

in a powerful machine at a single heat, the utmost economy of material and greatest possible strength of connections are obtained. This is one of the most noticeable peculiarities of their bridge.

#### THE ST. LOUIS BRIDGE.

The work on the St. Louis bridge is going on finely and is well done. Every piece is carefully tested before it is put into the structure, the fits are well made and a careful inspection finally insures the rejection of any piece faulty in either construction or material. The "skewbacks" are very awkward shapes to forge and are very heavy. They are furnished by several of the larger forges of the country. Those that we examined were made by Lazell, Perkins and Co., of Bridgewater, Mass., and were well executed.

#### MANUFACTURE OF GLASSWARE.

As was remarked in an earlier letter, the glass manufactures of Pittsburgh are very important and extensive. A large number of firms are making window glass, and the remainder are generally making a lime glass of such excellence that it requires an expert to distinguish it from flint. It is sometimes called a flint glass, but is made without lead, which was formerly supposed indispensable in the manufacture of a very clear glass. This lime glass lacks the weight and the metallic ring of true flint glass, but, if well made, compares very favorably with it in other respects.

We visited the establishment of W. A. Hamilton and Co., who were making druggists' prescription bottles of a good quality of lime glass, and we were much interested in watching the operation. The great beehive-shaped furnace, with its ten glowing pots and the forty or fifty men and boys clustering around it and hurrying to and fro, was a novel and entertaining spectacle. The skill displayed by the workman in taking from the liquid mass just the right quantity of melted glass upon the end of his hollow iron rod, in blowing it up to just the proper form and size to fit the mold and the rapidity with which the work was done were equally remarkable. The reheating of the necks of the bottles at the "glory hole" and nicely finishing the lip formed an appropriate side show.

A large proportion of the furnaces are now blown out for repairs. This requires some weeks, and the furnaces being rebuilt, their fires are lighted and are not extinguished until another year brings around again the season for repairs.

The O'Hara Glass Works, conducted by Messrs Jas. B. Lyon and Co., were formerly noted as the makers of the best flint glass manufactured in this country. They are now making a lime glass and are sustaining their reputation by the excellence of the new product. These were among the earliest glass works started in the United States, and were established by General Jas. O'Hara and Major Isaac Craig, in 1795, first making window glass. They began making flint glass in 1802. They have made their reputation, and are sustaining it, like the best iron masters of the place, by steady attention to the choice of the best materials and by doing the best possible work upon them, and then by a thorough system of inspection which prevents any, except perfectly satisfactory products, going into the market. Some of the cut ware made here is very beautiful. This work is done by grinding, the work being held in the hand of the workman; and the skill displayed in cutting the most delicate patterns is frequently perfectly marvelous, and appears the more astonishing when it is noticed that the work is done by no more elaborate apparatus than a little metal wheel, running with emery as the cutting material.

The molds in which the pressed articles are formed are quite remarkable specimens of metal work. They are cast frequently in several pieces in order that the article may be withdrawn from them when made, and the ingenuity displayed in concealing the joints, and the patience and the skill exhibited in giving their inner surface a perfection of polish, are equally notable.

#### COAL AND IRON DEPOSITS.

An excursion by the Monongahela to McKeesport, where a Boston firm are erecting extensive works in which to make iron tubes, afforded an opportunity to enjoy the beautiful river scenery above Pittsburgh, and some of it was very picturesque, and also to explore one of the coal mines from which comes the Pittsburgh coal. The deposits are usually several feet deep in thickness—averaging perhaps four feet and over—as level as a floor, and at sometimes a considerable height above the river level. The mining is easily and safely carried on, the veins being of good height and the rooms having a good floor and roof. The coal is loaded into cars where the bed outcrops on the river bank, and is let down inclined planes and dumped directly into the boats and barges which carry it down to the city or to ports lower down the river. It would be difficult to imagine how Nature could have more conveniently arranged these great deposits for the use of man. None of the expense and danger is incurred here, that attends the sinking of deep shafts and the hoisting of coal to the surface that is generally necessary elsewhere, and there is comparatively little expense for transportation where, as here, the coal is dug from the river bank itself.

There are 15,000 square miles of these coal fields; \$15,000,000 of Pittsburgh capital is invested in mining and probably \$25,000,000 in transportation, while the total of all interests dependent upon these coal fields cannot fall short of the enormous sum of \$100,000,000.

Neither time nor space will admit of a description of our visit to the mill of Schoenberger and Blair, where we saw the best iron sponge—made directly from the ore by Mr. Blair's process—that we have seen anywhere, or to the Superior Mills, where we found probably the best arranged iron rail ing mill in the United States.

#### THE SIEMENS FURNACE.

We cannot describe the Siemens furnace that we saw in such common use where high temperature or economy of fuel was desired, nor even refer to the beautiful application, which the inventor has made in it, of well recognized scientific principles and of as well known practical engineering facts; and we must even omit a description of what we saw at the Allegheny observatory, where Professor S. P. Langley has arranged for the regulation of the time of the great Pennsylvania railroad and its branches by electrical clocks connected with his own standard at the observatory—the widest "distribution of time" in the world already, and in a fair way to be much further extended by the energetic astronomer who has commenced the work. The ten days of our visit were quite insufficient to satisfy our desire to thoroughly explore even a small number of the numerous interesting engineering establishments, or to witness the many attractive sights about this great human beehive. We must leave all until our good fortune shall offer an opportunity to revisit this place, and hurry westward and northward to see where the iron ores generally used here are obtained and how they are mined, and to see some of the great deposits of copper which feed our markets. R. H. T.

#### SCIENTIFIC AND PRACTICAL INFORMATION.

##### FIREWEED FIBER.

A plant, yielding a fiber capable of being spun and woven, called the *epitobium* or fireweed, has lately attracted the attention of manufacturers. It is very similar to the cotton plant, but the seeds are smaller and no ginning is required to separate them from the boll. Wicks, ropes, yarn, and even paper have been made from it, the last named application being especially successful, the product almost equaling the silk-made paper of China and Japan. The most valuable characteristic of this plant is stated to be that it will grow in any soil, and it is said to have appeared spontaneously in evergreen covered lands which have been burnt over.

##### PREPARATION OF SILK.

Silk in its raw state, as spun by the worm, is either white or yellow, of various shades, and is covered with a varnish which gives it a stiffness and a degree of elasticity. For the greater number of purposes to which silk is applied, it must be deprived of this native covering, which has been long considered to be a sort of gum. The operation by which this coloring matter is removed is called scouring, cleansing, or boiling. Nothing agrees so well with the nature of silk and preserves its brilliancy and suppleness so perfectly, so far as European experience goes, as a rapid boil with soap and water. It appears, however, that the Chinese do not employ this method, but something that is preferable. Possibly the superior beauty of their white silk may be owing to the superiority of the raw material.

To produce the China white, a little annatto is mixed with the soap water, so strong as to lather by agitation, and the silk is passed through it. As to the other shades, they have only to be dyed more or less with a fine indigo, previously washed in hot water and reduced to powder. After being withdrawn from the bath, the silk is introduced into the sulphuring chamber, if it is to be made use of in the white state. The silks intended for the manufacture of blondes and gauzes are not subjected to the ordinary scouring process, because it is essential in these cases for them to present their natural stiffness. For these the manufacturer selects the raw silk of China, or the whitest raw silk of other countries, which are steeped and then rinsed in a bath of pure water, wrung and exposed to the vapor of water, and then passed through the azure water.

The dull silks, says the *British Trade Journal*, in which the varnish has already undergone some alteration, never acquire a fine white, unless they are exposed to sulphuric acid gas. Exposure to light has also a very great effect in whitening silks, and is had recourse to, it is said, with advantage by the Chinese. The Chinese prepare their silk with a species of white beans, with some wheat flour, common salt, and water in the respective proportions of 5, 5, 6, and 25. It is difficult to discover what chemical action can occur between the decoction and the varnish of raw silk; possibly some acid may be developed which may soften the gummy matter and facilitate its separation.

A RAILWAY tunnel under the Mississippi river at Memphis, Tenn., is projected, to cost five millions of dollars.

A CUBIC foot of air weighs 523 grains. A cubic foot of water weighs 1,000 ounces.

THE POPULAR SCIENCE MONTHLY, No. 4, for August, contains a variety of interesting scientific articles, collated principally from foreign magazines and other publications. To those who cannot conveniently find access to the original sources, these compilations will prove valuable. The editor, Professor E. L. Youmans, is well known as a lover of science, and as an indefatigable worker in the promulgation of useful knowledge.

Facts for the Ladies.—Miss H. W. Terry, Wading River, N. Y., has used her Wheeler & Wilson Lock-Stitch Machine almost constantly for 5 years, on all kinds of family sewing, and broken but one needle. See the new Improvements and Woods' Lock-Stitch Ripper.

#### 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. Cheap Engines for Sale by Brady & Logan. See page 93.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 34 Day St., New York, for descriptive pamphlet.

Callow's New process of Graining Oak, Walnut, Chestnut, Rosewood, &c., with Metallic Therom Graining Tools, patented July 1 1870, does triple quick work, first class imitations, is durable, and makes every man his own Grainer. Address, with stamp, J. J. Callow, Cleveland, O.

Forty-five horse Engine, Lathes, Drills, three inch Shafting, with assorted Pulleys, and other iron working Machinery and Tools, in Brick 4 story Factory, for sale low, with or without Building. Easy rail and water distance from New York. Address Box 1,203, New York.

Lenoir Gas Engine—Wanted, the address of any agent in this country of the Lenoir Gas Engine, or of any person who has one imported within two or three years. Address, F. R., Box 498, Newport, R. I.

Platina Plating—Alb. Lovie, 729 N. 3d St., Philadelphia, Pa. Gear Wheels, for Models; also Springs, Screws, Brass Tube, Sheet Brass, Steel, &c. Illustrated Price List free by mail. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

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.

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

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

Wanted—An Engine Belt 76 ft. long, 19 inches wide; either new or second hand. Address P. O. Box, No. 237, Buffalo, N. Y.

Wanted—Two good machinists used to Lathe, Planer, and Bench work. Steady employment and good pay for the right men. Address, stating terms, age, &c., Oneida Community, N. Y.

Wanted—Melter. Permanent situation, at good wages, to a good, experienced Iron Melter. Address C., Iron Founder, Cleveland, O.

Tested Machinery Oils—Kelley's Patent Sperm Oil, \$1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Kelley's Chemical Metallic Paints, \$1, \$1.50, \$2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

Secondhand Saws and Mandril for Sale—one 46 inches diameter, used six weeks in cutting Georgia Pine Flooring—one 32 inches, never been used. H. A. Crane, foot W. 30th 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.

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

New Style Testing Machines—Patented Scales. Send for New Illustrated Catalogue. Riché Brothers, 9th and Coates Streets, Philadelphia, Pa.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

State Rights on improved Cigar Moulds for Sale. Patented June 25, 1872. Inquire of Isaac Guthman, Morrison, White Side Co., Ill.

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

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

The best recipes on all subjects in the National Recipe Book Post paid, \$2.00. Michigan Publishing Company, Battle Creek, Mich.

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

We will Remove and Prevent Scale in any Steam Boiler or make no Charge. Two Valuable Patents for Sale. Geo. W. Lord, Phila., Pa.

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

An inducement.—Free Rent for three months to tenants with good business, in commodious factory just built for encouragement manufacturing. Very light rooms, with steam, gas, and water pipes, power elevator, &c. &c. Manufacturers' Corporate Association, Westfield, Mass. Plans of Building, Room 22, Twenty One Park Row, N. Y.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

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

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

Pattern Letters and Figures, to put on patterns, for molding names, places and dates on castings, etc. H. W. Knight, Seneca Falls, N. Y.

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

Presses, Dies, and Tinner's Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water St., opposite Fulton Ferry, Brooklyn, N. Y.

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

Extra Heavy Oak tanned Belting—Rubber Belting, Packing, Hose, &c. Greene, Tweed & Co., 18 Park Place, New York.

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

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau St., New York.

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

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. Army, 301 and 303 Cherry Street, Philadelphia, Pa.

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, &c. 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.

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.

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 year.

**To Excel in Improvement** is the leading element of this country, and no other article of labor-saving machinery has equalled in this respect the sewing machine in rapid strides of improvement. Among them the New Wilson Under-Feed Machine may be counted the leading one in this connection. Mr. W. G. Wilson, its inventor, and President of the Company that manufactures it, makes its improvement his constant study. Everything has been added to it that constant experimenting and science could suggest, and it is offered to the public to-day without an equal for family use. Light, rapid, beautiful, durable and perfect, the Wilson holds the leading place among the best sewing machines in use. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

## 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.—**FLY PAPER.**—Will any one give me a recipe for making the paper that, if flies alight upon it, they stick to it?—T. W. S.
- 2.—**STRENGTH OF CITRIC ACID.**—How much citric acid equals one dozen lemons?—T. W. S.
- 3.—**PATENT LEATHER.**—What composition is used for glazing patent leather, and how is it put on?—S. B. D.
- 4.—**WHITE INDIA RUBBER.**—Is there any way in which india rubber can be made perfectly white, without destroying its elasticity?—M. H. J.
- 5.—**WIRE FOR SIEVES.**—What kind of a wire sieve will withstand the action of salt and guano? Iron sieves or wire will do only for a few days; then they are rusted out and worthless.—A. C. S.
- 6.—**TEETH IN WHEELS FOR CHAIN BELTS.**—Will some one inform me of a rule for laying out or spacing off teeth in wheels for chain belts to run on? Different wheels require different spacing for the same chain.—M.
- 7.—**GRINDING LENSES.**—I wish to make a powerful lens for a microscope. The one I have is not strong enough. Can some one tell me how I can turn and polish the glass?—E. J. O.
- 8.—**CENTERING LATHES.**—How can the conical points of the centers of lathes be ground so that their cross sections shall not vary from circles by more than one ten thousandth part of an inch?—G. M. T.
- 9.—**JAPANESE PAPER WARE.**—Can any one tell me how his is made, or put me in the direction to acquire the information?—E. A. W.
- 10.—**PERMANENT ANILINE INK.**—Can I make permanent ink from aniline colors? I dissolved rosaniline in alcohol, and to get the proper tint, I mixed it with water and gum arabic. It is a splendid ink, but after a time it fades and washes away.—G. J.
- 11.—**ANATOMICAL SPECIMENS.**—How can I prepare anatomical specimens such as are seen in museums? They look as if they were dried.—G. H. J.
- 12.—**COMPRESSIBILITY OF WATER.**—Supposing you put water under a pressure of one, two, or three atmospheres; in what proportion does the volume of the water decrease and the specific gravity increase?—L. E.
- 13.—**MAGNETIC CURRENTS.**—Will Mr. John Wise the aeronaut, or some other experienced philosopher, inform me whether there is any perceptible variation in the line of magnetic currents, when we rise above the earth, as indicated by the compass?—A. E.
- 14.—**IMPURE WATER.**—Owing to the continued drought, the water in the storage lakes supplying our city has become very much reduced, and the water now has an unpleasant taste and smell. What can be put in our pitchers, etc., to purify before using?—J. W. L.
- 15.—**REFRIGERATORS.**—Can any one give me general information as to refrigerators? I want to make one on a small scale for family use, and would like to know the materials used and their cost. Would the money required to build an ice house and the labor spent in filling it be as well laid out in a refrigerator?—W. A.
- 16.—**ENGINE FOR GANG PLOWS.**—Could not an engine be built of small power with elevating screws for the boiler, to keep it on a level, and so enable it to be controlled for the purpose of breaking prairie with two or more plows in gang?—A. J. D.
- 17.—**POWER FOR STEAM YACHT.**—I am about to build a screw propeller steam yacht, 30 feet long by 10 feet beam. What is the smallest single engine that can be used to run it 15 miles per hour? What ought the diameter of the screw to be, and how many revolutions ought it to make per minute?—W. S. B.
- 18.—**DRYING FRUIT.**—Can the heat of the sun be stored up to be used during the night? One of the great wants of the West is a cheap and convenient method of drying fruit. Could the sun's and the waste heat from the cooking stove be so stored that little fuel would be required?—E. E. S.
- 19.—**COFFEE USED IN DYEING.**—I saw a statement some time ago in a paper (now mislaid) that a large quantity of coffee was used in the process of dyeing; it was submitted to a hot bath by which certain properties were extracted, then dried and sold for food. Please inform me how I may distinguish the genuine from the adulterated grain.—S. E. M.
- 20.—**FETID WATER.**—The water in my cistern has a very disagreeable odor; what can I do to remedy it? On standing a few hours in an open vessel, a scum rises to the top resembling iron rust in color. The cistern is new and so set as to receive no surface water; the roof is also new and is not shaded by trees. Three ordinary iron pumps which are used constantly are attached. The top is kept covered.—F. D. H.
- 21.—**TINNING IRON.**—Can any one, familiar with processes of tinning iron, tell me if glycerin will do for dissolving sal ammoniac or muriatic acid, so that the articles when properly cleaned can be dipped from this preparation into the melted tin? I have used a solution of sal ammoniac in diluted muriatic acid, and dipped the articles in powdered rosin before dipping into the tin. I have also used melted tallow instead of powdered rosin, but I wish to use something which is easy to remove from the articles after tinning, and which will not rust iron nor injure silver plate.—W. S. H.
- 22.—**PRIMING OF BOILERS.**—I have a boiler ten feet long with 40 two inch flues and a steam dome on top; the engine is estimated at 30 horse power, with 60 pounds of steam. As sure as we let steam get down to 50 pounds, the water gushes out at the safety valve and the cylinder chokes. Can you explain to me the trouble? I contend that the pipe from the engine is too long; it is 12 feet, and consequently I think it gives room for the steam to condense.—S. M. P.
- 23.—**RED ANTS.**—In your issue of July 20 is an item informing the public that red ants throw out a liquid substance from their bodies. Now tell us, gentlemen, how we can throw out the red ants altogether from our cupboards. How shall we be rid of the red ants themselves? Salt has been said to be an antidote, but a trial of it proves that salt don't scare worth a cent. What will do it?—J. C. W.

## 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 100 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

**MADRAS WATER WORKS.**—J. S. L.'s *Madras Athenaeum* has not come to hand.

**A SHOWER OF POLLEN.**—A. V. P., of Mich., says: We had a heavy shower yesterday, and with the rain there fell a large quantity of the yellow powder, a specimen of which I enclose. The impression here is that it is sulphur. One person claims that it is the sulphur that would have been burnt up had the cloud been accompanied by lightning. I have tried to burn it, but it does not burn; therefore I conclude that it is not sulphur. Thinking you might be interested, I send a sample. Answer: The substance sent is the pollen of a species of pine. A representation of the particles as they look under the microscope may be seen in Wood's "Botany," page 108, Fig. 367. Showers of pollen and *in fusoria* are not uncommon, and are always interesting phenomena. The daily papers recently reported the fall of a shower of yellow sulphur at Saratoga Springs during a rain. But it was probably pollen, as above.

**MINERAL SPECIMEN.**—Enclosed I send you a stone, or something else found among hundreds of others in a small stream of water. They are not all alike. It is very hard indeed. Is it of any value? Answer: The specimen is a quartz pebble. No stone which will yield to the file and grindstone can be diamond. Quartz pebbles, when large and perfectly clear, are used by opticians.

**UTAH OBSIDIAN.**—I see a little notice on the African diamond fields. Please tell me whether, in those fields, Mr. Paterson has seen multitudes of the dark colored stones of which I send you herewith a specimen. When I found them (on top ground like gravel, and plentiful), I thought of Brazilian diamond fields. I have also seen them on marly soil and metamorphous clay slate shales and green sandstone, mixed with bluish formations of all colors. I had no time to lose, or I would have spent a week to dig and wash the marly ground. But if there be such stones in the African regions, I have every reason to believe I found similar fields here in Utah.—S. Answer: The specimens sent are of volcanic origin. The black is obsidian or black glass lava, which often occurs in nodules in river sand in Mexico and elsewhere. The other is a known variety. They are interesting to the mineralogist, and are sometimes used for jewelry, but they have an indifferent value. We were not aware that Mr. Paterson found obsidian in the African diamond fields.

**STEAM AND COMPRESSED AIR.**—To C. B. B.—Compressed air may be used in place of steam to work an engine.

**HEATING FEED WATER FOR LOCOMOTIVES.**—To A. M.—Several devices have been employed for the purpose; but we cannot say which would be most suitable for your engine.

**BOILER SCALE, ETC.**—S. M. P. should consult our advertising columns. As an "Engineer's Guide," Bourne's "Catechism of the Steam Engine" is a good authority, and may be studied by beginners.

**STAG HORN BEETLE.**—I send you a horned bug for inspection, as I see, by the *Scientific American*, that you write a chapter on such things occasionally. These bugs are numerous towards night.—J. F. W. Answer: The bug is the stag horn beetle or *Lucanus dama*. Its larva or caterpillar has a rusty colored head, and lives in rotten wood.

G. H. C., of Conn., sends some mineral specimens, requesting to know their character. We reply: The golden spangles in the quartz rock are pyrites. The black specimen appears to be tourmaline, but the fragment is too small for safe determination.

**SOLID AND HOLLOW IRON SHAFTS.**—Which would sustain the greater weight, a solid cylinder of iron two inches in diameter and two feet in length, or a hollow cylinder of two inches external and one inch internal diameter of the same length? Each is supposed to rest horizontally, supported at the ends, and the weight rests upon, or is suspended from, the middle of each cylinder.—S. S. Answer: Assuming that average cast iron be the material employed, the quiescent breaking load of a solid cylinder of the specified dimensions would be about 5,040 pounds, while that of a hollow cylinder would hardly exceed 3,808 pounds.

L. S. F., of O.—The issue of June 22d closed the volume of 26 numbers commencing January 1st. The next issue was dated July 6, no intermediate paper being issued.

**PRINTING QUESTIONS.**—To M. W. Z.—Two of your questions are business enquiries, and could not be definitely answered by us or our correspondents. Every maker will recommend his own goods, and prices vary considerably. Pay a fair price to a reputable manufacturer, and stick to him as long as he sends you the right thing.

**AQUARIUM CEMENT.**—R. C., of Ill., will find a good recipe on page 267 of our Volume XXV.

**METAL LINING IN CAST IRON BOXES.**—Let W. A., query 12, on page 416 of Vol. XXVI., drill a few holes at an angle on the inside of his boxes, partially through the metal. The melted Babbitt metal will run into these holes, forming lugs which will effectually keep the metal in place and be tight until worn out.—S. G. S., of N. Y.

**TAKING IMPRESSIONS ON PAPER.**—Query 19, page 10.—Impressions can be taken by coating a piece of thick paper with oil and holding it over the flame of a candle or lamp until it is smoked black. Any kind of oil will answer, though linseed is the best; little oil should be used.—E. E. S., of O.

**FORCE OF FALLING BODIES.**—In view of the difference between the two answers to J. E., query 12, June 8, and of my own ideas, somewhat different from either, I would say: The striking force of a moving body, in whatever direction it moves, is its momentum. Its momentum is the joint result of its quantity of matter and its velocity. The ratio of this momentum to that of other moving bodies is compounded of the ratio of its quantity of matter, which is indicated by its weight, and of its velocity at the instant in question. Its momentum, therefore, is not weight any more than it is space or time, and it cannot be expressed by pounds, in the ordinary sense of that word, any more than by feet or by seconds, nor is it expressed by any two of those terms. To obtain a statement of the momentum of a body for the purpose of comparison: Multiply its weight by its velocity—its number of pounds, for instance, by the number of feet it would move in a second if it should proceed for a second at the rate for the instant in question. The velocity of a falling body is continually accelerated, and it increases not as the space fallen over but as the square root (query? Ed.) of that space. Therefore to multiply the weight by the space fallen over will not give the momentum. The velocity of a falling body at the end of one second of its fall is 32 1-6 feet per second, and it has fallen one half that distance. It will fall 41 1-8 feet in half a second, and its velocity is then 81 1-24 feet in half a second. The velocity at four feet descent is nearly the same, but more exactly is 16 1-312 feet per second. This multiplied by the weight in pounds gives the momentum. The general formula is: The square root of (64 38 multiplied by the distance fallen)—the velocity, and the velocity multiplied by the weight—the momentum. So much for determining the momentum. The extent of change produced by the blow of a hammer has a compound relation to the force of the blow and the ability of that which it strikes to resist. Some obstacles resist in proportion not only to intrinsic power, but also to the time during which they exert their resistance, and their resistance to a blow is less as the velocity of the blow is greater. Such are the different attractive, repulsive, and expansive forces, and such is substantially the case where springs are to be bent and where many forms of cohesion are

to be overcome. In such cases, the change produced is as the weight multiplied by the square of the velocity, and in case of a falling body is as the weight multiplied by the distance fallen. Other resistances are independent of time, and are in proportion to the space over which the resistance operates. Such is substantially the case of friction. Here the change is as the momentum of the blow. It is so in the case of bodies resisted by the momentum or inertia of other bodies, or, as in greater or less degree is the case of a body moving through liquids, of the particles of bodies. The case of forging with a hammer presents a compound of both these kinds of resistance, varying in their proportions with the nature of materials, degree of heat, and other considerations.—G. M. T.

## Recent American and Foreign Patents.

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

**ARGAND LAMP BURNER.**—Joseph Ravoux, of New York city, assignor to himself and Lucien Knapp, of same place.—This invention relates to improvements in the construction and arrangement of lamp burners which are adapted for the reception of annular wicks, and has for its object to improve the flame by a more perfect system of admission of air. It consists in admitting air at the base of the flame of an argand burner by means of perforations in the concentric tubes which enclose the wick. The upper ends of the tubes are bent apart—the inner one inward and the outer one outward—to allow free passage to the air.

**BIRD'S NEST.**—John A. Deknatel, New York city.—This invention furnishes an improved wooden bird nest which is made in two pieces, each turned out of a single piece of wood, and japanned both inside and outside.

**PAINTER'S PALETTE.**—The improvement in this invention consists in adjustably attaching to the palette a clamp, by means of which it can be attached to any suitable fixture and thereby rendered more useful in sign and ornamental painting. It may be used without the clamp, in the usual manner. Oscar Le Roy Andrews, of Boston, Mass., is the inventor of this improvement.

**CELL COVER FOR SEWING MACHINE TABLE.**—George Alfred Wheeler, Worcester, Mass.—This invention consists in arranging a series of cells, in sewing machine or other tables, in a row, and providing them with sliding covers which adjoin and all slide in the same direction when being opened or closed. A spring acts on one end cover, and through that communicates motion to any or all of the others so as to close them.

**AUTOMATIC BELL RINGING APPARATUS FOR LOCOMOTIVES.**—James S. Lamar, Augusta, Ga.—This invention consists of a crank shaft which is mounted on the locomotive and provided with a friction wheel or a gear wheel in such a manner that it can be readily geared or ungeared with one of the axles. The bell is connected to the crank by a cord and is rung automatically when the locomotive is in motion; thus saving the labor of ringing it by hand, which is considerable in large towns where the distances along which the bell is required to be rung are long.

**SAW GUIDE.**—James Arthur, Anoka, Minn.—This invention produces a saw guide which can have its jaws adjusted while the saw is in operation without exposing the operator's hands to dangerous contact with it, and in which, furthermore, either jaw can be adjusted independently of the other.

**WHEEL PLOW.**—Guy Tozer, Jackson, Mo.—This invention furnishes an improved plow which is designed more particularly for tight clay soils, but which may be used with advantage in other soils. It is so constructed as to open the bottom of the furrow so as to drain off surplus water from the roots of the grain and prevent them being chilled by it in cold weather or scalded in warm.

**ROTARY STEAM ENGINE.**—George H. Whitcher, South Brooklyn, N. Y.—This invention furnishes an improved steam engine, which is so constructed as to give a constant and steady motion, and which may also be used as a pump, if desired; it consists in combining two steam cylinders with two other smaller cylinders eccentrically shafted within them, and a horizontal piston. The construction, which would not be understood from a verbal explanation alone, insures the rotation of the inner cylinders and their shafts when steam is admitted.

**PORTABLE HOUSE.**—Harvey W. Forman, Centralia, Kan.—The invention relates to an improvement in that class of house whose parts are detachable, in order to admit of being packed and transported conveniently and cheaply from one place to another. It consists in a new arrangement of parts with a view to increased lightness, strength and durability of the structure.

**HATCHWAY GUARDS.**—Edward H. Ball, of New York city.—This invention furnishes an improved guard for elevator and other hatchways which is so constructed as to be raised by weights automatically into position as the hatch is opened. When shut down, it is secured in place by a spring bolt which is released by the rising hatch.

**LIFTING JACK.**—Charles Maynard, of North Topeka, Kas.—The object of this invention is to render more useful and effective the ordinary lifting jack for wagons and other wheeled vehicles; and it consists in connecting the parts so as to cheapen, simplify, and improve the construction without involving any material alteration in form.

**HEADLE CONNECTION FOR LOOMS.**—Thomas K. McIntyre, of Warner, N. H.—In this invention, metal straps are used for connecting the various parts of looms instead of the ordinary leather ones. They are cheaper and more durable. The strap is made in two toothed pieces which are joined by a sleeve which is drawn over the parts where the teeth mesh. By this construction its length is easily adjustable.

**MILK STRAINER.**—Richard G. Kendall, of Fairweather, Ill.—This invention relates to a useful improvement in milk straining buckets or pails, and consists in a new mode of making the strainers detachable from the bucket, so that they may be changed or removed with facility. The strainers are made with a grooved frame which slides on to lips on the spout of the bucket.

**FENCE.**—Israel L. Landis, Lancaster, Pa.—This invention is an improvement on a fence patented by S. H. Rose, September 25, 1866, and it consists in combining, with the pins that pass horizontally through the posts and support the panels in an upright position, other pins that pass transversely through bottom strips of the panels and prevent the panels being raised by small stock in its effort to pass under the same.

**FRUIT DRYER.**—Judson Allen, of Everett, Mo.—In this improved dryer an air chamber is arranged below the drying chamber and above the heating chamber, which receives air from the sides of the case, and delivers it through its perforated vertical side walls to the drying chamber above, so as to prevent too much heat radiating through the bottom plate. At each corner of the dryer is a hot air conductor, which can be adjusted either to turn the heat into the dryer, or to allow it to escape through the top. On the front of each conductor are deflecting plates which cause an equal distribution of the heat in the drying chamber.

**MEDICAL COMPOUND FOR HEART DISEASE.**—Michael D. Britten, of Eaton, Mich.—This invention relates to a new and useful improvement in the curative art; and consists in a compound composed of the pitch of *pinus origida* beech bark and the heart of the iron-wood tree, all steeped in alcohol moderately for several hours.

**FRUIT CRATE.**—Elijah B. Georgia, Clifton Station, Va.—The invention consists in a fruit and vegetable crate consisting of top and bottom frame slatted and connected by slats nailed to their inner sides.

**ADJUSTABLE STAND.**—Matthews Stahn, Baltimore, Md.—This invention consists in a triangular stand for photographer's use, formed in two hollow sections, one of which is raised or lowered within the other by means of a windlass, and held by clamp screws.

**WATER WHEEL.**—John Frank, Chester, O.—The invention consists in adjusting a water wheel vertically by means of slotted uprights, a tenoned bridge tree, and an adjustable wedge support; in attaching the buckets by mortise and tenon to a central hub and then holding it by a single band and a bolt to each bucket; in giving a gradual curve, then a quick rise at the end, and then a relative height and width to the buckets; and finally, in making the cup in sections, detachably held by crossrods on the inside and bands on the outside.