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Notes & Queries

R. W. J. will find a formula for proportioning safety valves on p. 363, vol. 29.—J. F. can blue steel by the method described on p. 123, vol. 31.—J. S. will find that bronzing on iron is described on p. 283, vol. 31.

(1) J. A. M. asks: Can I magnetize cast iron? A. Yes, temporarily, by enclosing it in a wire helix traversed by an electric current.

(2) S. L. asks: 1. Do you think that a young Irish retriever could be broken of the habit of running away when a gun is discharged? A. Take your dog to a pigeon or shooting match, and gradually approach the shooters with your pet, and encourage him. Most dogs can be broken of gun shyness in this way, but some of them can never be cured. 2. Please give me the name of some handbook on training dogs for the field. A. The best book ever published on the sporting dog is "The Dog," by Mayhew, Dinks, and Hutchinson; it is published by Orange Judd & Co., 245 Broadway, N. Y.

(3) W. C. asks: Is a building, having a lightning rod which is formed of a copper pipe or tube laid flat on the roof and fastened with small strips of zinc to the roof and walls of the building, perfectly safe during a storm? A. The above method of attachment of the rod to the building is correct. But the main thing pertaining to the use of a lightning rod is to have the rod properly connected with the earth. The bottom of the rod, in the earth, must be greatly enlarged, either by having the rod extended underground for a long distance, or by connecting the rod with iron water pipes or iron drain pipes in the ground, or by placing the bottom of the rod in contact with a large mass of charcoal, which may be laid in a trench. No building is safe if the rod is merely stuck down a few feet into the dry earth. This is the common plan, but it is unsafe. Safety can only be secured by having an extensive mass of good conducting material at the bottom of the rod, in the earth.

(4) T. S. and others ask: How is transfer or indelible paper made, for marking clothing? A. The paper is probably saturated with a solution of bichromate of potash, logwood, and a little carbonized sirup.

(5) D. G. S. asks: Will a cosmorama lens of 36 inches focus do for the object glass of a telescope which I think of constructing, combined with an eyepiece of ½ inch focus? A. A common lens will not do at all for the object glass of a telescope, as it gives too defective an image. You must consider that the image has to be enlarged by the eyepiece, which will enlarge all defects also. For a telescopic objective, it is imperatively necessary to have an achromatic lens made of a crown glass bi-convex lens, and a correcting plano convex lens of flint glass.

How can I obtain sulphuretted hydrogen? A. Pour diluted sulphuric acid on sulphuret of iron or on sulphuret of antimony.

(6) A. B. says: I made a magnetic needle out of a rat-tail file; and while polishing it upon an emery wheel, I thought of testing the action of moving bodies upon it. Having no point ready, I stuck it upon a sharp pointed lead pencil and held it in front of one of the emery wheels. It instantly began to revolve at about 200 to 250 revolutions per minute, running from right to left. I thought it was the current of air striking it, and held the needle on the other side of the wheel. It instantly checked its motion, and started in the opposite direction. In this position, the air would strike it in the reverse of the first position. To further prove it I held it opposite the wheel on the other end of the shaft; and to my surprise it stopped and started revolving in the same direction. It was not produced by air currents. Held between the two wheels, it also revolved. To further prove it, I placed it upon a pin and cork, putting it in an iron pan so that all currents of air would strike the bottom of the pan; and it still revolved, but at reduced speed. I came to this conclusion: Each wheel has a north and south pole, and the north pole of one wheel is opposite to south of the other. It may be that, when in motion, one wheel forms a north pole and the other a south. The wheels have iron arms filled with wood segments, and are covered with leather and emery. Please explain the cause. A. Probably the wheels contain some residual magnetism, and one side is positively and the other negatively polarized. If the wheels are made of cast iron, this might readily be the case.

(7) C. C. P. asks: 1. Will leather scraps, ground down nearly to a powder, be of value as a fertilizer? A. Yes. 2. Are freshly ground bones in a fit state to be used as a fertilizer? A. Yes.

(8) J. C. asks: I have a piece of genuine moss agate which I would like to cut up in small pieces. How can I do this? A. Agates are cut by means of a small copper disk on a lathe, fed with emery. The surface is then coarsely ground by means of a grindstone of a hard reddish sandstone, and the polish is afterwards given on a wheel of soft wood, moistened and imbued with a fine powder of hard red tripoli.

(9) W. S. & S. say: We wish to make a siphon and draw the water from a well 52 feet deep with 75 feet fall. Can we form a vacuum and start the water running? A. The water could not be induced to rise out of the well without other aid than the mere pressure of the atmosphere.

(10) H. B. B. asks: Is there any cement or paint that would answer for lining a cistern to contain vinegar, that would not be destroyed by the acid nor spoil the vinegar? A. Vats of this character are sometimes coated with melted rosin.

Is the refuse of the blacksmith's forge and furnace beneficial to fruit trees? A. It has been recommended for this purpose. Give it a trial.

(11) J. M. T. asks: Can you give me a process for cleansing the dark color from steel blades after cutting fruit? A. Rottenstone is used for this purpose.

(12) F. N. asks: 1. How can I fix colors on caoutchouc or on gutta percha? A. Caoutchouc is probably lettered with rubber solution while it is stretched, the coloring matter immediately dusted over it, and the whole allowed to dry. 2. How can two pieces be made to adhere to each other by the edges? A. By means of a caoutchouc solution in naphtha.

(13) P. B. asks: I have a portrait that is being destroyed by cracking and scaling off of the paint from the canvas. The cause is attributed, by those who profess to know, to the picture's being varnished before the paint was perfectly dry. Is there any remedy for it? A. We do not know of anything except revarnishing.

(14) J. S. asks: Will the residue of sulphuric acid and carbonate of soda, or marble dust, after having been used in the manufacture of soda water, be of value for manure? How should it be prepared? A. The excess of sulphuric acid can be completely neutralized by limestone, and the dried residue used as gypsum. Or calcined bones can be employed, and a mixture of the sulphate and acid phosphate of lime produced.

(15) A. B. G. asks: I want to color glass for lantern slides. How shall I proceed, so as to show any or all the colors of the spectrum in the screen? A. The aniline colors are mostly used for this purpose on a surface prepared with albumen or some similar substance. These colors admit of exquisite shades of fineness and, for this purpose, are remarkably soft and rich in tone. See p. 390, vol. 30.

(16) J. C. G. asks: What is the reason that the second crop of clover yields more seed than the first? A. The crop multiplies itself by scattering its own seed in the fall. This, in the spring, takes root, and soon more than replaces that portion of the last year's growth which has decayed, and which now acts as manure.

What is a good work on mnemonics? A. Consult Appleton's "Cyclopedia."

(17) J. W. K. asks: Can artesian wells be bored here, in Eastern Virginia? A. Yes.

1. How can I mount pictures? A. You do not state whether the pictures were on canvas or paper, also whether they are oil paintings, prints, or photographs. 2. What preparation is used to obviate the necessity of glass? A. Varnish is used for this purpose. 3. What is the origin of the word "remontant," and its meaning? A. It is a French word. Le remontant=the belt strap or belly band of harness.

(18) R. K. says: I have a fine hop vine; but the caterpillars are eating it up. What can I smoke them with so as not to injure the vine? A. Place under the vine a dish containing a small quantity of ignited charcoal: throw upon the coals a quantity of sulphur, and, if necessary, move the dish so that the ascending vapor may temporarily surround each twig and leaf. This is the most effectual remedy known.

(19) M. A. B. asks: What is the rule for calculating the variation in an aneroid barometer, caused by high or low temperature? A. The only correction necessary for an aneroid barometer is a slight one for temperature, detected experimentally thus: Observe carefully its indication at any moment in the external air; remove it immediately before a fire, and heat it until the thermometer on the dial shall reach 100°; then notice the variation of the hand; this variation, divided by the number of degrees through which the thermometer has moved, will give you the correction, whether in defect or excess, to be applied for each degree of change.

(20) W. B. asks: 1. What metal is least liable to tin when coming in contact with a soldering iron? A. Copper or iron. 2. Is there any metal or substance that will not tin, and yet will stand the heat of the iron and be not liable to break? A. We do not know of any such metal.

(21) G. M. G. says: 1. I am making ink composed of nut galls, gum senegal, sulphate of iron, aqua ammonia, alcohol, and rain water. When first applied, it is a pale purple, and slowly turns intensely black. What can I use to make it black when first applied? A. Replace the ammonia and alcohol by a little alum. This we think would make a decided improvement. The addition of logwood to the ink would have the effect of rendering it black when first used, but such ink is much more liable to fade and corrode the pens. 2. Can you give me a cheaper and a better recipe than the above? A. Take 1 oz. extract of logwood; pour over it 2 quarts boiling water, and, when the extract is dissolved, add 1 drachm yellow chromate of potassa. This is an excellent blue black ink, does not fade, and, as it contains no gum, flows freely from the pen. It can be made for about 25 cents per gallon. If an old inkstand is to contain any of this ink, it must be thoroughly cleansed, as ordinary iron ink decomposes the chrome compound.

(22) D. W. U. says: I wish to know how to keep strawberries in their natural color, to take to the fairs as curiosities. I have strawberries measuring 4 and 5 inches in circumference. A. The fruit may be preserved in many ways. One of the simplest methods is that of immersion in some solution of strong antiseptic properties, such as salicylic acid. To retain the natural color of the fruit for any length of time, however, is something quite difficult. We would advise you to obtain photographs of your mammoth fruit as soon as possible.

(23) C. M. asks: 1. What effect will dissolving blue stone in water, in which iron is to be casehardened, have? A. Firstpolish the metal, and then place it in a sand bath until the desired color is obtained, then plunge into water. The addition of blue vitriol to the quenching bath would only serve to copper plate the metal as soon as immersed in it. 2. What preparation is there that, when put on casehardened work, will give it the fine glossy appearance that the fine English guns have? A. Try the following varnish as a lacquer: Gum sandarac 8 ozs., pounded mastic 2 ozs., clear turpentine 2½ ozs., pounded glass 4 ozs., pure alcohol 32 ozs. Mix and dissolve.

(24) J. H. M. asks: What will absorb the ammonia, generated by the urine, etc., of horses in a stable? A. Sprinkle the floor and stalls with dry clay, which has a powerfully absorbent action upon ammoniacal vapors.

(25) W. H. P. asks: What acid is in rhubarb? Can it be extracted and concentrated, and how? A. The juice of the rhubarb contains oxalic, citric, and malic acids, the latter often in considerable quantity. We hardly think the plant can be utilized for lemonade, because of its characteristic purgative properties. The most objectionable acid of the three may, however, be removed in great part by chloride of calcium.

(26) H. J. E. asks: Do all kinds of iron crystalize under strain? A. No.

How is good mortar made? A. The lime ought to be pure, completely free from carbonic acid, and in the state of a very fine powder; the sand should be free from clay, partly in the state of fine sand and partly gravel; the water should be pure, and, if previously saturated with lime, so much the better. The best proportions are three parts of fine sand, four parts of coarse sand, one part of quicklime recently slaked, and as little water as possible. There should always be enough water added at first; if water is added after slaking has begun, it will be chilled and the mortar lumpy. The addition of burnt bones improves mortar by giving it tenacity, and renders it less apt to crack in drying.

Is the casting of small brass or iron articles smooth and without flaws considered as one of the lost arts? A. It is not; at present it is by no means impossible to make a perfect casting.

What is civilization? A. Civilization mainly consists in intellectual development, culture, and refinement.

(27) J. C. H. asks: How can I make the hardest alloy that melts below a red heat? A. Melt together 2 lbs. copper and 1 lb. tin.

(28) W. H. Jr. says: I have separated iodine from iodide of potassium by passing chlorine gas through a solution of it. The chlorine gas was made by the action of sulphuric acid upon calcium chloride. I now find that the solution of iodine contains some of the calcium chloride. How can the iodine be separated from it? A. It may be separated by distillation over a slow fire; but the temperature should not be allowed to rise above 350°.

(29) C. S. R. asks: What composition can be molded, either under pressure or otherwise, have a hard, smooth surface, and not be brittle nor liable to warp? A. Many metallic alloys, we think, would answer your purpose. See p. 11, vol. 31.

(30) S. E. M. asks: 1. Will the common gold fish spawn in a tank that holds 30 gallons water? A. Yes, if the tank be otherwise properly arranged. See pp. 36, 102, vol. 30, and p. 29, vol. 32. 2. What kind of plants will grow best on the bottom of the tank? A. Any of those indigenous to fresh water lakes and streams.

(31) R. B. R. asks: Suppose a suitable turbine wheel to be driven by a certain fixed quantity of hot water, forced through by high pressure steam, the apparatus being so arranged as to use the same water over and over again, such a quantity of water to be supplied only as will make good the loss by evaporation, and the steam used expansively: would such a motor be economical? A. It would be much more economical to use the steam in a well designed steam engine.

(32) F. H. B. asks: 1. Will good plumbago used in the cylinder of a new engine, be of service to prevent cutting? A. A true bore of cylinder and well fitted rings are the best preventives. It ought not to be necessary to use plumbago in a new cylinder. 2. Is there anything in the mixture of metal of which the cylinder and rings are cast, that makes some more liable to cut than others? A. Care is necessary in mixing the iron, to produce a quality that is tough and of uniform texture.

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(33) W. asks: If I have a steam yacht for my own pleasure on the Mississippi river, would I have to get a license for her, and would I need a licensed engineer and pilot? A. Yes.

(34) T. S. W. says: A firm recently ordered a machine for making ice, and secured one of the following dimensions: Boiler 4 feet 6 inches x 2 feet diameter, with 8 two inch iron flues; cylinder 4x12 inches. Directions for use: Raise steam to 50 lbs., and run the machine at 120 revolutions. Good wood was first used, and afterward coal and rosin; but after a few revolutions steam would run down to 30 lbs., which was not sufficient to drive the machine. Reporting that the boiler was not large enough, or there was not sufficient heating surface, they received two iron blocks to be put, one in each end of cylinder, so as to reduce the stroke to 8 inches, and a new crank to suit this stroke, with a coil of lead pipe to be placed in water tank through which to exhaust. The exhaust had previously been into the smoke stack. The makers of the machine claimed that the boiler was large enough, yet sent the extra pieces, the putting in of which would make everything work all right. Please to give your opinion. A. The boiler was too small.

(35) W. M. J. says: J. R. W. (vol. 32, No. 24, June 12) must have something wrong in the setting of his boiler or with his engine. I think it is in the valve; for it is certain that he should run his 8x16 engine and do all it could possibly do on from ¾ to 1 cord of wood. It is certain that a good return tubular boiler will save at least half the fuel used by a two flue boiler. A. We would be glad to receive some facts in corroboration of your views.

(36) J. C. G. says: I am 19 years of age. My occupation is that of a stationary engine driver. I have a good English education, and am considered very good in mathematics. Mechanical engineering is the only business I care for or think about. I have tried to get a situation in a machine shop to learn the trade; but owing to depression in business, I have not succeeded. Would it be best for me to enter a shop or a scientific school? Will I be prepared to superintend the construction and designing of engines by such knowledge as I could gain in such a school? A. It is very desirable to get such advantages as are afforded by the course of a good school of mechanical engineering, such as the Stevens Institute, Hoboken, N. J., the Massachusetts Institute of Technology, Boston, Mass., or Cornell University, Ithaca, N. Y. When one graduates from such a school, he has learned how to study, and has also acquired a great deal of practical experience, in addition to a knowledge of the fundamental principles and methods of the engineering profession.

(37) D. L. B. asks: 1. Would a solid iron bar sink in the ocean in the deepest part, or would it float at a depth where the amount of water, displaced by the bar, would be equal in weight with the bar? A. It would float under the conditions stated. 2. At what depth would the water be of such a density? A. We cannot tell you, as experiments have not been sufficiently extended.

(38) E. F. M. asks: Can rubber belts be renewed? A. No.

Which is the front end of a planer, where the boards go in, or where they come out? A. Where they go in.

What glue is best for cementing leather belt ends together? A. Use marine glue, or gutta percha dissolved in bisulphide of carbon.

Can brass in small quantities be melted in an iron ladle in a common blacksmith's forge? A. It will be better to use a crucible made of clay or plumbago.

How are plaster of Paris molds made? A. They are cast over the pattern.

(39) Z. W. B. says: 1. I have a small steam engine 5x6 inches, that cuts off at half stroke. How can I change it to make it cut off at ¾ stroke? The valve is a plain slide valve. A. You must lengthen it and increase the travel. 2. Is a ¾ circular safety valve large enough for a return tubular boiler 24x36 inches with fifteen 2¾ inch tubes 36 inches long, and a heating surface of 45 feet? A. Yes.

(40) H. D. & Co. say: 1. We are running a 400 horse power engine at 75 lbs. pressure. City water is very expensive, and artesian is very hard. Is it feasible for us to condense our steam, or a large part of it, by currents of air? Has any contrivance of that sort ever been perfected? A. There have been a number of plans proposed for condensing steam without the use of water, but we do not know of any that are in practical operation. There is, of course, no difficulty in arranging such a device, if it is made large enough. 2. Is it of any use to try to clear hard water by raising its temperature under pressure above 212° before entering the boiler, thus reducing the boiler scale? A. This treatment removes some of the impurities, and is generally found to be of great advantage.

(41) W. H. H. asks: I do the street sprinkling in our city, and force salt water 1,200 feet through a 4 inch pipe up a rise of 75 feet. I use a 10 inch steam pump, and 6 inch water cylinder with 12 inches stroke. I require 60 gallons a minute; my pipe has 5 elbows. I hire steam and take it 200 feet through a well protected pipe. A dispute has arisen as to the required horse power to do the above work, and it is agreed to leave the question to you? A. It would be necessary to make a test, in order to settle this question. From the data sent, we could only make a guess.

(42) L. S. asks: Who was the first inventor of the locomotive? A. The first locomotive was built by a Frenchman named Cugnot.

How long a piece is used in testing rope? A. Generally a piece not more than one or two feet long.

I have been firing a Baldwin locomotive, which has a mud drum, by blowing out at drum; the mud would not all come out unless I took the drum head off. Much mud has also settled between the bottom flues, around the drum. We have inserted rods through the drum, and also through plugs in smoke box, but could not do much good. We have also tried a strong stream of water, but to no effect. Can you give some good advice? A. Try the plan of hauling the fire at night, and letting the water remain in the boiler until it is quite cool. That may soften the mud, so that it can be washed out.

(43) H. A. A. says: I am using an engine which throws out much fire. What is the best cap to prevent this? A. You can purchase a spark arrester similar to those used on locomotives. Frequently a piece of wire cloth, placed over the top of the smoke stack, will remedy the trouble.

(44) C. E. B. says: In a boiler (say a rectangular one) filled partly with water and partly with steam, is the same pressure exerted on the bottom as at the top? If not, is the pressure greater on the top or on the bottom? What is the proportional difference, and would the proportion vary with the temperature, and in what proportion, if any, would the pressures vary as the volume of the steam and water might be respectively changed? A. At the top of the boiler you have the pressure of the steam: at the bottom the pressure of the steam, increased by the weight of the water and the steam. Suppose, for example, the weight of water in a boiler is such as to bring a pressure of 1 lb. on each square inch of the bottom of the boiler. If, now, steam is raised in the boiler until its pressure is 40 lbs. per square inch, the pressure per square inch at the top of the boiler is 40 lbs., and at the bottom 41 lbs.

(45) T. G. W. asks: What is superheating steam? What temperature and other conditions will produce superheated steam? A. Superheated steam is steam having a higher temperature than is due to the pressure. To superheat it, it is only necessary to let it pass through heated pipes or vessels having a high temperature, and in this manner it can be heated to any desired degree.

(46) C. C. says: I enclose you some facts in regard to our engine: Cylinder is 14x20, steam pressure 55 lbs., revolutions 120, cut off at ⅜ stroke, indicator shows 23 lbs. mean pressure, exhausts into a feed heater. Power is 45½ horse. Running at 60 lbs. boiler pressure (vacuum gage showing 24 lbs.), revolutions 120, cut-off at ⅛ stroke, showing 9 lbs. mean pressure, and 9 lbs. mean vacuum, she shows steam 35 horse power, and vacuum 17, total 52 horse power. The engine (high pressure) has been changed to a condensing, and the indicator cards and other particulars were taken before the alteration and after, respectively. Coal bill was reduced 33,000 lbs. a month by the change. The work was about the same; if there were any difference, it was more in the last case. Coal used was slack or fine soft coal in both cases. A. This is a very good illustration of the gain from condensers, and will, doubtless, be interesting to all steam users. We would be obliged to our correspondent if he would send us the amount of coal burned before the change, the original cost of the engine, and the cost of attaching the condenser.

(47) O. C. M. asks: How can I make a mold for zinc castings, so as not to have airholes in them? I want to make a small engine, 2½x4 inches stroke, of zinc. A. Use a brass mold made warm.

(48) C. W. S. says: We have a railroad locomotive that we are using to run a sawmill with; her dimensions are: Two cylinders 10x16, running at 120 revolutions per minute. Boiler has 120 copper tubes 8 feet long x 1½ inches diameter; fire box is 3 feet deep, 3 feet wide, 26 inches long, open on on bottom. Wishing to burn sawdust, we constructed a firebrick fireplace underneath and opening up into the firebox of boiler. The fireplace is built of firebrick something after the form of tanners' ovens. It is 7 feet long, 51 inches wide, and 3 feet deep. We have not draft enough to take the heat through the flues; our stack is 50 feet high and 18 inches in diameter. The fireplace makes a quantity of smoke which is very black and seems to clog in the firebox. We cannot make enough steam, but we can make heat enough in the fireplace, if we could draw it through the flues. Do you think a blower would answer? A. A blower or steam jet would probably be of some service. For dimensions, it would be best for you to address a manufacturer.

(49) M. A. O. says: I wish to make a vessel for household use, and in its construction I will have to use a piece of brass or copper, 2 inches square, in a vessel to hold 1 quart. Would there be any fear from corrosion if the vessel was not cleaned properly every time it was in use? It is to be used for milk, vinegar, etc. Would copper be better than brass? A. Both copper and brass would be dangerous.

(50) C. P. V. asks: What size of lens is required for a camera obscura, to take a picture 8 inches square at a distance of ¼ of a mile? A. The distance at which a picture is to be taken and its size do not depend on the size of the lens, but on its focal length, which is determined by its curvature. To take a good picture of 8 inches square, the focal length of lens must be at least 12 inches. If the scene is so far off that there are too many objects in the picture of 8 inches square, and the details are too small, you must take a lens of longer focus, which will make the details larger in proportion to its focal length; it will also make a large picture if needed, but a small one just as well. As a larger lens admits more light, it will require less time to make the picture than a small lens, which of course admits less light. In any case it is well to use a diaphragm placed about 2 inches in front of the lens; this makes the picture sharper, but protracts the time necessary for taking it. It will not reduce the size, even if you make the opening as small as a pinhole.

(51) W. D. M. asks: Is there any one man who can turn 80, 100, or 140 feet of 2 or 2½ inch shafting on any machine in one day of 10 hours? A. Yes, with a special tool.

(52) J. B. P. asks: What are the objections to the following plan for running street cars? Use all the available space in the bottom, sides, and top of car as a reservoir for compressed air, which is to be supplied to the cars at street crossings from a pipe or air main, laid along the tank and beneath the surface. The pipe is to connect with a large tank centrally located, and the pressure kept up with air pumps run by stationary steam engines or other power. The car driver could connect and receive his supply while passengers were changing at street crossings. With a sufficient capacity and pressure to start with, the car would run several squares without being replenished, and might draw another car. The air main should be of a sufficient capacity to avoid friction in the flow of air, and to supply the cars quickly. A. We could hardly form an opinion without having more data. We believe the difficulties of this form of motive power have been with the arrangements for compressing the air, and its cooling effect when used in the engine. A great many inventors have turned their attention to this subject, but so far we have not heard of any system which is a complete success.

(53) C. P. L. asks: Please give me a recipe for a cement to fasten oiled wood together. A. Melt together in an iron vessel equal parts of common pitch and gutta percha.

(54) C. G. asks: How can I make large lumps out of small bits of sal ammoniac? A. Dissolve in water, and allow to crystalize slowly by evaporation.

How can I make cheap liquid manure for young plants on poor ground? A. Fill a large barrel with old rotten manure, fill with water, allow to stand one week, and draw off as required.

How can I magnetize knife blades on a Tom Thumb telegraph apparatus? A. While the current is passing, place the middle of the knife on one of the poles of the magnet (taking care not to let it touch the other pole) and gradually move the blade along from the middle towards one end. Repeat this several times, taking care always to move the same pole in the same direction.

(55) E E. says: I have a cistern which leaks badly. The water penetrates through the cement and brickwork. Can I put on new cement over the old, and make the cistern tight, or must I remove the old before putting on the new? How would it do to cement on the outside of the cistern? Would it stop the water from coming through? A. Remove all water from it and get it as dry as possible; then put on a good coat of Portland cement in clean sharp sand, and give it time to set before you put water into it. After it becomes hard, let the water into it, and you ought then to have a tight cistern.

(56) C. W. S. asks: Is it practicable to make and use a light carriage on common roads, propelled by other than horse power? Can a 2 or 3 horse power engine and boiler be made (of iron, steel, or other metal) sufficiently strong, light, durable, and cheap, to be economical to use to propel a light carriage to carry one or two persons on common roads? A. We believe there are no serious difficulties in the way of designing such a machine. Steam road rollers, traction engines, and steam plows are in successful operation, doing the work more economically than it can be accomplished by animal power.

(57) E. N. B. asks: Will you tell me how fast to run a ¼ inch twist drill to drill iron? A. At 250 revolutions per minute.

(58) C. S. F. says: During the late spring we planted some tomato and radish seed. The seeds were placed in two cups with a solution of chloride of lime. The water in the tomato cup froze solid, while the radish seed did not freeze at all. Both were set side by side in the open air. Why did not the radish freeze? A. It was due to a difference in the amount of cooling in the two vessels, dependent upon some undetected difference in the surroundings of the two vessels, the thickness of the glasses, or some similar cause.

What is the address of the Stevens Institute of Technology, and is it a free university? A. Hoboken, N. J. It is free only to poor students who have distinguished themselves for great merit.

1. What can I use to gum pressed leaves and flowers into an herbarium, so as not to curl and stain the pages, or discolor the flowers or leaves? A. Try pure gum arabic. 2. What can I put on leaves or flowers to make them retain their color when pressed? A. Copal varnish.

(59) M. T. J. asks: What is the best compost for celery in a sandy soil? A. Well rotted pig manure.

(60) N. F. B. says: We have recently heard it asserted by one of our manufacturers that it was more profitable, or fully as much so, to pump fresh water into boilers for the purpose of making steam as it is to allow the hot condensation water to be returned to the boilers. He contends that water once made into steam loses in a measure its life and vitality to be re-used for that purpose, and that fully as much or more fuel is required than if allowed to run off and fresh water is used. We would like to know if this is really the case. We have our pipes so arranged that the steam, which is used for heating purposes, passes from the boilers, and the condensation water returns directly back again without contact with the air, at nearly a boiling point. Would the value and vitality of the water (if lost) be restored by pumping air in with it, or allowing the water to be exposed to the air before going again into the boiler? A. We think that your present arrangement will answer as well as any other. It is true that water which contains no air acts differently when heated from the water ordinarily used in boilers, but we do not think that it has been proved that the specific heat is much different. Besides, it is exceedingly doubtful whether your condensed water is entirely free from air. The United States Commission on steam boiler explosions intend to make some experiments on airless water, if they do not take up the time till cold weather in getting ready as they did last season.

(61) C. L. K. asks: Water in shallow vessels put into a cellar will prevent vegetables from freezing. I have seen ice freeze to two inches thick in one night, and potatoes remain unfrozen by the side of the vessel in which the water was. A. It is true that water in melting gives out a large amount of latent heat; but the question is whether, under the circumstances mentioned, the potatoes might still have remained unfrozen, the water being absent.

(62) D. H. S. asks: How can I cleanse a well which has become foul, the water being impregnated with water from a drain? A. Pump it dry if possible, and have it cleaned out. Then pump as much water from it as you can every day for a week. Let the water settle and then test it; if not yet good, keep exhausting the water until thoroughly washed out, and the water becomes pure.

(63) B. & G. H. ask: How can we make a frost-proof house? A. The outside wall may be 8 inches thick and the inside wall 4 inches, the walls tied together with iron anchors or with brick withs. Sawdust is sometimes used for filling; and sometimes the air alone, when unventilated, is considered a sufficient non-conductor of caloric without filling.

(64) K. K. K. says: I have a number of fish globes and aquaria. I use well water drawn with an iron pump. Occasionally I notice that the water in some particular aquarium or globe has a peculiar crystal-like brilliancy, different from that in others treated in the same way. What is the cause, and how can this beautiful effect be with certainty obtained? A. The clear water is free from suspended animal matter and dirt. 2. Would filtered well water be suitable to replenish aquaria? A. No. 3. What is a good cement for aquaria? A. Put an egg-cup-ful of oil and 4 ozs. tar to 1 lb. rosin: melt over a gentle fire. Pour the cement in a heated state, but not boiling hot, into the angles. The cement will be firm in a few minutes.

How is terra cotta made? A. It is made from a pure clay and a fine-grained clear sand or calcined flints, mixed with crushed pottery, made into a paste, in which state it is molded, dried slowly in the air, and then in a kiln until of the hardness of stone.

(65) S. A. S. asks: What will make a good flux for brass? I am melting up a good deal of old scrap and sometimes use glass for a flux, but it makes the brass too hard. A. Glass is a good flux. Do not overheat your brass.

(66) J. W. asks: Can a small achromatic lens one inch in diameter be used to correct a large one of crown glass, say from 6 to 8 inches diameter? A. A small concave flint lens may be used to correct one more than twice as large of crown glass by placing it half way in the tube, and then you have what is called a dialytic telescope.

(67) R. L. asks: 1. I have good lenses for a 3 inch achromatic astronomical telescope. The 3 inch object lens is of 42½ inches focus, and the Huyghenian eyepieces are of ¾ to ⅙ inch focus. How long should the main 3 inch tube be, and how long should the sliding focus tube be? A. The main tube should be 40 inches, and the sliding focus tube 8 or 10 inches long. 2. What is the best and cheapest metal to make it of? A. Brass or German silver is the best material for the sliding tube, and wood for the large tube. Paper, well varnished, is also good. 3. Where should the diaphragm, if any, be placed? A. One diaphragm should be placed, of course, in the Huyghenian eye piece, between the lenses. Another diaphragm should be placed in front (outside) of the 3 inch lens, in case the image is not sharp; and it is well to have several of them, and use them according to the necessities of the case.

(68) J. S. asks: 1. How are chilled iron rolls used for rolling in paper mills, made? A. They are chilled in the mold. 2. How are they turned, and what is the shape of the tool? A. We have heard that a wrought iron tool is made, of ordinary diamond-pointed form, and iron cast around it in a chill.

(69) H. L. A. C. asks: How is it that the moons of Jupiter can be so plainly distinguished with the aid of an ordinary looking glass, when they are invisible to the naked eye? A. You do not see in an ordinary looking glass the moons of Jupiter, but the planet itself is made visible several times by the repeated reflection of the upper and under surfaces of the glass. For proof: First shift the position of the mirror so as to give a more oblique reflection, and the supposed moons will go further apart. Secondly, let the mirror be nearly vertical, and then lay it horizontally, and the position of the apparent moons will always be in the plane of reflection. Thirdly, watch the movements of the moons in the mirror every night; and if you place it in the same position, they will never change their positions as the real moons do. Fourthly, compare the position of the supposed moons seen in the mirror with those of the real moons seen in the telescope, and you will find them very different. Fifthly, look at Venus or Mars, or even a bright button, in the same way, by help of the mirror, and it will show in the mirror the same moons as you suppose Jupiter does, and in exactly the same position. Sixthly, take mirrors of different kinds of glass, and each mirror will show different positions and different numbers of moons: with some mirrors, you may see six and even more moons near to Venus.

(70) J. B. N. and others.—The potato is a native of America, and was not seen in Europe till Sir Walter Raleigh introduced it there, after his return from this continent.

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(71) W. & R. ask: What is a good and cheap ointment or varnish to prevent rust on polished iron and steel exposed to dampness, or to a sea voyage? A. Tallow and white lead. A. Is there known a process which facilitates the union of steel to iron cast around it, that obviates the necessity of pouring the iron very hot and in large quantities, as now generally done, to the frequent injury of the steel? A. Dry the mold and cast endways.

(72) J. H. W. says: A drop of turpentine n a grain of chlorate of potash, with the addition of a drop of strong sulphuric acid, produces immediate combustion. Can I obtain similar results by the mixture of any solids? A. Sugar may be made to replace the turpentine in this experiment; but there is nothing that will replace the oil of vitriol, unless it be the anhydrous sulphuric acid, and this is not a pleasant substance to handle.

1. Ganot's "Physics" states: "For physiological or chemical effects, the wires on the bobbins (of a magneto-electrical machine) should be fine, and each from 500 to 600 yards long. For physical effects, on the contrary, they should be thick, and only from 25 to 35 yards in length." I want to produce the longest spark; which arrangement, other portions of the machine being similar, will accomplish my object? A. The fine wire will produce a current of the highest tension, and consequently the longest spark. 2. Can I increase the spark by passing the induced current of one of the above machines (constructed for medicinal purposes) through an induction coil, or would such an arrangement only add to the resistance? A. It is requisite that the inducing current in a Ruhmkorff coil should be one of quantity; and as the current referred to in the preceding question does not possess this essential attribute, it is useless for this purpose.

1. Does mercury evaporate? A. Yes. 2. Which would be more durable as a valve seal, subject only to climatic changes of temperature, mercury or glycerin, the seal being in a position difficult of access for adjustment or inspection? A. Although both have objectionable features, the mercury would probably answer your purpose best.

I wish to construct a small but powerful battery, to be placed in a position difficult of access, but arranged with cord and pulley in such a way that I can lift the electrodes out of solution when not in use, and produce strong electric action immediately on replacing them. Under such conditions, I wish to employ such materials as will be most constant. The battery will not be used more than five or six times in a day, and then for only a few seconds. What form would best answer the purpose? A. Arrange a number of large plates of zinc and carbon alternately, and connect for quantity, that is, all the zincs together to form one pole, and all the carbons to form the other. Place in a lead-lined wooden trough, containing a cooled solution consisting of one part by weight of bichromate of potash in ten parts of hot water and five parts of oil of vitriol. The plates are readily arranged so as to be lifted together out of the solution.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. B.—It is clay with yellow ocher; it contains oxide of iron, but only in small quantity.—A. L. H.—All the specimens are oxide of iron, except No. 2, which is asphalt.—P. D.—They are cubical crystals of iron pyrites.—J. T. W.—Silver was not detected in the sample forwarded. It would be necessary to take a larger sample to subject it to careful assay.—F. H. D.—Quartz.—J. M. R.—It is slate, with a small percentage of bituminous matter. Not valuable.—F. H. F.—It is wulferite or molybdate of lead, and contains 51 per cent lead and 39 per cent molybdic acid.—D. L.—No. 1 is a rock containing sand, clay, and oxide of iron. No. 2 and 3 are dolomite, No. 2 containing some clay.—C. H. W. Jr.—No. 1 is quartz with carbonate of copper. No. 2 is galena.—E. F. R.—The water holds a considerable amount of oxide of iron in solution, which on contact with the air is separated, and gives the iron stains shown on your paper. It is probable that the water is impregnated with matter from a cesspool, as it contains a large amount of organic matter.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Use of Superphosphates. By T. B. S.
On the Altitude of Thunderclouds. By ——.
On the Grasshopper Plague. By J. S.
On Astronomy. By J. R.
On the Potato Bug. By J. C. B.
On a Cold Water Engine. By R. J. W.

Also inquiries and answers from the following:

A. F. K.—N. H. W.—J. C. T.—R. J.—N. F. R.—A. N.—J. T. B.—R. H. S.—J. F. W.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells sundials? Where can salicylic acid be obtained? Where are small printing presses sold? Whose is the best paint for ship's bottoms?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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8,394.—RANGE.—H. A. Wood, Bangor, Me.
8,395.—COFFIN HANDLES.—M. H. Crane, Cincinnati, O.
8,396 & 8,397.—CHAIN PUMP CURB.—H. L. Fry, Cinn., O.
8,398.—GAME BOARD.—C. G. Harger, Jr., Watertown, N. Y.
8,399 to 8,403.—OIL CLOTHS.—J. Hutchison, Newark, N. J
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4,838.—E. A. Kitzmiller, Pittsburgh, Pa., U. S., *et al*. Broom handle painting machine. June 15, 1875.
4,839.—J. H. Myers, Rochester, N. Y., U. S. Harvester rake. June 15, 1875.
4,840.—J. L. Clark *et al*., Westminster, England. Floating docks and pontoons. June 15, 1875.
4,841.—A. A. Wilson, Montreal, P. Q. Compound paint. June 15, 1875.
4,842.—J. A. Egginton, Montreal, P. Q. Colored relief letters. June 15, 1875.
4,843.—J. C. Ramsden, Halifax, England. Apparatus for the combustion of fuel. June 15, 1875.
4,844.—H. W. Murdock *et al*., Toronto, Ont. Pocket door fastener. June 15, 1875.
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4,846.—R. Taylor, Guelph, Ont., *et al*. Rail joint and nut lock. June 15, 1875.
4,847.—J. L. Bond *et al*., Sarnia, Ont. Pawl and ratchet mechanism. June 15, 1875.
4,848.—W. C. Barker, Millport, N. Y., U. S. Chain pump. June 15, 1875.
4,849.—E. J. Brooks, New York city, U. S. Metallic seal. June 15, 1875.
4,850.—C. E. Patric *et al*., Springfield, O., U. S. Seeding machine. June 15, 1875.
4,851.—G. B. Peters, Marshall, Mich., U. S. Lubricating compound. June 15, 1875.
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4,853.—E. R. Stockwell, Theresa, N. Y., U. S. Slat iron for carriage top. June 15, 1875.
4,854.—J. F. Donoghue, Springfield, Mass., U. S. Anti-incrustation battery for boiler. June 15, 1875.
4,855.—W. Griffith, Toronto, Ont. Lever mortise lock. June 15, 1875.
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4,859.—A. Tolton, Eramosa, Ont. Pea cleaner and pneumatic chaff carrier. June 15, 1875.
4,860.—D. Lister, Toronto, Ont. Welding process and composition. June 15, 1875.
4,861.—L. Brush, Buffalo, N. Y., U. S. Passage ticket. June 15, 1875.
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