Notes & Queries

A. M. C. asks: Is there anything which will as effectually protect iron from rust, etc., as the galvanizing process, but which is less expensive?

H. J. H. asks: What is the best composition to preserve pickets set in the ground?

T. B. C. wants a recipe for sticking emery on tin. "There is a constant jar on the tin, and glue will not hold."

H. F. U. asks for the exact proportion of ingredients requisite to make a wholesome self-raising flour.

M. C. asks: What is the process of graining oak root, and what colors are used by painters in doing it in distemper?

Answers to Correspondents

C. T. S. can preserve his composing stick or other steel articles from rust by following the directions on p. 27, volume 25.—F. can attach leather or cloth to galvanized iron by using the recipe given on p. 107, vol. 28.—J. W. J. should try the method described on p. 406, vol. 25, for preserving eggs.—F. A. will find a recipe for shoemaker's ink on p. 75, vol. 27.—R. H. L. will find his question as to the weight on a safety valve answered in the reply to W. A. S. on this page.—E. R. D. should consult the makers of windmills. His query about slip of belts is answered on page 380, vol. 28.—J. L. R. can try the much recommended tannate of soda in his lime water.

W. C. F. asks: At what velocity will steam issue through a round hole, one eighth inch long and one sixteenth of an inch in diameter, under a pressure of 100 lbs. to the square inch; and what would be the difference in the velocity provided the diameter of the hole be increased to one eighth inch, the pressure and length of hole remaining the same? Answer: See editorial pages of this issue.

W. H. S. asks how to precipitate gold, silver, copper, nickel, and platinum from solutions. Answers: To precipitate gold, add a strong solution of ferrous sulphate, or sulphate of iron, to a solution of any salt of gold, as the chloride, prepared by dissolving gold in *aqua regia*. The gold is precipitated as a brown powder. Silver is precipitated in the metallic state from the chloride, made by dissolving silver in *aqua regia* by iron. Add clean pieces of iron to a solution of the chloride of silver. For copper, add clean scrap iron to a solution of blue vitriol, sulphate of copper. For metallic nickel, first add a strong solution of oxalic acid to a strong solution of sulphate of nickel. Collect the pale bluish green precipitate. Heat the precipitate in a covered crucible, lined with charcoal. For platinum, dissolve the metal in *aqua regia* (a mixture of muriatic and nitric acids), precipitate with a solution of sal ammoniac, and heat the precipitated red hot. The result is spongy platinum.

N. J. N. asks: 1. How can I calculate the difference between the steam pipe and exhaust pipe of a stationary engine? Is a three inch exhaust large enough for an engine of 12 inch bore and 20 inch stroke, with a 2 inch steam pipe, running at 104 revolutions per minute, 80 lbs. pressure to the square inch in the boilers? 2. What is the accompanying specimen composed of? 3. Will it affect the water in the boiler to put in the carcass of a dead mule, in pieces? 4. How can I compute horse power? Answers: 1. Consult "Link and Valve Motions," by W. S. Auchincloss. 2. Some compound of lime, probably the carbonate. 3. We never heard of the plan before. 4. See answer to M. C., on this page.

J. R. K. says: 1. We want to carry the condensed steam from an engine into a tub eight feet deep, for the purpose of boiling straw. What per centage of power do we lose on the engines? 2. We have a tubular boiler 42 inches in diameter, 80 two inch tubes, 14 feet long, with stack 18 inches diameter and 50 feet high, with very poor draft. The boiler is situate in a hollow; the hill on one side is about as high as the stack, the other twice as high. Can you suggest a remedy for the bad draft? Answers: 1. None, if the condensed steam does not have to be raised, to be put into the tub. 2. Probably a mechanical draft, by a blower, will remedy the trouble.

J. P. C. says: I use a small vertical portable engine and boiler, and sometimes I have to carry 100 lbs. steam to do the work. The boiler is 56 inches high 28 outside diameter, with 24 one and a half inches tubes. The firebox is 18 inches diameter x 22 inches high. The middle gage is 39 inches from bottom of boiler, and she steams best with water at that hight. I use fir wood for fuel, which makes an intense heat. Am I safe from heating the tubes too hot with the firebox full of wood, and water at middle cock, 13 inches above crown sheet? Evaporation is rapid and steam is pretty wet if carried higher. The boiler foamed so badly that I could not tell anything about the hight of the water. I fancied that the oil which got in around the plunger of the force pump had something to do with it. I got the idea from something I once saw in the SCIENTIFIC; since then I have been very careful to keep all oil out, and have never been troubled with foaming in the least, at any pressure from 20 to 100 lbs. Answer: If when the engine is in motion, the water issues solid from the lower gage cock, there is no danger. It is only when boilers have such a bad circulation that the tubes or crown sheet are left bare that there is danger from heavy firing.

H. B. & K. ask what kind of dryer is best to put in coal tar, in making a gravel roof. Answer: Try boiled linseed oil, or litharge.

T. S. S. asks how to make and bleach skeletonized or phantom leaves. Answer: Boil the leaves in a weak solution of caustic soda for some hours, wash thoroughly and then expose to the fumes of burning sulphur.

E. C. C. says: I want to make springs 4 inches long x ⅛ inch wide by one thirty-second thick, to be pressed from sheet metal or otherwise. They are required to spring ⅛ inch and not to rust, and to be as cheap as possible. Is there any metal cheaper and better than sheet spring steel? They can be tinned or galvanized to prevent rust. Answer: Spring steel will probably be the best material for you to use.

G. says: Some bins containing soft crushed sugars are full of little red ants; I would like to know why they select that sugar from the other kinds, and how we can get them out? Answer: A plentiful supply of what is known as Persian powder, around (not in) the sugar bins, will prevent the inroad of ants. Sugar bins should be made of hard stout plank, with closely fitting covers, and kept perfectly clean. If they could be lined with earthenware or stoneware, and made air-tight, so much the better. The only way we can suggest to you, for getting rid of the ants already in the sugar, is to spread it out in thin layers and pick out the ants by hand. The ants prefer the brown sugar, probably on account of its greater sweetness and moisture.

R. W. W. asks how to clean a carpet which has been soiled by accident. It was washed with soap suds: and to remove a sour smell, it was washed with soda water. "The color remained good until, to remove further odor, I poured on bay rum; that operation turned it a light green color. The original colors are two shades of brown, red, green and black, on a white ground." Answer: We advise you by all means to discontinue the use of soda water and bay rum on the carpet. The alcohol in the bay rum has probably so dissolved and spread the colors that there is no remedy. To remove the smell, try a very dilute solution of carbolic acid.

W. H. R. asks: 1. How great a vacuum can be produced with an air pump with one inch bore and 3½ inch stroke? 2. Can an article be held on a trap by such vacuum fast enough to lift 16 lbs.? 3. Will soluble glass answer for artificial stone exposed to the weather? 4. What sudden pressure will a cast iron tube stand safely, if given by a quantity of gunpowder or other combustible? Answers: 1. It depends on the relative size of the receiver and connections. With the cylinder alone, if the piston is tight, a nearly perfect vacuum can be produced, with reference to the air. 2. No, if the trap is the size of the cylinder. 3. Correspond with the manufacturers. 4. The tensile strength of cast iron is about 18,000 lbs. per square inch. Take ⅙ of this for a safe strain, and then the pressure per square inch that it will safely bear may be found by multiplying the thickness in inches by the safe strain, and dividing it by the diameter of the tube in inches. This is for thin cylinders. For thick ones, see article in SCIENTIFIC AMERICAN for June 21, 1873.

A. S. asks how to bleach and cure palmetto grass. Answer: Steep or boil the leaves in a weak solution of caustic soda, wash thoroughly, and then expose them to the fumes of burning sulphur in a close chamber; or instead of the sulphur fumes, soak in a weak solution of chloride of lime and rinse well afterwards.

H. R. asks: Is there such a thing as scagliola? If so, where can I get it, how can I make it, and what is it used for? Answer: Scagliola is a species of stucco made with the best plaster of Paris and a weak solution of Flanders glue; it is colored according to taste. This composition is often applied upon hollow columns of wood, and the surface, when hard, can be smoothed in a lathe or polished.

A. H. C. asks: What is the cause of white sugar flashing like a glow worm when you run the scoop into it? Answer: The cause of sugar flashing, as you describe, is probably owing to the electricity developed by the friction between the scoop and the sugar.

C. E. asks: What is the difference between true north and magnetic north in the city of New York for the year 1873? Answer: The magnetic north is 7° W. of the true north.

P. D. asks: By what means flowers, leaves and other vegetable matters are deprived of their colors, that is, bleached or whitened, for introduction into what I think are called "skeleton bouquets?" Answer: Expose the flowers for a few minutes to the fumes of burning sulphur in a close vessel, care being taken to prevent the heat from reaching them.

W. A. S. asks: 1. What formulæ are used in measuring safety valves of different sizes? 2. How do you go to work after you get the figures? Answers: 1. Measure the diameter of the valve, in inches—square this and multiply it by the decimal .7854; this will give the area of the valve in square inches, Find the weight of the lever, and the distance of its center of gravity from the fulcrum. This can be found by balancing the lever on a knife edge. We call the distance, the lever arm of the lever. Weigh the valve, and measure the distance from the center of the valve stem to fulcrum, noting that all distances are to be measured horizontally. This is the lever arm of the valve. Find the number of pounds in the weight, The distance of point of suspension of weight from fulcrum is called the lever arm of the weight. 2. Having obtained these figures, make an equation, thus: Pressure of steam in pounds per square inch × area of valve in square inches × lever arm of valve = (weight of ball × lever arm of ball) + (weight of lever × lever arm of lever) + (weight of valve × lever arm of valve.) It is evident that if all the parts but one are known, this equation will determine that part.

E. M. K. says: 1. How quickly can a 35 horse power engine be stopped if it is making 75 revolutions per minute with 70 lbs. steam? 2. How can I Babbitt a governor on a high pressure engine? 3. The oil or tallow cup that was on the cut off-chest was changed and put above the governor in the steam pipe; is that right? 4. How can I reverse an engine? 5. The boiler is to carry 75 lbs. steam. There is a 4½ lbs. iron weight added to the safety valve. When it is off, steam blows off at 75 lbs. by steam gage. Is this right? 6. Is there water or oil used on emery stones and wheels, and how are they turned off? 7. Are the toads that stay around gardens poisonous? Answers: 1. It depends in a great measure on the weight of the moving parts, but under ordinary circumstances such an engine could be safely stopped in 15 seconds. 2. If it is a box, closed at both ends, heat the journal, cover it with a piece of oiled writing paper, place it in the box, and pour in the molten metal. If the place is open at the bottom, after putting in the journal stop the opening with clay, and proceed as before. 3. Yes 4. Arrange stops for the eccentric so that it will be loose on the shaft, between the positions for forward and backward motion. 5. We think you had better remove the extra weight. 6. There are emery wheels made to run in oil and water. Unless they are specially prepared, they should be run dry. 7 So far as we know, such toads are not poisonous.

J. K. S. asks: 1. How can I construct a storm glass? 2. How can I expel fleas from a cat that is filled with them? Answers: 1. Put the following ingredients into a long and narrow bottle: one quarter ounce camphor, one sixteenth ounce niter, one sixteenth ounce muriate of ammonia, dissolved in 2 ounces of alcohol. Cover the mouth of the bottle with a piece of bladder, containing a puncture made by a fine needle. 2. Boil tobacco leaves in water, and wash the cat in the decoction.

M. W. H. asks: 1. What is nitro-glycerin made from? 2. Does it, when ignited, leave any sediment or ash? 3. Can gunpowder be ignited by a current of electricity without the conducting wire touching it? 4. What will be the pressure of one ounce of common gunpowder, when ignited in a cubic foot of space? 5 What is the pressure of nitro-glycerin per ounce, in a cubic foot of space? 6. What the pressure of white or fulminating powder per ounce, in a cubic foot of space? 7. How many cubic feet will one ounce of common gunpowder fill, if exploded in a cylinder or tube one foot square, it standing upright, so that there will be only the atmospheric pressure of one square foot to sustain? 8. Will sulphuric acid keep ink from molding? 9. Will a pocket compass lose its magnetic power? If so, how long will it take, and can it be made good again, and how? Answers: 1. Made of nitric acid, sulphuric acid and glycerin. 2. No. 3. Yes, if the powder be confined. 4. One ounce gunpowder equals about 1 cubic inch space, and expands at the moment of explosion, as estimated by competent chemists, 2,700 times, or to about 1½ cubic feet. Therefore the pressure in a confined cubic foot space, will be 22½ lbs. above the atmosphere per square inch. 5. Nitro-glycerin has 13 times the explosive force of gunpowder, therefore the pressure of one ounce may be estimated at 293 lbs. per square inch above the atmosphere. 6. No known experiments have determined. 7. At moment of explosion 1¼ cubic feet. After the gases have cooled, however, probably from ⅓ to ⅕ of this. 8. The effect will be to corrode steel pens. 9. It will not, if not tampered with. When lost, the magnetic power is easily restored by rubbing on another magnet.

C. G. G. says: I wish to dig an ice cellar near my well of excellent water. If I drain the cellar through a filter, into the well, will the water be affected hurtfully? Answer: We would advise you by no means to drain your ice house, even through a filter, into your well. Filtered water may look perfectly clear and taste pure, and yet be poisonous, though that from your ice may be harmless. Let no drain come near your well.

M. C. asks: 1. How can I find the power of a steam engine by plain arithmetic? 2. I want a plain rule for finding the horse power of a tubular boiler. 3. Will the same rule apply to all boilers? 4. Is there a rule for finding the capacity of a plunger pump? 5. Which would be the proper place for an air chamber of plunger pump, on suction or force side? I propose to attach it to relieve a very heavy thumping. 6. What causes a vacuum in steam cylinder, and how can it be prevented? Answers: 1. Multiply the diameter of the cylinder in inches by the decimal .7854; multiply this by the number of revolutions per minute, and by twice the length of stroke in feet, and divide the result by 33,000. 2. Divide the number of square feet of heating surface by 15. 3. Only approximately to any. We do not know of any absolute rule, except a practical test. 4. Multiply the diameter of plunger in feet by the length of stroke in feet, and by half the number of strokes per minute, and you will get a rough approximation of the number of cubic feet delivered per minute. So much depends upon the construction and location of the pump that it is difficult to give a general rule that is reliable. 5. On delivery side generally. 6. The condensation of the steam. It can be destroyed or prevented by letting in air.

J. H. says: You repeatedly advise young mechanics to study mathematics. Will you tell me how long it will take to make a person sufficiently posted on the subject, provided that he has an average amount of brains, a good general knowledge of arithmetic, no knowledge of algebra (or very slight), a fair amount of perseverance, his nights only to study, and no funds to employ a teacher? What work would you advise me to commence with? Answer: A great deal depends upon making the right kind of start, so as to know how to study, as well as what to study. In algebra, we would recommend Davies' "Bourdon," and in geometry, trigonometry, and the use of logarithms, Davies' "Legendre." Each book costs from $1.50 to $2.00, and to master their contents thoroughly will require, with the limited time afforded you for study, from nine months to a year. But you will have gained a recompense; for avenues of great benefit to your business will be opened to you, which would otherwise have been as sealed chambers. In commencing your studies, remember that it is not so much rules, as methods, that you wish to acquire. Always proceed on the principle that the book is wrong and must be proved right; and get practice continually in the interpretation of formulas and results.

A. A. D. says: I am constructing a rotary engine with 4 vanes, each of which has 2·8125 square inches area; it is constructed on the eccentric principle and is to work on expansion, with 50 lbs. steam pressure and to make 200 revolutions per minute. Would more vanes create more power? What sized boiler would it require, and what kind of boiler, of plate iron or copper for efficiency and cheapness? How much fire surface ought it to have to make the most steam and be the most economical? Please rate the power of the above engine, and give a reliable mode of calculating power of rotary engines. Answer: We cannot answer these questions without receiving more data. To calculate the power developed by a rotary engine, multiply the piston area that is acted on continuously by the mean pressure of the steam throughout the stroke. Multiply this by the mean piston speed in feet per minute, and divide by 33,000.

E. A. W. asks: How is the black varnish or lacker applied to small articles of wire, such as fish hooks, hair pins, etc., and of what is it composed? Answer: Add to 2 lbs. asphaltum (fused in an iron pot) hot boiled oil 1 pint; mix thoroughly, remove from the fire and when cooled a little add 2 quarts oil of turpentine. Apply with a varnish brush.

F. B. T. asks: What should be the size of a water wheel, and of the stream of water to run a sewing machine? The water is supplied through hose to a tank 8 feet above ground. Answer: There are a number of sewing machine motors, driven by water, in the market. Correspond with their manufacturers.