Scientific American.

NEW-YORK, APRIL 26, 1856.

Valuable Experiments with Cast Metals.

A very finely executed and comprehensive work has just been published by authority of the Secretary of War, containing reports of officers belonging to the U. S. Ordinance Department, on the above named subject. The experiments were extended over a series of years, and were made to test the strength and other properties of metals employed in the manufacture of cannon. The work is a scientific one of great value, especially the information it contains relating to the nature and treatment of cast-iron, a material of deep interest to so many millions of people in our own and other countries.

The experiments were mostly conducted under the charge of Major W. Wade, who details them in an exceedingly clear and interesting manner. One new fact developed by them is, that iron fused a number of times up to a certain point, is thereby greatly improved in strength. In trials with some iron, it was found that its transverse strength was nearly doubled by being melted and cast four times. This is a discovery of great importance to all engineers and cast-iron founders. At the South Boston Foundry, experiments were made to test the strength of cast-iron which had been submitted to fusion during different periods of time. Eleven thousands pounds of iron were cast into four six-pounder guns; one after the metal had been under fusion or melted half an hour; the second, under fusion an hour and a half; the third, under fusion three hours, and the fourth, under fusion three hours and three quarters. The gun first cast burst at the thirty-first fire; the second, at the thirty-fourth; the third was fired thirty-eight times, and remained unbroken. Thus the strength of the metal seemed to increase in a ratio corresponding to the period of fusion, or under which it was kept in a highly molten state, and it might have been inferred from this that the fourth gun would have been the strongest of all. Instead of this being so, however, it proved to be the weakest, for it burst at the twenty-fifth discharge. In view of these experiments, Major Wade, in this report, says, "these results appear to establish satisfactorily the fact, that a prolonged exposure of liquid iron to an intense heat, does augment its cohesive power, and this power increases as the time of the exposure up to some (not well ascertained) limit, beyond which the strength of the iron is diminished. This is a new developed fact in relation to cast iron, subject to concussions, of deep import to all engineers. Experiments were also made to test the transverse strength of cast iron bars, two inches square and twenty-four inches long, the metal of which was kept under fusion during different periods of time. These bars were set on supports twenty inches apart, and the breaking force was applied at the middle. The results obtained from four castings were in favor of that which was kept fused longest—three hours. On this head the report says, "from this it appears that the cohesive power of the iron, so far as it can be shown by its capacity to resist transverse strains, is increased 60 per cent. by its continued exposure in fusion. This is also a fact of importance to engineers and architects, regarding girders and beams, subject to a *crushing* force.

In most of the books which treat of the strength of cast iron, the resistance which it opposes to certain strains, is given; but little useful information can be obtained in them regarding the very great difference of strength in different kinds of cast iron. But as the density between the lower and higher grades of this metal differs as 6·9 to 7·4—a difference of 31 pounds per cubic foot, and as the tenacity of the metal has a relationship to its density, it was found by these experiments that cast iron, having a density of 6·900, had only a tenacity of 9000; while that having a density of 7,400, had a tenacity of 45,970.

Castings of the greatest weight, according to their size, are by far the strongest, and weighing them is a ready means of judging comparatively of their strength.

Some important facts were also developed in relation to the cooling of heavy castings. At the Fort Pitt Iron Works, two eight inch and two ten inch guns were cast, one of each in the common way, solid, and one of each with a core on a tube of iron, through which water was made to circulate after casting, to cool it from the interior, according to an invention of Lieut. Rodman. The solid eight inch gun burst at the 73rd discharge; the hollow cast one stood 1500 discharges, and did not burst; the solid 10 inch cast gun stood only twenty fires, while the hollow ten inch gun stood 249. These guns were cast of the same material and at the same time; the difference in favor of the hollow cast guns, is astonishing. This is attributed to the method of cooling, it being supposed that in cooling, the solid guns contract entirely from the outside, and that a strain is exerted upon the arrangement of the particles of the metal, in the same direction as the strain of the discharges. Lieut. Rodman goes into a very subtle mathematical demonstration to show that this is the case, and that his method of cooling the casting obviates this unequal strain. But on the back of this, Major Wade presents a new fact in relation to *the effect of time*, after the castings are made, and before they are used, which is also of vast importance to engineers. Eight inch guns proved thirty days after being cast solid, stood but 72 charges; a gun of the same bore, proved 34 days after being cast, stood 84 charges, while one which was proved 100 days after being cast, stood 731 charges, and another, proved after being cast six years, stood 2,582 charges. What an important fact is thus newly developed, showing us that solid cast cannon should not be actively used until they have been kept for some years. Major Wade accounts for this phenomenon in cast iron, by supposing that the particles strained in the cooling re-adjust themselves in the course of time to their new position, and become free or nearly so, and he presents some good arguments in favor of this theory.

The lesson to be derived from this, by our engineers, is, that heavy castings of iron for beams and machinery, subject to strains, are less capable of resisting them immediately after being cast; in other words, old castings are much stronger than new iron castings.

There is much other new and useful information in this work, for which we cannot find room to allude in this article, but will take occasion to do so in a future one.

New Patents.

The official list of Patent Claims, which we publish this week, is very long, covering nearly one page of our paper, and embracing more than sixty inventions. Over one-third of the whole number, twenty-one, were patented through the Scientific American Agency. The great success which attends our efforts in this direction, must be particularly gratifying to our clients.

Maine has Spoken.

Resolutions against the further extension of the Woodworth Planing Machine Patent have passed both branches of the Legislature of Maine, and received the Governor's signature. This is, indeed, good news.

We most earnestly hope that Congress will listen to the voice of reason and to the wishes of the people, as expressed through their petitions and popular assemblies, and not permit a devouring monopoly to be longer continued.

Ferry Steamboats to be put under a Safety Law.

It affords us much pleasure to be able to inform our readers that an amendment to the New Safety Steamboat Law, is now before Congress, including all passenger ferry steamboats, and tug boats, and some new provisions for the greater safety of all steamers.

American Institute Election.

The election for officers of the Institute takes place on the 8th of next month. Henry Meigs is nominated for Corresponding Secretary, W. B. Leonard for Recording Secretary, and E. I. Backhouse for Treasurer.

Recent American Patents.

Marble Saw—By J. E. Haviland, of Galveston, Texas.—This invention is for cutting two sides of a block of marble at once, on a taper or otherwise. The improvement consists in a peculiar connection between the saw gates or frames and the driving pitman, whereby the angle at which the saws cut, may be changed at pleasure without any alteration of the pitman.

Improvement in Stoves—By W. H. Binney, of Seneca Falls, N. Y.—In this stove there is an air pipe passing down through the center of the fire and communicating with an air chamber in the base. It is claimed that stoves of this description yield a much greater amount of heat, in proportion to the fuel consumed, than those in common use. The inventor also provides a damper for admitting air to the fire, above its surface, which unites with the escaping gases and causes their combustion. An additional economy is thus obtained.

Water Elevator for Cattle—By J. A. Ayres, of Hartford, Conn.—This is a farm-yard contrivance, of such a nature that by its use the cows or oxen whenever they wish to drink can raise their own water from the well. The invention consists of a movable platform so connected with a rope and wheel that the weight of the animal, in stepping upon the platform, causes the wheel to revolve and raise a bucket of water. The bucket is furnished with a faucet, which is opened in rising by striking a pin, and the water then runs into a trough. When the animal leaves the platform the faucet shuts, the bucket sinks into the well and fills again, ready for another customer.

Repeating Pistol—By Palmer Lancaster, of Burr Oak, Mich.—Most of the repeating firearms are furnished at the breech with a revolving barrel containing several powder chambers, which are successively discharged through the long barrel. In the present invention the revolving barrel is dispensed with and the straight breech piece containing the chambers is substituted; said straight piece slides transversely, or at right angles, to the line of the long barrel. The improvement consists in a novel method of moving the breech so as to bring its chambers, alternately, into line with the long barrel for discharge.

Improved Shoe Last—By A. J. Barnhart, Hartfield, N. Y.—Many lasts are composed of two pieces, the upper, or block, and the lower, or foot part. They are chiefly used in combination when the leather is to be stretched over them, and are fastened together by pins. The present improvement consists of a lock or catch for effecting the fastening, whereby greater convenience and firmness is obtained

Improved Harvester—By W. A. Kirby, of Buffalo, N. Y.—Consists, first, in having the driving wheel of the machine hung in such a way that it is allowed to swing, and thereby allow the wheel and also the finger bar and sickle to be raised or lowered by the inequalities of the surface of the ground, each acting independently. Second, in a peculiar raking attachment. Third, in the peculiar mode of attaching the fingers to the finger bars. It is a good improvement.

Improvement in Raking Attachments to Reapers—By Wm. H. Hovey, Springfield, Mass.—Consists in the employment of a reciprocating rake, and also a swinging rake applied to the platform, so arranged as to sweep off the grain with the utmost evenness, regularity, and certainty. It appears to be an excellent improvement.

Improvement in Power Looms—By Andrew Allen, of Wilmington, Del.—This improvement is applicable to the weaving of ginghams or other fabrics in which filling threads of different colors are employed. It relates to the mechanism by which the lifting and dropping of the shuttle boxes for the purpose of changing the shuttles so as to change the color of the filling. Drawings would be necessary to illustrate the operations of the parts.

Improvement in Grain and Grass Cutters—By Wm. H. Hovey, of Springfield, Mass.—Consists in covering the sickle bar with a shell or shield through which the cutting teeth only project, so as to prevent the sickle from being choked or clogged by straw, grass, or other obstructions. This is a good idea

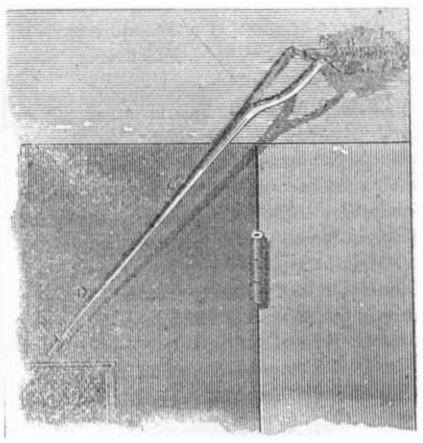
A peculiar device is also employed for raising and lowering the sickle so that it may pass over the obstructions, and likewise secured at varying hights from the surface of the ground as occasion requires.

Improvement in Calendar Clocks—By Edward Allen, of Glastenbury, Conn.—This invention relates to an improvement in the calendar mechanism which is the subject of letters patent issued to John Williams, dated Sept. 19th, 1854. The lever described in the specification of said Williams, through which the wheel of thirty-one teeth for showing the days of the month is caused to receive from the twenty-four hour wheel the overleaping movement necessary at the end of the short months, depends upon the force of gravity for its operation, and so will only operate in one position of the clock: on that account it is only applicable to upright clocks. This improvement consists in a new method of giving the necessary movement to the said lever, by which it is made capable of operating in all positions and is therefore applicable to marine clocks.

Furnace for Repairing Railroad Rails—By James McLellan, Detroit, Mich.—The upper part or tread of the rail is generally the first to give out. It laminates and breaks off into splinters, becoming so bad in time that a new rail must be substituted. Heretofore it has been impossible to repair the old rails by welding, owing to the fact that when placed in the fire the whole mass becomes equally heated, and, under the hammer, the thin neck part is crushed.

The present improvement consists in an improvement in the furnace so that only the tread part of the rail, where the welding is required, shall be heated. This is done by providing a hollow cast-iron holder, so formed as to receive the lower part of the rail and protect it from the fire, while the upper part of tread projects above the holder into the fire. The holder is filled with water so as to insure the cooling of the lower portion of the rail By the use of this improvement it is said that damaged rails may be very cheaply repaired. It appears to be a valuable invention.

Improved Door Spring.—By D. G. Smith, of Carbondale, Pa.—In this improvement the inventor makes a very ingenious application of the universal joint, and produces a door spring, at once cheap, simple, and good. The small frame piece, A, is screwed to the jamb, and holds the spring shaft, B, which connects with the forked lever, C; the extremity of the latter rests in a hook at D, on the door.



When the door opens, B, is partially turned and with it the spring. The spring in its reaction causes lever D to press upon and close the door. The operation is such that the lever presses with greatest force to shut the door when it is widest open, and again when it is nearly shut; so that the tendency of the spring is to keep the door always closed. Some springs relax when the door is nearly shut, leaving the acquired momentum to carry it the remainder of the distance; where such springs are used the door is apt to stand partly open, when at rest, especially if there are any currents of air about. Such is not the case with the above invention. This spring costs only a few cents for its manufacture, yet it is strong and apparently very durable.

To disconnect it from the door it is only necessary to lift the end of the lever, C, out of the hook, D, and allow it to hang down by the side of the door. Patented. Address the inventor for further information.

Floor Clamp for Carpenters—By H. M. Oliver, of Whitneyville, Conn.—Consists in the use of

a sliding jaw and hook operated by a lever, in such a manner that while the implement is is firmly secured to the beam, the board to be nailed is pressed firmly against the adjoining board previously nailed, so as to form a close joint. It is a cheaply made, effective instrument.

Catch Lock for Ship's Settees—By B. F. McCreary, New York City—The object of this invention is to insure the locking of the back of the settee without the necessity of depending on servants; also to dispense with pins and spring catches, which are liable to be broken or deranged. The back of the settee, unless fastened, is likely to become broken, owing to its great weight, by being too frequently moved by passengers or by the rolling of the vessel. The present improvement is a self-acting catch lock of a strong and durable character.

Improvement in Wigs—By Dewitt C. Warner, Wilkesbarre, Pa.—This invention consists in attaching the hair to a ground-work of gutta percha, either in the form of a perfect scalp or frame-work, or in plates or strips of any desired form, for toupees, plaits, curls, &c. A crease is made in the gutta percha with a hot iron; the ends of the hair are laid in the crease and the iron again used to turn a furrow of the hot percha over on to the hair and thus cement it down. The advantage of this ground-work over the net-work commonly employed in wigs, &c., consists in the facility with which the hair can be attached, and the consequent reduction of the expense of labor; it may be put in singly or in locks. It also allows the hair to be combed and dressed with as much ease and perfection as if it were of natural growth. We are told that wigs made on this plan can be washed and cleansed thoroughly without injuring the beauty of their appearance or affecting their durability.

Improved Harness Creaser—By G. W. Pruyne, of Mexico, N. Y.—This invention relates to the creasing of leather used chiefly in harnesses, such as straps traces, etc. It consists in the employment of a pair of rollers, one of which is made of metal and the other of wood. The peripheries of the rollers have concave and convex surfaces, respectively, corresponding to the form intended to be given the leather.—The convex portions of one roller fit into the concave portions of the other. The leather straps are placed between the rollers which are then pressed together by a foot pedal. The straps while thus under pressure are drawn through the rollers and come out creased in the most perfect manner. This machine saves much time and labor.

Hot Air Engine—By John Ericsson, of New York City.—In this new patent the inventor causes a piston, working within a cylinder, to perform the successive combined operations of simultaneously discharging the heated air, and taking in the charge of cold air, compressing and transferring it to a regenerator and heater, or either, and thence to the opposite end of the cylinder, to act upon and impel the piston. So far as we can judge, this invention is no better, if it is as good as that which was tried in the steamer *Ericsson*.

Improvement in Furnaces—By A. McDonald Sprague, of Mobile, Ala.—The object of this invention is to permit the supplying of fuel to steam boiler and other furnaces, without opening their doors. When the doors are opened, in the common manner, a large quantity of cold air rushes in and checks the fire; a loss of fuel consequently ensues in restoring the temperature.

In this improvement the fuel is deposited in a metallic box, which is then shoved into, or rather over the fire, through an aperture in the furnace front. The box has a false bottom so arranged that by means of a rod it is opened, and the fuel dumped into the flames; the apparatus is then withdrawn.

Cloth Stretcher.—By J. J. Hilliard, of Fall River, Mass.—In the manufacture of woolen goods, the cloth is apt to shrink up during the dressing operation, and occasion difficulty in the work The present improvement is an attachment to the machine, whereby the cloth is kept evenly stretched, without being in any way injured or soiled by the lubricating grease.

Stump Extractor—By J. B. Creighton, of Tiffin, Ohio.—The stumps are removed by means of a screw and lever. The screw passes through the top of a gallows frame placed above the stump. The lower part of the frame is furnished with wheels to facilitate transportation. The apparatus is simple, strong, and very powerful.

Recent Foreign Inventions.

Smokeless Artificial Fuel—A. Morin, of St. Etienne, France, has obtained a patent for making a smokeless artificial fuel from that made with small coal or coke mixed with either tar or bitumen. He takes a common artificial fuel, which is made by mixing small coal or coke with tar or bitumen and molded into blocks, and subjects it to a high heat in a retort, so as to decompose the bituminous and tarry matter, and yet obtain from them a coke in the retort, which is the smokeless artificial fuel he claims to have produced.

Improvement in Steam Boilers—The London *Mechanics Magazine* deseribes an improvement in steam boilers, for which a patent has been secured by J. Lee Stevens. The inventor is patentee of a smokeless furnace which bears his name; and the recent patent is for an improved combination of the parts of a boiler by which air is to be more advantageously applied and combined with the products of combustion; the boiler is formed with a water space above the furnace, and above this space there is a return flue through which the products of combustion pass to a chamber called "the igniting box." From this chamber the tubular flue passes to a chamber flue at the opposite end of the boiler. In front of the "igniting chamber," there is a double cover pierced with holes through which streams of air pass, to mix with the products of combustion before they pass through the tubular flues. This arrangement is of no use for furnaces, in which anthracite coal is used, but may be useful in those using bituminous coal, in which much carbonic oxyd escapes as smoke.

Breech-Loading Rifles and Muskets—C. E Reeves, of London, has obtained a patent on the above named class of fire-arms. He employs a movable breech, which is made to fit into the end of the rifle barrel, and is held in close contact with it by the lateral pressure of a wedge piece, which is hinged to the barrel and the lock frame, and which drops between the end of the breech and a false breech. To charge the rifle, this wedge piece is first withdrawn, and the breech slidden back clear of the barrel into the space vacated by the wedge piece. A small finger lever at the side slides back the breech, which is then turned up and receives the charge; then it is brought down again into line with the barrel, slidden forward, and forced into position by the wedge piece described. The movable breech in this rifle, is a charge chamber, and appears to be a supplementary device to the Sharp's rifle.

Distilled Coffee—T. A. Poncelin, of Paris, has obtained a patent for distilling roasted coffee, to obtain a substance without residuum or grounds, and perfectly soluble in water. The liquid is stated to be pale limpid and volatile, and possessing a fine aroma.

Globotype Telegraph—The London *Artizan* contains an illustrated description of a new and peculiar telegraph bearing the above name, invented by David McCallum, of Stonehouse, Devon, Eng. The leading characteristic of this invention consists in releasing small glass balls of three different colors—white, black, and blue—in such a manner as to fall over a series of inclined planes, and drop into their proper places, where, by their color and the way they are made to arrange themselves, they form a message. These balls are thrown out one by one at the will of the operator, and as multiplied and intermixed they form the alphabet, like Prof. Morse's dots, spaces, and dashes. From the short description given of it we have not been able to perceive how an operator at one end of a line, can, with a single wire, separate and direct the three different colored balls, and make them arrange themselves into a message at the other end of the line, but the Artizan speaks favorably of its simplicity, practicability and capability of being worked with one wire. It is very far from being as simple as the Morse Telegraph or the Chemical Telegraph, and although it evinces ingenuity in construction, it certainly is not of a character to supersede any *recording* telegraph now in use.

Notes on Ancient and Curious Inventions.—No. 4.

Paper Making—In article No. 1, page 238, we stated that Mr. Wilkinson had manufactured paper in Pennsylvania in 1732.—The name should have been Thomas Wilcox. We have received a letter from Joseph Wilcox in which he states that the manufacture of paper is still carried on at Ivy Mills, Delaware Co., by the descendants of the original founder of paper manufacture. The establishment manufactures bank note paper, and with only one or two exceptions, is the only mill in the United States where hand-made paper is now made.

In the Patent Office Report for 1850 there is a letter from James M. Wilcox, of Ivy Mills, on this subject, in which are some useful hints. It is stated in it that the best qualities of writing paper contain from 30 to 50 per cent. of linen, and that cotton rags of themselves are too tender to make good strong paper. An excellent substitute for the linen of paper which we obtain in foreign rags is that of raw cotton, which makes a beautiful paper when mixed with worn-out cotton rags. When the price of cotton was as low as six cents per pound it is stated that large quantities of it were used in the manufacture of paper. E. Conkling, Esq., of Cincinnati, suggests the invention of machinery to remove the short cotton knap or fiber that is left upon cotton seed by the usual process of ginning, and the using of this fiber for making paper. The suggestion is an important one. While the cotton so obtained could be used for making paper, the clean cotton seed resulting therefrom would yield more oil by expression. The amount of short cotton fiber left on the cotton seed raised in the United States is equal to three times the amount of rags, by weight, used in paper making.

Machines for making paper were used in Europe previous to their introduction into our country. In 1830 the first successful Foudrinier machine was made at Windham, Conn., and since that time no paper machines have been imported from abroad. There are two kinds of paper making machines, the Foudrinier, or shaking endless wire-web machines, and the cylinder machines. The former makes the best, but the most expensive paper.

A very great improvement was made in paper making about 1830 to render it cheaper by discharging the color from rags by the use of chlorine, whereby common printed rags could be used for making white paper. Before that period white rags alone were used for writing paper. Every improvement which tends to make paper cheap is of vast benefit to mankind. It is believed by many that a cheap kind of cotton may be cultivated to be used raw in making paper. Beautiful paper can be made from hemp bagging and cable rope.—Hemp bagging is in great demand, for mixing with rag pulp to give strength to paper for newspaper printing. Machine-made paper costs about one-eighth that of hand-made paper for work—not taking into account the expense of the machinery. As good paper is now made in the United States as in any other country, and with the same quality of materials our paper manufacturers can produce paper equal to that of the best English or French. A great deal of wall paper is imported from France, but very little of any other kind. Much of our coarse wrapping paper is made from straw, and a finer quality is now extensively manufactured from the sea grasses which grow in great abundance along our shores in the salt marshes. The excitement which existed in the early part of last year, when rags were dear, respecting obtaining new materials, such as wood, shavings, &c., for white paper making, has resulted in the erection of a large and splendid mill at Little Falls, N. Y. The machinery is now almost completed, and the establishment is expected to be in full operation in a few weeks more. We have seen some very fine specimens of wrapping paper made from bass wood at this concern. The projectors are expecting, shortly, to turn out fine printing paper in large quantities made from the same wood.—The making of paper from wood is a very old art. The improvement claimed at Little Falls is in the mode of bleaching.

A great number of patents (85) have been taken out for improvements in the processes, machinery, and materials relating to paper making. Paper making from other substances than rags engaged the attention of many persons long ago. A patent was taken out in 1801 by Joseph Condit, Jr., of New Jersey, for making paper from currier's shavings. B. Allison and J. Hawkins, of New Jersey, obtained one for making paper of corn husks in 1802. S. Green, of Connecticut, obtained one for paper made from sea-weed in 1809. J. McThorndyke, of New York, made patent paper from pelts in 1817. E. Collier, of Massachusetts, took out one for making paper of sea grass in 1828. J. W. Cooper, of Pennsylvania, for making it of straw, in 1829, and L. Wooster and Joseph E. Holmes, of Pennsylvania, for making it of wood, in 1830. The patents for making paper from these different substances are now public property.

A Railway for Ships.

A correspondent—G. B. Onslow—suggests a "Ship Railway" across the Isthmus of Nicaragua, as a superior and more speedy means of transporting ships from ocean to ocean, than by a canal. "A ship car," he says, "may be supported on a number of trucks, and these may be placed, three abreast, on as many separate tracks of rails. The center track and trucks would require to be very strong and heavy. At the harbor, on each ocean, a floating dock can be made, into which the car for a ship may be made to descend, and again take up the ship. This railroad should be built level, and in the most substantial manner."

He has no doubt but a ship railroad can be built, by which steamers and ships may be transported overland with all their passengers and cargoes, from the Pacific to the Atlantic Oceans. We believe that such a railroad can be built, and that ships can be transported on it, in the manner described by him. The idea is a grand one,—but the great question is, would such a railroad pay? War ships were transported over land on rollers to batter down the walls of Constantinople, by a Turkish Sultan, more than three centuries ago, and certainly with our modern improvements in engineering, we can do so now on a railroad. If such a railroad would pay, it would be the means of greatly extending our commerce. A full description of this idea, with an illustration, may be found in No. 15, Vol. 1, Scientific American.

A Hollow Mountain.

The *North Californian* states that recently while eight men were crossing Table Mountain they observed that in many places the ground seemed hollow, and in one place, on striking upon the ground with a sledge, the echo was given back with such distinctness that led them to believe that there would be little difficulty in breaking through. Having procured proper implements, they set to work. After going the depth of four feet, one of the party who was using a crowbar was seen suddenly to fall, and upon examination a hole was found about four inches wide, through which the bar had slipped and sunk into the mountain. The aperture was immediately enlarged, but it was found that, owing to the brittleness of the rock, it was exceedingly dangerous working around it.

Gold Quartz Mining.

The Nevada *Journal* (Cal.) states that the prospects of gold quartz mining at present is excellent, and the yield from this source is about one-sixth of the product of the whole State. In 1851 there was a wild excitement regarding the immense profits that were expected to be made at once in crushing quartz and obtaining gold from this source, and vast sums of money were expended in erecting untried machinery. Much experience has been gained since, and a mill can now be put up for $8000 that will do more work than some of those which cost $100,000. Improvements have also been made in the amalgamating processes. New mills are being continually put up, and the product from gold quartz is constantly on the increase.