to domestic animals, is well known to be a most virulent poison. Scarcely a year passes that we do not hear of the poisoning of some poor child by the minute quantity of phosphorus sucked from the ends of lucifer matches. There is, however, a substance which seems to be virulently poisonous to the lower orders of animals and yet is beneficial to the higher classes. This is sulphur, which is a substance not at all prejudicial to man and the higher animals, but it is death to lice, the itch insect, and fungi, such as grape mildew, etc. Peas can be grown in soil composed largely of sulphur, but sulphur is well known to be a specific for mildew on the grape vine. It has been said by Dr. GRANT and others that sulphur acts on mildew because it combines slowly with the air, forming sulphurous acid, which thus destroys the mildew. The facts do not sustain this view. Sulphur does not undergo slow combustion, but it volatilizes at ordinary temperatures, and it is probable that it is the vapor of sulphur which is the active agent.

Mr. STETSON called attention to the action of charcoal as a disinfectant. It is used with great success by those who keep pigs. Such persons are in the habit of feeding charcoal to the animals.

Dr. EDWARDS thought the fact of sulphur's being a poison, and the contrary, depended upon the amount of the dose in proportion to the size of the animal. An amount of strychnine which would kill a mouse might do good to a horse.

THE CHAIR alluded to the combination of sulphurous acid with alkalies as a disinfectant. Sulphite of soda had recently been suggested as a preventive of scarlet fever. If this is true it is a most valuable discovery, as scarlet fever is unquestionably the greatest scourge of the younger portion of the human race.

PRESERVATION OF STEAM BOILERS.

Mr. GIFFORD read an analysis which he had made of a substance obtained from the interior of a boiler. It consisted of zinc, oxide of zinc and fatty acids.

Mr. EMORY described the origin of this matter. It was found adhering to a mass of zinc which had been suspended in a boiler for the purpose of preserving the iron from corrosion. The zinc was suspended in the water of the boiler by means of a wire attached to the iron of the boiler. A galvanic battery was thus formed, and the zinc was gradually destroyed while the boiler was protected. It was with a view to determine the peculiar action that took place that Mr. GIFFORD had made the analysis.

THE PATENT OFFICE AND PATENTS

Mr. STETSON now addressed the association on the subject of patents and patent laws. It had been announced that he was to read a paper, but he remarked that the only papers he was in the habit of reading were such as he composed on the spot, so he contented himself with an extempore address. His remarks were exceedingly interesting, but though possessing novelty for many present, they were such as our readers can easily find in publications relating to the subject. Mr. STETSON had brought a variety of patents of different countries with him, and used them for the purpose of illustrating his lecture. There was the ponderous affair issued by the British Government—letters of huge size, and having a seal attached to it weighing some pounds. Then there was the patents of France, Spain, Cuba, etc., all different, and possessing marked characteristics. The chief point dwelt upon by Mr. STETSON was the simplicity, efficiency and economy of our American patent system when compared with the systems of European countries. Mr. STETSON'S remarks were listened to with marked attention and evident pleasure.

THE PRODUCTION OF LIGHT BY COMBUSTION.

Dr. VANDER WEYDE now took the floor, and explained the operation and mode of action of the lime light, and also of the Argand burner. His remarks were illustrated by several beautiful experiments, performed by means of very superior apparatus. He first called attention to the fact that when a jet of common gas, proceeding from an annular hole, is ignited, it gives considerable light. When a jet of oxygen is passed through the center of such a flame the light almost disappears, but the heat is wonderfully intensified. So intensely hot does the flame now become that platina melts in it; iron burns and is consumed—passing away in sparks, and melted globules of oxide, which fall to the ground and then divide into myriads of little spheres, which are dispersed all over the floor. The Doctor then called attention to the fact that, in order to obtain light, it was necessary to introduce some solid matter into this intensely hot flame. When platina is introduced it becomes intensely hot, and as it fuses only at a very high temperature it gives out a great deal of light. It has been proposed to produce a useful light in this way, viz., by surrounding the hot, but non-luminous, flame of the Bunsen jet with a cage of platinum wire. But the highest degree of illumination is obtained when the flame is made to play on some infusible surface, such as lime, magnesia or zirconia.

The Doctor then introduced a small mass of lime, and the light—the well-known lime light—was developed with great power—the eye being unable to endure its brilliancy. This light has been called the *calcium light*, but erroneously. A calcium light would be produced by the combustion of the metal calcium, just as the magnesium light is produced by the combustion of the metal magnesium. (To illustrate this point, the Doctor exhibited a piece of magnesium ribbon, and ignited it. The light was very brilliant.)

In order to still further illustrate the point that when too much air is supplied to a jet of gas, or when pure oxygen is substituted for common air, the light is diminished, the Doctor exhibited the Bunsen burner—an instrument in common use in laboratories for producing intense heat. When no air is allowed to mix with the gas there is considerable light. When air mixes freely with the gas the light is diminished, and ultimately reduced to nothing. The Argand lamp was then so arranged that the supply of air could be entirely cut off or regulated at pleasure. When no air was admitted the flame was smoky and dull. Too much air reduced the amount of light, and pure oxygen had the same effect as a superabundance of air. The arrangement which produced the greatest amount of light was that in which the supply of air and gas were so adjusted to each other that the latter was prevented from smoking.

At the close of Dr. VANDER WEYDE'S remarks, Mr. PHIN was asked to defend his side of the question, which he attempted by saying: As was noted last Tuesday evening, this question is not one which can be decided by any experiments which may be performed by Dr. VANDER WEYDE or myself. The question—What was the Bude light? is simply one of history. That Mr. GURNEY used an Argand lamp, and that Argand lamps have been used for this purpose does not admit of doubt. In Dr. URE'S Dictionary of Arts, under the head "Bude Light," this point is discussed, and also in APPLETON'S New Cyclopædia. The evening is too far advanced to allow of any extended discussion of the subject, but a very few minutes will, I think, suffice to set this matter at rest. In the gas lights now burning before you the light is produced by intensely heated particles of carbon—at least that is the old theory. To heat this carbon to the required temperature a portion of the gas is burned, and gives very little light, as you will see if you examine the surface of a candle, where a thin layer of intensely heated gas will be found. In this highly heated part of the flame platinum readily fuses, and yet this part of the flame gives no light, but serves merely to heat the carbon. Now I think Dr. VANDER WEYDE will agree with me that the higher the temperature of this carbon the more intense the light which is produced. Is this not so, Doctor?

Dr. VANDER WEYDE.—That is the very point on which we differ. The light is produced in greatest intensity by slow combustion. When the heat is very intense the carbon is consumed too rapidly, and has not time to give out any light. The little light that is given out is very intense but the quantity is very small. Dr. VANDER WEYDE then repeated several of the experiments previously mentioned, which seemed to prove to the satisfaction of the audience that his views were correct. The meeting adjourned during the performance of these experiments.

Glacial Scratches at Fair Haven.

Prof. DANA, discoursing in the *College Courant* of his excursions about New Haven, makes the following interesting statements concerning the traces of glacial action in the vicinity of Fair Haven.

A fine display of the sandstone formation and some interesting views may be had by taking a course directly across Perkins & Chatfield's quarry to the hill a quarter of a mile eastward, until the highest point is reached, and then turning northward toward Fair Haven again. Along the route over the hills, the ledges of sandstone are very numerous; and a third of a mile east of the Perkins & Chatfield quarries are the extensive quarries of Landcraft & Son. The ledges have all a nearly north-and-south direction. As elsewhere, the dip of the strata is uniformly to the eastward, with but little variation in the angle. From the most southern of the points reached, the view takes in the plains of East Haven, Beacon Hill, and the Sound far to the southeast.

A grand exhibition of *glacier* scratches is to be seen in the eastern, or second of the Perkins & Chatfield openings, a few rods only from Prospect st. When the rocks were first laid open, a rounded surface of sandstone, 20 to 30 feet wide, and extending the whole length of the quarry, about 300 feet, was exposed to view, bearing evidence throughout of having been shaped, planed and grooved by glacier action. The central portion, as well as the two ends, has been quarried away, but what is left affords a fine display of the planing and ploughing effects of the moving ice. Along the west side of this rounded ridget, especially in the more southern part, the ice cut a deep trench, showing that its under surface was very uneven, and had bold projections. Its abrading power was mainly due to the masses of rock with which it was armed below. The scratches have the direction N. 15° E. (N. 7 1-2° E., true course), corresponding closely with the trend of the Connecticut valley. The direction shows that these are some of the tracks of the great continental glacier that moved over this region from the north, during the glacial period, filling the valleys and covering all the hills with ice.

From the Landcraft quarry, a road leads across the hills and fields, northward, and after passing a brick powder-house, enters Prospect street just south of Brown street, a short distance from Fair Haven. Near the powder-house (which is in sight from Prospect street), along the almost vertical bank on the east side of the road, there is a magnificent specimen of sandstone moulding, its dimensions commensurate with the ice-tool with which it was made. Another large mass, a little to the north, shows well the glacier scratches. At the top of the ridge, above the Babcock quarry, in a line with the house of Mr. Babcock, and just south of the first fence, there is another long rounded surface of sandstone, north-and-south in trend, bearing glacier markings; but the scratches have been mostly obliterated by the action of the weather. Directly above the quarry, and only forty yards distant, there is still another exposure of glacier-marked sandstone.

The north-and-south direction of the projecting ledges of sandstone over the country is probably owing to the ploughing action of the glacier.

The ledges themselves, as they have long been bare, have no distinct scratches, because of wear from weathering; but if the hills could be swept of their soil, the surface of the harder rocks would beyond doubt be found to be everywhere rounded and furrowed in Alpine style.

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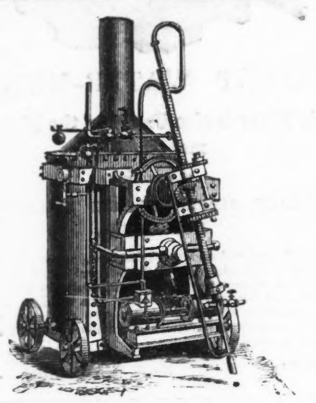

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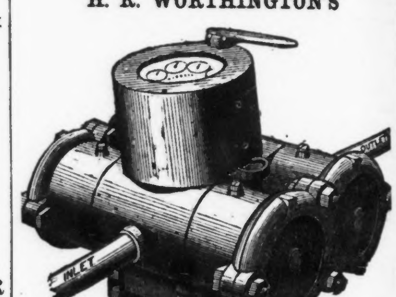
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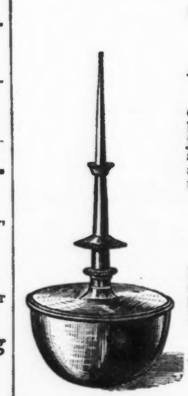
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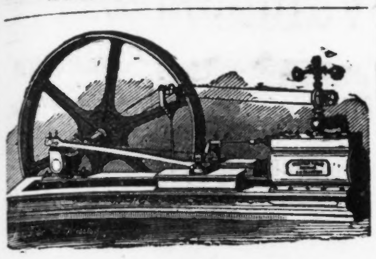

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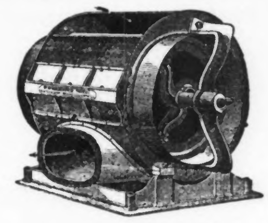

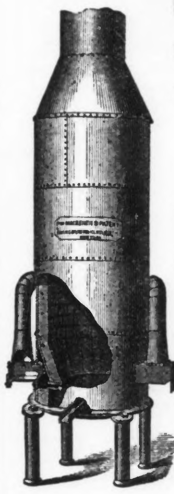

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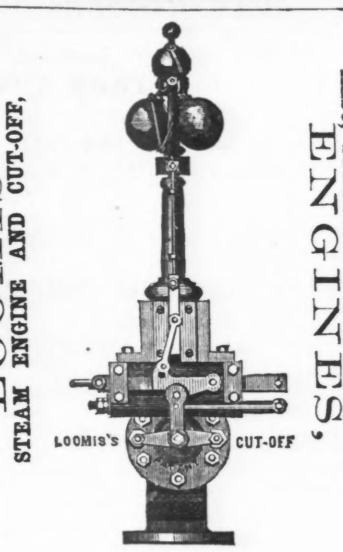

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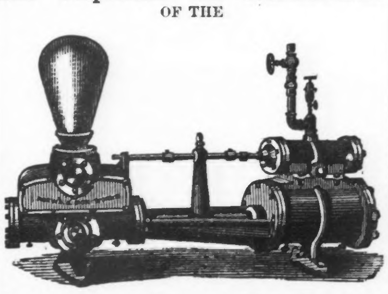

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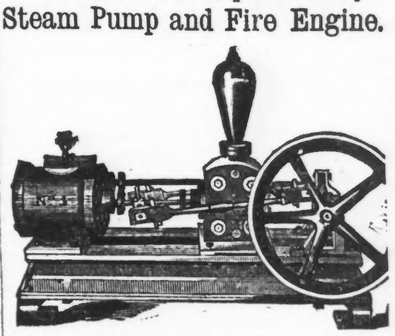

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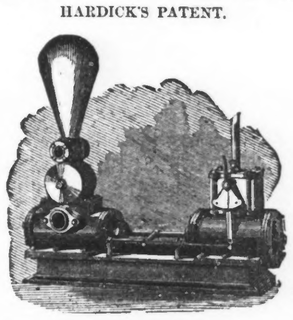

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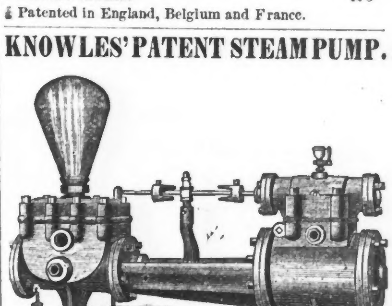

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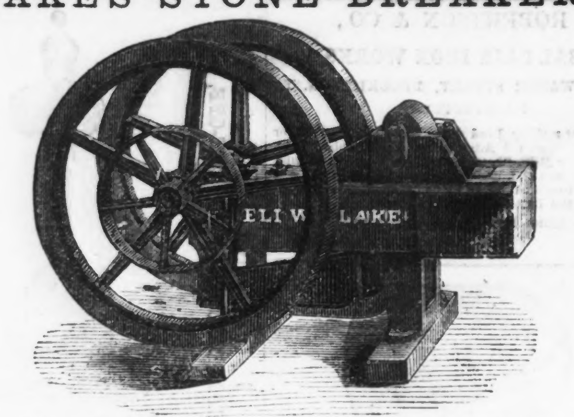

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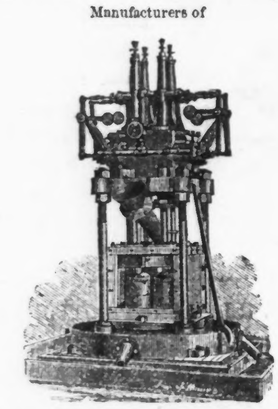

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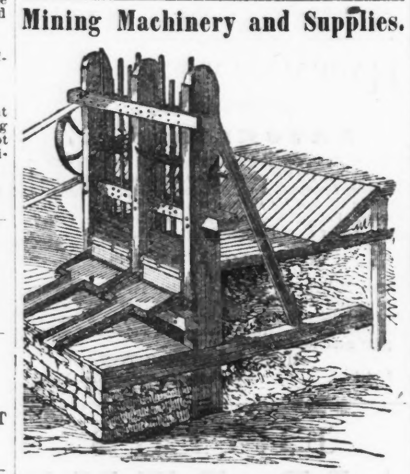

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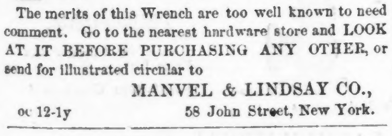

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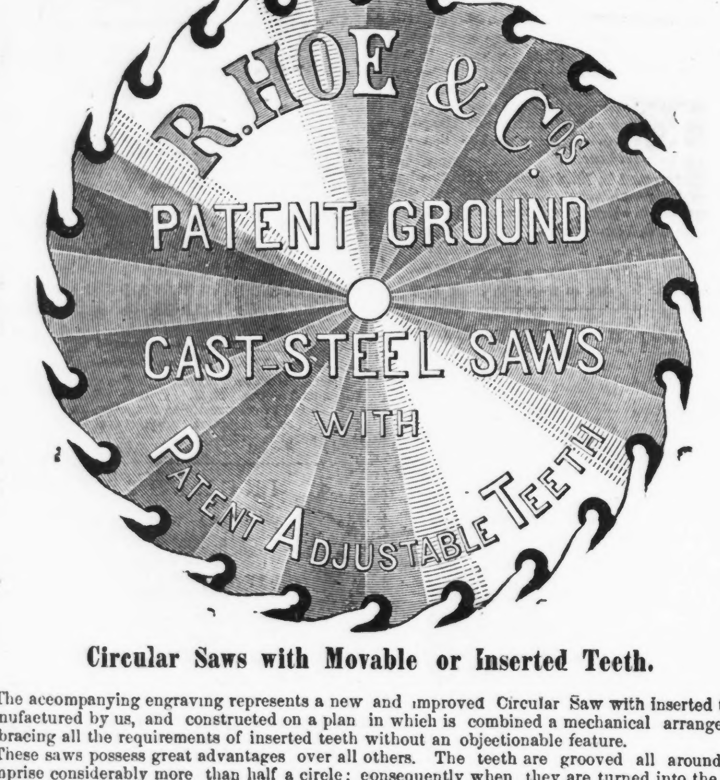

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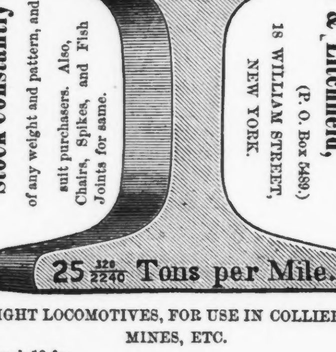

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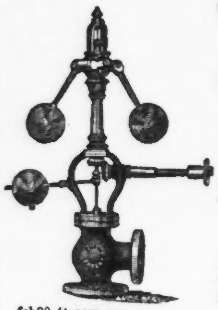

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