

modified into a long prehensile spined tentacle. With this tentacle she collects the pollen and thrusts it into the stigmatic tube, and after having thus fertilized the flowers she consigns a few eggs to the young fruit, the seeds of which her larvæ feed upon. The Yucca is the only entomophilous plant known which absolutely depends for fertilization on a single species of insect, and that insect is remarkably modified for the purpose. The plant and its fructifier are inseparable under natural conditions, and the latter occurs throughout the native home of the former. In the more northern portions of the United States, and in Europe, where our Yuccas have been introduced and are cultivated for their showy blossoms, the insect does not exist, and consequently the Yuccas never produce seed there. The larva of the *pronuba* eats through the Yucca capsule in which it fed, enters the ground and hibernates there in an oval silken cocoon. In this stage the insect may easily be sent by mail from one part of the world to another, and our transatlantic florists may, by introducing it, soon have the satisfaction of seeing their American Yuccas produce seed without any personal effort on their part.

JEWELS IN THE UNITED STATES.

It is stated that the chief discoveries of rubies and sapphires in this country have been made in Macon and Cherokee counties, North Carolina, where the mining of corundum is carried on to a great extent. A ruby has been found of the weight of a pound. A crystal of ruby and sapphire corundum, weighing 315 pounds, has been sold for \$350. These specimens are all found in beds of chrysolite which extend into Georgia, a distance of 100 miles; that is, corundum is found only in chrysolite. Professor Carr has recently seen one of these crystals which had partially become tourmaline—at least one half of it having become metamorphosed into that stone.

Professor I. Lawrence Smith, of Louisville, Ky., having made the subject a specialty, declares his belief that the so-called diamonds discovered in this country were not diamonds, but that they are colorless sapphires which, if properly cut, are nearly if not quite as brilliant. They will scratch every other mineral, except the diamond itself.

This is doubtless the whole fact in relation to the mooted diamond discoveries of Arizona, as the telegram, recently published in the daily papers, regarding the buying of rough diamonds in London by American purchasers is, in all probability, a mere sensational supposition.

ANOTHER LADY SCIENTIST.

*Place aux dames!* Miss J. Swain, in the late convention at Dubuque, read an excellent paper on "Why we differ, or the law of variety," treating her subject with remarkable taste and ability. The fair philosopher discussed the material aspect of humanity, how each individual consisted of a little more or less hydrogen, oxygen, nitrogen, carbon, sodium, sulphur, and phosphorus respectively, and judged that differences in the proportion of these ingredients, if carefully ascertained, might lead to a knowledge of the law of variety in individuals.

CURIOSITIES OF VIBRATION.

Professor Lovering, on vibration, mentions the following curious instances: When the first suspension bridge was building in England, a fiddler offered to fiddle it away. Striking one note after another, he eventually hit its vibrating note, or fundamental tone, and threw it into such extraordinary vibrations that the bridge builders had to beg him to desist. Only recently a bridge went down under the tread of infantry in France who had not broken step, and 300 were drowned. An experiment is often referred to of a tumbler or a small glass vessel being broken by the frequent repetition of some particular note by the human voice. It is said, and may be true, that certain German tavern keepers increase their custom by the occasional performance of this feat. In the Talmud there is a curious question raised as to what would be the damages if a domestic vessel were broken by a noise made by an animal, such as a barking dog.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

*The machinery used in copper mining.—Homeward journeying from the Lake Superior region.—The new city of Chicago.—General character of the new buildings.—The water machinery.—The North Chicago Rolling Mills.—Manufacture of Bessemer steel.—Description of the process.*

NIAGARA FALLS, August, 1872.

In presence of this most sublime of all earthly scenes, one feels very little like writing of such vulgar concerns as those which must form the subject of this letter; but as we found, in copies of the SCIENTIFIC AMERICAN that we obtained in the little mining towns recently visited, the commencement of the series, it will probably be expected that others follow uninterruptedly.

COPPER MINING MACHINERY.

When writing from Negaunee, I had intended, had space permitted, to describe the machinery in use in the mining regions visited.

There is usually but little machinery about a mine, whatever its character or location. The ore is raised through vertical shafts in iron buckets, and through inclined shafts in skips, as the miners call them, peculiarly shaped wagons having small wheels which run upon a tramway laid upon the lower side of the shaft. The skips are also made of iron. The hoisting rope is usually of iron wire of from seven eighths to one and a half inches diameter, according to circumstances, the smaller size being sufficient for inclined shafts and light loads, and the larger being required where

heavy loads are raised through vertical shafts. The rope is led through a series of heavy blocks, or over a set of larger pulleys, to the engine house, where it is wound upon a drum of from thirty to forty-eight inches in diameter. In one case, where a one and a half inch rope was used, the drum was eight feet in diameter. A small quick-running engine is generally used to drive the drum when hoisting, and a brake controls the latter when the engine is thrown out of gear and the bucket is lowered. The strap brake is used with the best winding machinery, and the compression is effected by a right and left handed screw, whose connection with the strap is made by means of nuts secured to the strap ends.

At the Jackson mine, near Negaunee, the compression is obtained by a very neat and immensely powerful combination of levers and screw, designed by Captain Merry, the superintendent of the mine. At this place, the winding apparatus was driven very satisfactorily by a 40 horse power Root engine and boiler, built in New York.

At the Champion iron mine, the winding machinery is well made and highly finished. It does excellent work, and is considered by many to be the finest in that section. It was built in Detroit, and I very much regret that the name of the firm of whom it was purchased has escaped from my memoranda. I think, however, it is from the Michigan Iron Works of Messrs. Hodge & Christie. At a number of places we found the very neat and effective stone breaker of Messrs. Blake, of New Haven, an admirable machine.

HOMEWARD JOURNEYING.

From Negaunee we came by rail to Escanaba, thence by steamer through Green Bay to Menominee, and, there taking the train again, reached Chicago in just twenty-four hours from Negaunee.

NEW CHICAGO.

We remained at Chicago long enough to inspect the burned district with some care, to visit the water works, and to spend a half day with Mr. Forsythe, the superintendent of the Bessemer plant of the North Chicago Rolling Mills.

The resurrection of Chicago after the great calamity is something marvelous. Rebuilding commenced before the fire was extinguished, and has gone on unceasingly since. The results of such wonderful enterprise and energy are now seen in the rebuilding of perhaps one half of the business portion of the South side. The new buildings are generally substantial, neat, and convenient, and many are noble structures, uniting, in an unusual degree, architectural beauty with strength and excellence of workmanship. The new Chicago will be far superior to the old Chicago which it replaces, and ultimately it may be that the great fire will be considered, upon the whole, as having been a benefit to the city, notwithstanding the terrible suffering that came upon the citizens of this portion of Chicago as its consequence.

THE CHICAGO WATER MACHINERY.

The pumping machinery of the Chicago water works is located directly in the midst of the burned district, but fortunately remains uninjured. Four large steam engines are at work supplying the city with water, which is drawn from the lake through a tunnel extending far out into the lake, and which is of itself a noticeable piece of engineering. Besides the four pumping engines actually in use, two new engines of great power are in process of erection, and another tunnel is proposed. The new engines were built by the Fort Pitt Foundry, and are very similar to those of the St. Louis water works. We noticed here the Winter cut off on the old engines, the only application of that device to pumping engines that has come under our observation. The new engines have a modified Sickles cut off, and the bucket and plunger pump. They are fine looking machines, and should do good work.

CHICAGO ROLLING MILLS AND IRON WORKS.

The North Chicago Rolling Mills are situated in the suburbs of Chicago, and are extensive works. By the courtesy of Mr. Potter, the president, and the kind attention of Mr. Forsythe, we were enabled to make a very thorough inspection of the plant.

There are two large blast furnaces running here, smelting a variety of ores and making Bessemer pig metal. These furnaces are 17 feet in diameter and 66 feet high; the blast, at a pressure of 3½ pounds per square inch, is heated to a temperature of, probably, 800° Fah. before entering the tweezers; the fuel is a mixture of coal and coke. The product amounts to about 600 tons per week. In the rolling mills about 45,000 tons of iron rails are made per year—enough to lay nearly 500 miles of track. There is nothing peculiar in the processes in use here.

BESSEMER STEEL WORKS AND PROCESS.

The Bessemer steel plant consists of two five ton converters and their accessories, and is placed in a building by itself. Here selected pig iron, from Lake Superior ores principally, is melted in cupola furnaces, and thence flows, at the proper time, in a glowing stream into the converter, the vessel in which its conversion into steel takes place. Air is then forced, by powerful blowing engines, into the bottom of the vessel, and rises, in hundreds of minute streams of bubbles, through the liquid metal, burning out its carbon and silicon, leaving it almost pure iron, and at so elevated a temperature that it is more fluid than at first. An alloy of iron and manganese, rich in carbon, is next added, and in such quantity that the amount of carbon entering the mass is just sufficient to convert it into the desired quality of steel. The manganese assists by neutralizing the deleterious effect of any sulphur that may be present, and by preventing ebullition of the metal when poured into the molds. The process is one of the most beautiful applications of scientific

principles to useful purposes that has ever been made. The operation presents to the spectator one of the most imposing sights that can be witnessed in any branch of manufacturing industry, and the ingenuity displayed in every detail of engineering connected with it is no less remarkable. This most interesting and immensely important branch of modern industry is patented by, and owes its successful introduction very greatly to, a most persistent and ingenious British inventor, Henry Bessemer; but, as might be anticipated, American enterprise and inventive talent have done much towards increasing the reliability and effectiveness of the process. An American, Kelly, was working upon the problem contemporaneously with Bessemer, and met with some success even in advance of him, and the efficiency of the apparatus is largely due to our fellow countryman, A. L. Holley, who has brought up the number of charges worked off per day by a pair of converters to, in some cases, as many as there are hours in the day. Some of the transatlantic Bessemer steel works are producing, even now, but eight or ten charges per day.

R. H. T.

The Great Suspension Bridge between New York and Brooklyn.

Work on the East River bridge is progressing rapidly. The caisson on the New York side is now completed, and the superstructure or tower has reached the height of twenty-four feet above high water, eight hundred cubic yards of masonry being laid every week. There are about fifty men employed on the structure, and they are under the personal supervision of four engineers, headed by Colonel Roebling. Mr. Martin, one of his assistants, has the present control of the work. Everything possible is done by steam. The stone comes from Maine, and is stored at Red Hook, Long Island immediately opposite Governor's Island. A scow plies between the structure and the island every day. From the scow, the stone is lifted by steam to the dock, where, at a certain point, two tracks come together. The stone is placed on two cars and conveyed to the structure, to the top of which it is raised and placed in its proper position by means of steam derricks. Then the spaces are filled up with concrete composed of cement, sand, and gravel. Even this is mixed by machinery. A revolving shaft is used to perform this operation, which is found to be much more thorough and economical than it could possibly be if done by hand. After this structure is completed, the next step will probably be the building of anchorages on the New York and Brooklyn sides. These will each be 800 feet inland from the towers, the New York one at the corner of Water and Dover streets, and the Brooklyn anchorage at the corner of James and Mercein streets.

The American Institute Fair.

It seems to be an impossibility for the managers of any exhibition to get into proper order before the opening day, and the managers of the American Institute are always more or less behind-hand with their arrangements. The machinery is still in a very incomplete condition, and any attempt to give the public an idea of the merits of the show would be lost labor. As the building in which the fair is held is now the property of the Institute, and the managers have had possession of it for some months past, there is no excuse for the want of punctuality.

As soon as the display is sufficiently complete to allow of judgment being passed upon the exhibition, we shall give our usual full account of such improvements and new appliances as it contains.

A Singular Explosion.

Workmen were lately employed to clean out the grease and paint from the inside of the steam cylinder of one of the large ferry boats of the New Jersey Central Railway Company, opposite this city. For this purpose the piston had been duly removed and three men went down into the cylinder, which is 11 feet deep and 50 inches in diameter, taking with them a pail of benzine, which liquid they used in softening the grease. Suddenly a small snake like streak of flame started from under the hands of the man nearest the benzine pail, and the next instant an explosion occurred, and scattered the burning fluid over the persons of the men.

Martin Sweeney was terribly burnt about the face and neck, and was taken to the hospital. Charles Maloy and John Hays were also severely burned on the face, neck, and arms.

FROM the official testimony given by the chief engineer of the steamer Metis, it appears that the recent foundering of that unfortunate vessel in Long Island Sound was due to the flimsy construction of the partitions in the hull of the vessel. The ship had four separate compartments. By a collision with a schooner, a leak into one of the compartments was made, and the rising of the water therein broke through the adjoining partition and filled the vessel. Had the partition been of proper strength, the steamer would have floated.

GEORGE P. ROWELL & Co., advertising agents, received twenty-seven thousand dollars in advance yesterday, for inserting a four line advertisement one year in all American weeklies. The advertisers are Geo. Stinson & Co., fine art publishers, Portland, Maine.

THE fair of the Maryland Institute for the Promotion of the Mechanic Arts will open on October 1, and continue till October 31.

BRIGADIER-GENERAL SYLVANUS THAYER, of the United States Corps of Military Engineers, died Sept. 7th, at Braintree, Mass., aged 87. He had been fifty years in the public service.

**Facts for the Ladies.**—Mrs. R. Gunning, New York, has earned with her Wheeler & Wilson Lock-Stitch Machine \$2,800 in two years. See the new Improvements and Woods' Lock-Stitch Ripper.

ON TRIAL!!! The new INDEPENDENT \$2.00 monthly, "THE SCIENCE OF HEALTH," sent three months for 25c. by S. R. WELLS, 389 Broadway, N. Y.

### Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, \$4 00 a year. Advertisements 17c. a line.

A Machinist and Engineer, with best of references, is about to visit England and Scotland, and would execute any business entrusted to his care promptly and faithfully. Address Engineer, Station A, Boston, Mass.

Wanted—The New York Steam Engine Co., Manufacturers of Machinists' and Railway Tools, can give steady employment to a number of good machinists used to tool work. At their Shop in Passaic, N. J., 11 miles from New York, on Erie Railway.

A new and desirable article for agents. 200 per cent profit. Sample 25c. post paid. Wendell & Francis, 438 Walnut St., Philadelphia, Pa.

Gauge and Milling Lathe combined, \$30.00. Wm. Scott, Binghamton, N. Y.

Pleasant Rooms, with Power to let at low prices, in a village of 13,000 inhabitants. Address Lock Box 129, Woonsocket, R. I.

Whitcher's Pat. Rotary Engine is the simplest, cheapest. On exhibit at P. Fields & Son, North Point Foundry & Mac. Wks., Jer. Cit., N. J.

Ashcroft's Original Steam Gauge, best and cheapest in the market. Address E. H. Ashcroft, Sudbury St., Boston, Mass.

See adv. for \$300,000 investment—Manufacture of fire arms.

Engineering and Scientific Books. Catalogues mailed free. E. & F. N. Spon, 446 Broome Street, New York.

Steel Measuring Tapes, manufactured and sold by W. H. Patne, Greenpoint, N. Y. Send for circular.

Inventions put into working shape; experimental and other machinery constructed. R. Kreuzbauer, 10 to 12, Room 5, 34 Park Row. Best references.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. The Patent Right for the Southern States for sale. Address W. H. H. Heydrick, Chestnut Hill, Phila.

Foundry Facings of extra fine quality manufactured and for sale by Herbert & Co., Bloomsbury, N. J.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1302 N. 2d Street, St. Louis.

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 780 South Broad Street, Philadelphia, Pa.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in SCI. AMERICAN, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and set by J. Dickinson, 64 Nassau St., New York.

Brown's Coal-yard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water St., N. Y.

Ashcroft's Self-Testing Steam Gauge can be tested without removing it from its position.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Meat Chopper—The Union Meat Chopper—the Best in the country. For Circulars and Price Lists, address J. Dyer, Elizabethtown, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 801 and 803 Cherry Street, Philadelphia, Pa.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water St., New York.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. \$1 to \$1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Brown's Pipe Tongs—Manufactured exclusively by Ashcroft, Sudbury St., Boston, Mass.

American Boiler Powder Co., Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N. Y.

Boynton's Lightning Saws. The genuine \$500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, \$6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

The Berryman Manf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N. Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Portable Baths. Address Portable Bath Co., Sag Harbor, N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks., Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms \$4 00 a year.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

## Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—PITCH OF A PROPELLER.—Will you please explain the meaning of the term "pitch" used in describing a screw propeller?—J. D. E.

2.—SAPONIFICATION OF LINSEED OIL.—What will cause linseed oil to turn to soap after absorption by a piece of woolen goods?—J. D. E.

3.—REDUCING VALVE.—If I wish to drive my engine with a pressure of 50 lbs. on the square inch, the gage on my boiler showing 100 lbs. on the inch, can I do so by using an intermediate boiler and a reducing valve? What is a reducing valve?—A. H.

4.—BRICK BURNING QUERIES.—How shall I remedy a kiln of brick in which the fires have been allowed to go out during the burning, leaving the bricks too soft? If I take down, soak in water, reset and burn over, can anything be put in the water to improve the quality of the brick?—S.

5.—SAW MILL HANDS.—Please tell me why it is next to impossible to find a man who thoroughly understands the management of a circular saw mill? Such is the case in this State (Tenn.) Is it because a saws harder to run than any other tool?—G. V. V.

6.—MECHANICAL DRAWING.—What is required of a young man in addition to a thorough knowledge of mechanical drawing, to fit him for a position as draftsman in a first class machine shop? Is a practical education in the principles and construction of machinery, or a course in mechanical engineering, essential?—S. J. L.

7.—ATTRACTION.—Two leaden spheres, each one foot in diameter, are placed with their centers four feet apart. What is the force with which they attract each other? What is the force that unites two pith balls, when floating near each other upon the surface of water?—A. F. M.

8.—REVOLUTION OF THE EARTH.—Would the earth's velocity upon its axis be increased by moving matter from the equator to the poles?—A. F. M.

9.—RADIATION OF HEAT.—Does the radiation of heat depend upon air, and would heat radiate in a room or vessel from which the air was exhausted? If air be essential in the case of heating a house, would not the register supply sufficient air to the air chamber and so dispense with a draft through the chamber? The particular question is: Can I heat a house by a furnace with the air draft closed?—H. P.

### Answers to Correspondents.

**SPECIAL NOTE.**—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at \$1 00 a line, under the head of "Business and Personal." ALL reference to back numbers must be by volume and page.

**TARNISH ON BRASS.**—To A. P.—We have given many directions for cleaning polished brass. See pages 281, 298, 314, and 329, of volume XXV. of the SCIENTIFIC AMERICAN.

**CEMENTING RUBBER TO SHEET IRON.**—D. P. W. should try either or both of the methods described on page 42 of volume XXV. and page 42 of volume XXVI. of the SCIENTIFIC AMERICAN. If he paints his sheet iron with a thick metallic paint, he can fasten his rubber on with glue or any cement he chooses.

**POWER OF ENGINE.**—By a slip of the pen, there is an error in my answer, on page 170, to this query. The horse power, theoretically, is 1 856, which is subject to variation as I mentioned.—D. B., of N. Y.

**ELIMINATION OF MERCURY.**—To I. H. M., query 9, page 138.—Place the tin amalgam in a retort, and distill at a low red heat, conducting the mercury into a receiver of water. If the quantity to be operated upon is small, you may use a hard glass retort.—E. H. H., of Mass.

**CEMENT FOR MEERSCHAUM.**—To E. S. T., query 10, page 138.—Dissolve carbonate of magnesia in strong hydrochloric acid till saturated. With this solution, make a paste by adding fresh calcined magnesia, and rapidly use the cement so formed for building up the fractured pipe. If a piece is to be cemented in, moisten each edge with the solution, apply a little of the thinnest cement, and bring the pieces into correct apposition. In an hour or less it will have hardened sufficiently to clean off, and the pipe will be quite serviceable.—E. H. H., of Mass.

**DRILLING HOLES IN GLASS.**—To W. V. B., query 11, page 138.—Use chrome steel for drills, and make the points very obtuse angled. Use a slow motion, with firm and moderate pressure. Moisten continually with a saturated solution of camphor in turpentine.—E. H. H., of Mass.

**BOILING OIL.**—To V. L., query 12, page 138.—Steam can be used for the purpose, but to obtain the necessary heat, a very high pressure would be required, and would be attended with no advantage over coal where ordinary care is observed.—E. H. H., of Mass.

**INDIA RUBBER FOR STEAM JOINTS.**—To N. L., query 13, page 138.—India rubber washers exposed to the heat of steam pressure at four pounds and upwards will soon become hard and brittle, but if the joint has been carefully made at first, this will not affect its integrity.—E. H. H., of Mass.

**NITRO-GLYCERIN.**—To P. G. S., query 20, page 138.—Take nitrate of potash in powder 1 part, sulphuric acid 3 1/2 parts. Mix thoroughly, and cool to zero, then pour off the strong fuming nitric acid, draining thoroughly the mass of sulphate of potash left behind. To this acid and four fifths of a part of glycerin very gradually, taking care to maintain the whole at as near zero as possible. In an hour's time add a considerable quantity of water; the nitro-glycerin will separate and fall to the bottom. Wash it thoroughly with fresh water, and whatever else you do, be careful in all your manipulations with this powerful agent.—E. H. H., of Mass.

**CEMENT TO RESIST WATER AND ALCOHOL.**—To F. S., query 24, page 31.—You do not say what material is to be cemented. The peeling off depends on an affinity between the cement and the object it is placed on, and what will answer in some cases will not in others.—E. H. H., of Mass.

**DRILLING HOLES IN GLASS.**—To W. V. B., query 11, page 138.—Holes can be drilled in glass by the use of turpentine constantly applied to the drill.—C. O. I., of Pa.

### Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

**FLOW.** Charles C. Lewis, Gainesville, Ala.—This invention has for its object to furnish an improved wooden mold board plow. The upper forked end of the standard is attached to the middle part of the plow beam, and the forward branch of the former supports the plow share. The land side is attached by its forward end to the share, to the outer part of which is fastened a brace, which, passing through the lower end of the standard, is secured to the land side. The space at the land side of the plow is closed by a metallic plate. The foot of a solid wooden mold board is fitted and secured in the cavity of the share, by which it is claimed the device is rendered light, cheap, and suitable for furrowing or for use in light soil.

**GRAIN CEILING FOR VESSELS.**—Constantin Lazarevitch, New York city.—When grain is shipped in bulk from one port to another, and especially to European ports, it is necessary to ceil the part of the vessel which contains such cargo to protect it from dampness. Such ceiling is required by the insurance companies. Boards are therefore placed between the bottom of the vessel and the grain, thus making a second bottom with boards, which overlap each other in that part of the hold. These boards are firmly nailed down to the bottom of the vessel, which renders it impossible to remove them without splitting, breaking, and effectually destroying them. This lumber, consisting of many thousand feet, is consequently sold for fire wood after the grain has been discharged. The object in this invention is to so put in and secure this ceiling that the lumber or boards of which it is composed shall not be injured, but may be removed intact and sold as perfect lumber, thus effecting a very material saving to ship owners, while reducing the cost of freight. The invention therefore consists in securing the ceiling with hooks, which do not penetrate or injure the lumber.

**WINDLASS.**—Melancton Bryant, Northport, N. Y.—This invention consists of the attachment of the pawl lever for turning the drum of a windlass or winch to the ratchet wheel or disk by a kind of yoke or frame, embracing both sides of the wheel, and confined upon it by sectional annular flanges fitting in annular grooves in the disk, and sliding around the disks in said grooves, for raising the pawl, but binding therein when the pawl is forced against the teeth, and moving with the disk when the latter is turned. When the pawl lever has the end of its short arm pivoted at the axis of the drum, it is capable of being worked much faster than the detachable bar arrangement, wherein two or more hand bars are placed in radial mortises arranged at intervals around the drum.

**MUSIC STAND.**—Lewis V. Brown, Salisbury, N. C.—This invention relates to an improved music stand whose rack can be extended for large or contracted for smaller sheets of music. The invention consists in making the rack proper on the principle of lazy tongs, of jointed rods, and in combining it with a bar or plate at the back, whereby it is locked in its expanded position. When the stand is not in use it is folded together and can be packed into a narrow space.

**FANNING MILL.**—James M. Kendall and James Peel, Madelia, Minn.—This invention consists of a simple and efficient arrangement of the shaking shoe and a revolving screen, whereby the grain is first subjected to the blast in the shoe, and then passed through the screen, which is revolved by gearing connected with the fan driving shaft, the said screen being protected from the blast of the fan by a hood. It also comprises a novel arrangement for shaking the shoe, whereby a horizontal and a vertical motion are imparted to the shoe. The shoe is constructed with perforated sides.

**SAND-PAPERING MACHINE.**—Orra I. Foster, Salem, N. H.—This invention consists of an arrangement of the fan blower for carrying the dust away, the fan blades being applied to a prolongation of the sand paper cylinder or its shaft instead of to the hood of the machine, as heretofore.

**CULTIVATOR.**—Totten Poling, Guthrie, Iowa.—This invention relates to an improved iron cultivator, which shall be so constructed that it may conform to irregularities in the surface of the ground, and may be readily adjusted to run deeper or shallower in the ground, as may be desired. Suitable appliances enable one of the plows to rise above or drop below the level of the other, thus adapting the cultivator to work upon an uneven surface, and enabling one of the plows to be raised to pass an obstruction without disturbing the other. This construction also forms an arch or rise in the connecting bar so that the cultivator may cultivate both sides of a row of plants at the same time without injuring or breaking the plants. The plow beams may be moved farther apart or closer together, as may be desired, their rear ends having a free lateral but no vertical movement. The plowman, while guiding the plows, walks at the side of the row of plants being cultivated. Bars bent downward and curved rearward to rest upon the ground serve as drag bars to support the plows away from the ground when passing from place to place.

**CARRIAGE WHEEL HUB.**—Jesse B. Bauman, Shepherdstown, Pa.—This invention relates to an improvement in carriage wheel hubs, the construction of which is such that the spokes, tire and felloe can be readily and easily tightened by means of movable collars, when it is necessary to take the dish out of the wheel.

**CARRIAGE WHEEL.**—Samuel R. Bryant, Waterford, Pa.—This invention relates to the mode of locking the spokes by means of grooves and wedges, and the mode of fitting the spokes and pipe box together. To lock together the spoke tenons so that lateral movement of one upon the other shall be prevented, longitudinal grooves in their contiguous surfaces are formed, and to prevent longitudinal movement of the spokes one upon another, transverse perforations may be formed to receive locking pins of any suitable material.

**WAGON BRAKE.**—Joseph Pavey and Marshall Martin, Walla Walla, Washington Territory.—This invention relates to improvement in a class of wagon brakes, wherein the brake bar is suspended below the reach of the wagon. This brake can be used with or without the wagon box, by reason of the employment of the bar for suspending the brake bar when the box is removed, and the attachment of the supports for the brake levers and to the axle.

**APPARATUS FOR DRYING FLOCK OR VELVET PAPER.**—Theodore A. Blanchard, New York city.—Flock paper after being docked has heretofore been dried by looping or festooning the paper over poles, which were usually arranged so that they could be moved closer together or further apart, as circumstances required. This mode of drying the paper, though allowing the air to circulate freely about the paper, always permanently creased or marked it where it passed over the poles. This invention consists in supporting the paper in a horizontal or nearly horizontal position during the drying operation upon drying frames prepared for the purpose.

**IMPROVED MANUFACTURE OF BITARTRATE OF POTASSA.**—Gustave Bourgade, Jersey City, N. J.—The object of this invention is to simplify the means of producing cream of tartar or bitartrate of potash, so that the same may be economically manufactured in large quantities. The apparatus consists of a double jacket steam kettle, made of copper or equivalent material, with its lower part hollow, for the admission of steam. In the bottom of the kettle is a discharge pipe, having a valve and covered with a filter. The inventor fills the kettle with water, and when it is boiling with the heat of steam admitted into the jacket, adds a quantity of crude argols, well ground, which are left to boil until perfectly dissolved. In order to prevent the formation of tartrate of lime, he adds a quantity of diluted sulphuric or muriatic acid. Bone black is then poured in and the mixture left to boil. After dissolution, a quantity of prime American clay well dissolved in water is added; after which the preparation is allowed to flow into crystallizing tanks.

**METHOD OF MAKING BLANKS FOR PLOW ATTACHMENTS.**—Orren A. Anthony, Mayfield, N. Y.—This invention consists in a method of making a blank for an attachment for plows of a single plate of steel, which is fitted on to the worn out point of a plow and secured by rivets or bolts through the share and collar.

**RAILROAD TANK VALVE.**—Charles W. Chappell, Watertown, Wis.—This invention has for its object to furnish an improved device for operating a railroad water tank valve, enabling the valve to be conveniently opened, whatever may be the weight of the water pressing upon the valve. This is effected by means of a lever attached to the valve stem being raised by the revolution of an eccentric on the end of a shaft which enters the side of the tank. This shaft is rotated from the outside by means of a hand wheel.