Business and Personal.

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Answers to Correspondents

W. H. F. will find engravings of electromotors in back numbers of the SCIENTIFIC AMERICAN.—W. S. M. will find directions for soldering files on p. 90, vol. 30.—J. F. will find details of tanning sheepskins with the wool on on p. 147, vol. 30.—A. W. C. should send us a description of his plan for preventing fires in buildings.—S. J. H. will find directions for transferring engravings to wood on p. 138, vol. 30.—H. R. will find directions for waterproofing cloth on p. 90, vol. 30, and for preventing mildew on p. 138, vol. 30.—J. A. C. must send his name.—G. M. H. will find full information in regard to concrete walls in the answer to J. L. C., p. 133, vol. 30. As to potato bugs, see p. 52 of this issue.—J. S. N. will find full directions for tempering springs on p. 261, vol. 29; for tempering mill picks, on p. 170, vol. 25.—C. W. R. is informed that we published a good recipe for wood filling on p. 155, vol. 30.

J. B. asks: 1. On what class of sea-going steamers are high pressure engines used? A. They are not used. 2. On what class of sea-going steamers is the condensing engine used, and what is the pressure of steam most commonly employed in such engines? What are the extremes of the pressures employed in such engines, measured above a perfect vacuum? A. On all. Steam pressure varies from 30 to 80 pounds. 3. Is steam generally worked expansively in sea-going engines, and what is the lowest terminal pressure in both the high pressure and condensing engines for sea-going purposes, measured above a perfect vacuum? A. Yes. Terminal pressure as low as 5 pounds in some cases. 4. Is the Woolf engine used to any considerable extent in sea-going engines as a high pressure engine? A. No. 5. What is the most common form or type of sea-going condensing engines? A. Vertical two-cylinder engines 6. If, at an additional expense of $100 in the first cost of an engine of one hundred horse power and perhaps $200 in a one thousand horse power, the effective working power could be increased from 10 to 25 per cent, depending on the pressure ranging from 60 lbs. to 150 lbs. above a perfect vacuum, would it be worth the trouble? A. We do not get a clear idea of what you mean.

S. asks: Which is the strongest and will bear the most weight, a hollow pillar or a solid one, of iron, of any size? A. The solid one. The same weight of iron, however, made into a hollow (and of course larger) pillar, will be stronger than if made into a solid one.

J. S. S. says: 1. I have been running my cotton gin by steam power, using a 10 horse power engine. I have recently erected a steam saw mill near my gin house; engines are about 180 feet apart. I want to run my gin from my saw mill engine, if it is practicable. Will it be cheaper to run the gin by wire rope, or convey the steam from saw mill boiler to my small engine, 180 feet, thereby doing away with one boiler? A. We would recommend the latter plan. 2. What sized pipe should be used to convey the steam from boiler to engine? A. About 2 inches in diameter. 3. Would it be better to convey the pipe under or above ground? I need about six horse power to run the gin. A. Whichever is most convenient. 4. Will under runner rocks answer as well for grinding corn as upper runner? A. We think that they will; but there is considerable difference of opinion among millers in regard to this matter.

L. A. G. says: I have made a field camera by the directions given in *Science Record* for 1874, but find no image on the paper unless the object is held within two feet of the lens, or the paper held within three inches of the mirror. My lens is 2½ inches in width with 7 inches focus, and made to slide in and out; the box is supported about 20 inches above the table, and a dark chamber is made by covering the wire with thick dark cloth. What is the matter? A. If the object or foreground is ten feet off, then the shorter conjugate focus of your lens will be 7·35 inches. The paper or ground glass must be placed at this distance from the lens, or a lens of focal length equal to the distance from table to mirror, *plus* the distance from mirror to lens, may be substituted; or you may reverse the box so that the lens is between mirror and table.

H. R. J. says: I work at architectural drafting and wish to be a thorough architect. I have a very good English education, but cannot afford to go to college. Can you tell me what course I should pursue to attain what I wish? Is a thorough knowledge of constructive carpentry necessary? What is the best and simplest work on it? A. You could succeed best by going into the office of an architect in good practice, and thus get access to his library, where you would find, most likely, the best works on every branch of the subject. In the mean time, you will find Tredgold's "Carpentry" an excellent book to begin with.

F. C. R. asks: How are hollow plaster of Paris toys made? A. They are made in two or more parts, and then joined together.

J. E. S. asks: How can the residuum in the still after the distillation of petroleum be best purified to produce a nice paraffin oil? A. American oils contain but a small propertion of paraffin. The crude oil is first put into a still, into which steam can be admitted; the still is also heated externally by fire. 25 per cent of a fluid is obtained which, on being submitted to fractional distillation, yields hydrocarbon of specific gravity 0·62 to 0·86, while the boiling point varies from 26·7° to 200°. The lightest and most volatile of these hydrocarbons is used as an anæsthetic (known as Sherwood oil), while the heavier oils are burnt in paraffin lamps. The residue of the first distillation (about 75 per cent of the original quantity) is again distilled with steam at 150° to 200°, and the products, of variable volatility are separately collected. The last portions of the distillate contain chiefly paraffin, which is in a crude state separated from the liquid by artificial cold. The heavy oils is used for lubricating, and the paraffin is purified. This is the treatment of the Rangoon oil, from Burmah.

S. H. D. asks: Will hot water put out fire on a building that is ignited by lightning? Some people maintain that it will not. A. Most certainly, if applied properly and in sufficient quantity.

E. K., Penza, Russia, and others write for practical details of a process for burning bricks with mineral oil, mentioned on p. 53, vol 30. A. The writer of the paragraph declines to give further information.

O. L. asks: Is there any simple and cheap method for rendering paper damp proof, so that, in giving it a form by embossing, it will not get out of shape? A process involving the passing the paper though a liquid would be advantageous for the purpose. A. Yes; by saturating it with oil. If you will state more fully what you desire to know, perhaps we shall be better able to answer you.

E. P. says: I have in use a 32 horse power boiler with 62 three inch flues. The brick work strikes the boiler about 4 inches below the water line. The said arch needs repairing. Would it be advisable to construct the cover 4 inches from the shell? Would not a boiler arched over in such a manner supply drier steam than when covered in the ordinary way? Would there be more danger of explosion? A. Such an arrangement as you propose is very common. 2. Would coal tar and plaster of Paris make a good cement for roofs? Would it render it as fireproof as if the tar were boiled? A. It will probably answer quite as well as if the tar were boiled, provided you can make the mixture as thoroughly.

E. L. E. says: A friend says that the lightning seen at a distance in summer evenings is heat lightning. I say there is never any lightning unless there is thunder; but it being at a great distance, we cannot hear the thunder. He also says that the thunder comes before the lightning; but as it takes so long for the sound to reach us, we see the lightning first. I contend that the lightning comes first, and that the thunder is caused by the rushing together of the air after being rent by the electricity. He says that there is never any thunder accompanying flash lightning, that it only comes with what is called chain lightning, and I say that the thunder accompanies both kinds of lightning. Which of us is right? A. As the lightning causes the thunder, you are right in the main. Wherever there is lightning there is always thunder, although it may be so far distant as not to reach the ear; this heat lightning, so-called, is merely the reflection of very distant flashes below the horizon.

M. A. says: The peach crop in this section of our State is becoming a matter of some importance, and the great difficulty in packing for shipment is the heat. Can a packing room, 20x20 feet, be so constructed that a low temperature can be maintained without the use of ice, and is there any agent other and cheaper than ice by which the temperature of a room can be kept at 45° or 50° Fah.? A. All methods for producing a low degree of temperature (excepting that of ice) are costly and troublesome. Such a room as you speak of could certainly be constructed. There is one simple plan, however, which seems to have worked well, and that is as follows: A small room, such as you speak of, is built entirely of wood and as nearly airtight as possible, having only one small door. The room should be built with double walls, about six inches apart, and between these walls should be filled with sawdust; the room is then covered both inside and out with a double coating of very thick felting. Into a netting hung in one of the top corners of the room is placed about 100 lbs. of ice; the room can now be filled with fruit and the door or opening made tight. It is said that fruit so stored will keep for months unaltered. After once closing the door or opening, it must not be again opened until it is desired to remove the fruit.

M. A. B.—We have never seen any noiseless gunpowder.

R. O. P. asks: Which of the fillings used in fireproof safes have stood the best in large fires? Is cement and water or plaster of Paris and water considered the best? A. There has never yet been a safe constructed that was absolutely fireproof. That in which a filling of alum is used is claimed to be the nearest approach to fireproof. But plaster of Paris and hydraulic cement also are used.

A. L. B. says: I am building a small oscillating engine, the cylinder having 1 inch stroke and ½ inch bore. I would like to make a double acting engine of it, for a small screw steamer. Could you give me a simple way of making this? A. Arrange the valve so that it will admit steam at each end of the cylinder alternately, opening the opposite end of the cylinder to the exhaust at the same time.

F. S. J. asks: A few days ago I placed in a small phial a solution of water and sulphate of copper. I then added about 20 drops of sulphuric acid, which made the solution quite warm; and having some ammonia near at hand, I added it also to the mixture, by way of experiment. Immediately one half (the upper) of the solution turned dark blue, with a hard white or cream-colored substance moving at the bottom of it. I shook the bottle a moment or so when the dark blue and white substance entirely disappeared. The bottle being now full, I emptied about half of it out, and in its stead placed ammonia and spirits of turpentine, which had the same effect at first as the ammonia in the former mixture; but after shaking for some time, the mixture turned a bright green, but was not clear. A. The heat developed on the addition of the sulphuric acid was due to its entering into chemical union with the water. You added the ammonia. It is lighter than the liquid, and only mingles with the upper surface. There the ammonia is in excess. The azure liquid is the solution of the basic sulphate of copper in excess of ammonia. The solid part below the azure is the basic sulphate, where the ammonia is present not in excess. At the bottom the liquid is acid from excess of sulphuric acid. On shaking the bottle, the above-formed bodies redissolve in the sulphuric acid to form sulphate of copper and sulphate of ammonia. The turpentine had no effect; it was the ammonia. The green turbidity was due to the basic sulphate; if you had added less ammonia, it would have been a dense precipitate. If you had added more, it would have dissolved to an azure liquid. Do not waste time in making such mixtures; go through a systematic course of qualitative chemical analysis.

J. W. says: 1. I have a new cistern for rain water. The paint on the roof is dry. Is the first filling of the cistern fit for use, or should it be pumped out and filled a second time before using? Should it be ventilated, and how? A. The first filling of the cistern might be fit for some uses and not for others; if you mean for drinking, we should say not. If the leaden pipe that supplies the water from the roof is of good size and is not trapped by having its lower end in the water, this itself will give you ventilation; but if you have an overflow pipe leading to a drain, it should be trapped. 2. The tank in the roof of my house is lined with lead, and the pipe (leading some 35 feet) is lead Is water from the lead tank, through lead pipe, good for cooking purposes? A. We should say that water standing in a lead-lined tank, and supplied through a lead pipe, was not good for cooking purposes. 3. How long should I wait before moving into a new house after the plastering and painting is finished? A. If the weather is good and the house kept open to let the air be frequently changed, it ought to be in a proper condition to be occupied in three weeks after the last coat of paint is put on.

S. asks: What is the best method for testing the percentage of chlorine in bleaching powder? Can you give me the name of some work where I can find specific instructions relative thereto? A. The most recent is the iodometrical method, and is based upon the fact that a solution of chloride of lime separates the iodine from a weak and slightly acidified iodide of potassium solution, the iodine being quantitatively estimated by means of hyposulphite of soda. The test is thus executed: 100 cubic centimeters (=1 gramme) of bleaching powder solution, obtained by dissolving 10 grammes of chloride of lime in 1 liter of water, are mixed with 25 cubic centimeters of solution of iodide of potassium acidified with dilute hydrochloric acid. The ensuing clear, deep brown colored solution is treated with hyposulphite of soda solution until quite colorless. The hyposulphite of soda solution is composed of 24·8 grammes of that salt to 1 liter of water; 1 cubic centimeter of this solution neutralizes 0·0127 grammes of iodine and 0·00355 grammes of chlorine.

W. J. N. W. asks: 1. I hear some men say that they can tell where a stream of water is, underground, and within a foot or two of its depth, by a forked switch which they hold in their hands. Is this true? A. No. 2. I see that the locust deposits its eggs in the twigs of trees. Why is it that they come up out of the earth and from what depth do they come? Do they eat anything while they stay in the ground? A. The eggs of the locust (*cicada septendecim*) are deposited in pairs in the terminal twigs of different species of deciduous trees, especially the oak. The larvæ hatch out in about six weeks after they are laid, and drop to the ground, in which they live, feeding on roots of trees, for exactly seventeen years, the pupa state lasting but a few days. When about to transform into the winged state they ascend to the surface, making cylindrical burrows, firmly cemented and varnished so as to be waterproof. In low and wet localities the pupæ often extend these galleries from four to six inches above ground, leaving an orifice of egress even with the surface. In the upper end of the chambers the pupæ can be found awaiting their approaching time of change, They will then back down to below the level of the earth, and, issuing forth from the orifice, will attach themselves to the first object at hand, and undergo their transformations in the usual manner. They issue from their burrows in countless millions, in forests or where forests were seventeen years before. The singular noise sounding like "Pharoah" produced by the males in these camp meetings is absolutely deafening. After depositing their eggs in the twigs of trees, they soon perish, no food of any kind being taken by them in their brief above-ground existence, nor do they fly far from their burrows. They have different periods in different localities; in this vicinity they appeared in 1843 and in 1860, and will appear again in 1877.

G. F. P. says: 1. We are informed that hollow copper lightning rods are used in preference to solid ones, on account of conducting the electricity better, also that the hollow rod conducts better, as the atmosphere is damp within the rod, which is a better conductor than metal. Is this so? If so, and the rod were smashed together in bending and turning the eaves, would it not render it dangerous? Does not the current require the same amount of space to pass all the length of the rod as at the beginning? I have noticed some rods that were smashed nearly together where they were bent in turning the eaves and cornices does this make any difference? A. A good material for constructing lightning rods is three quarter inch iron, terminating at the top in a gilt copper arrow head very sharp, and in the earth with a large extent of conducting material. The metals are by far the best conductors; damp or moist air is very inferior in comparison. 2. Do rods running only three or four feet into the ground offer much protection to the building? A. The house would probably be safer without the rod.

M. W. J. asks: Why is it that growing clover causes cows to swell? I never hear any complaint of it swelling horses or hogs. I am told that it will swell sheep. Farmers say that it is the gas that causes the cow to burst. If so, what kind of gas is it and what generates it? Why is it that the second growth of clover, that is, the growth after the cutting of the first crop, "slobbers" horses? The first growth will not, or at most very little. A. In consequence of the complicated digestive apparatus in cattle, if their stomachs are excessively distended with green clover or other succulent or saccharine food, fermentation takes place, the carbonic acid gas thus formed (sometimes in excessive quantity) distending and often rupturing the stomach and thus causing death. This result is often avoided by puncturing the distended paunch with a fine trocar with a canula or aspirator needle, thus allowing the gas to escape. Dry food, such as Indian meal, sometimes causes death in cattle if used in excessively large quantities: in their greediness, it is swallowed dry, and, when wet in the stomach, swells and becomes a hard mass which is very difficult to remedy.

N. L. T. asks: 1. Can you inform me of some cheap and efficient solution for the preservation of shingles on roofs? A. A solution of chloride of zinc. 2. Can I construct a reliable lightning rod of iron, and what should be the size of iron for such a rod? A. Yes. About ¾ of an inch in diameter. 3. Is the conducting power of a lightning rod injured by painting, and will ordinary paint prevent iron underground from rusting? A. No; red lead might be used. 4. Is it sufficient to extend the rod vertically into the ground to a depth level with a creek, about ten rods distant from the house? A. No. It would be better to extend your rod underground out into the water of the creek. 5. In my vicinity, the lightning rods generally used are made of copper and hollow, the metal being about ⅛ of an inch in thickness, and the rods about ¾ of an inch in diameter, extending into the ground six feet. Are these reliable in your opinion? A. No. They are unsafe because there is not a sufficient amount of rod conducting surface in contact with the ground. No rod is really a safe conductor unless it has an extensive amount of conducting material for its base, or terminal in contact with the earth.

J. W. S. asks: 1. Will galvanized iron undergo any change if exposed constantly to soapsuds? A. Yes, but very slowly. 2. How can I make a varnish with shellac which will not chip off after being applied sometime, as it does when dissolved in alcohol alone? A. Some recommend the adding to the varnish about 1 tablespoonful of boiled linseed oil to each pint of varnish; of course the oil remains only in mechanical mixture. 3. Can I collect ozone in small quantities, say 4 or 8 ounces, by displacement of water (as oxygen is made)? If not, how can I obtain it? A. No; it cannot be obtained separate from the oxygen or air from which it is formed. If a stick of phosphorus moistened with a few drops of water be placed carefully in a bottle of air, the slow oxidation of the phosphorus is attended with the production of ozone. In about one hour this has reached its maximum, when the phosphorus should be removed, otherwise the ozone odor will disappear This is one of the best methods of obtaining it in small quantities, although very dilute.