but great caution should be used in heating small, close rooms as stated, with closed door and window, when occupied. Bed rooms that are damp may be warmed and then ventilated with safety before going to bed.

(4551) A. R. H. says: Please inform me if you can compress water in a boiler when testing a boiler by cold water. When the boiler is full and I put my gauge on, do I not compress the air that is in the water when I start force pump, instead of the water? When filling boiler I am letting air out of the steam dome, and after the same is full I attach my gauge. Do I not displace air when more water enters the boiler? A. Water is slightly compressible, but not enough for observation in testing a boiler, because the elasticity of the metal in the shell allows it (the shell) to stretch more than the compressibility of the water. The air that may accidentally lodge at the irregularities in the shell, as well as the air mixed with the water, all help to make the gauge show compression. The pipe leading to the gauge is also liable to be filled with air, which also contributes to the apparent elasticity of the contents of the boiler.

(4552) I. G. B. says: It is said that the sun is on the meridian of any place but four times a year at 12 o'clock. That is sun and clock agree only at those times, which are 15th of April, 15th of June, 1st of September, and 25th of December. The question is why those particular days? Whereabout is the earth in its orbit on those days? A. The variation of the sun from mean clock time is a gradually increasing and decreasing amount from its perihelion and aphelion points due to the elliptic form of the earth's orbit, which alone would make but two terms in the yearly variation of time. The effect of the obliquity of the ecliptic so changes this condition that the combined sums and differences make four times in a year at which solar and clock or mean time agree as stated in your query. The sun is in perihelion about the 25th of December, and in aphelion about the 15th of June. As the velocity of the earth in the perihelion half of its orbit is greater than that in the aphelion half, so the curves of time difference are greater in the first and last quarter of the year, as shown in your almanac.

(4553) C. & L. ask: What is the cause of the moon's appearing of a reddish hue sometimes at its rising? To what is ascribed the enlarged form of the moon at times of rising? A. The red appearance of the moon and sun at rising and setting is caused by the unequal absorption by the atmosphere of the colored rays, which are combined in white light, the colored rays having the shortest wave lengths being first absorbed. The violet, indigo, blue, green, when the fading yellow gives the sun and moon the orange hue and occasionally a strongred. It is the vastly increasing distance that the light travels in the atmosphere on the horizon that causes absorption. The sun looks red at noon time through considerable depth of water. The increased diameter is only apparent, an illusion of eye. The measured horizontal diameter is the same as at higher altitudes.

(4554) E. A. McG. asks: 1. What is the buoyant force or negative weight of one cubic foot of hydrogen gas, of coal gas, of a vacuum, in ounces or pounds, taking the density of the air at sea level as a basis? A. There is no such thing as negative weight. In air at the sea level hydrogen has a buoyancy of about 70 pounds to 1,000 feet, and coal gas one-half as much. 2. How much stronger would a vessel containing hydrogen have to be, to resist its expansive force at a height of 10,000 feet, than at sea level, and what is the ratio of expansive force developed as it ascends? A. At the height named hydrogen or any gas inclosed at the sea level would exert a pressure of about 5 pounds to the square inch. The exact ratio can only be expressed by a complicated formula. 3. Is aluminum manufactured in any considerable quantities? If so, where, and what is about its value in the United States per pound? A. Yes; in Pittsburg and in other places. It is worth in quantities about $1.50 per pound.

(4555) T. W. writes: I am desirous of learning what agent I must employ to etch or rather engrave on hard sheet rubber, in the manner that nitro-muriatic acid acts on zinc, *i. e.*, I wish to cover the rubber sheet with a coating of wax, soap or like matter, then scratch the desired lines into the said coating and apply to the lines such a liquid as will eat into rubber in the exposed places. A. Aside from the sand-blast method we know of no way of etching vulcanite or hard India rubber. An impression can be produced by a die or engraving pressed upon it while heated to 212° Fah. If the surface is now smoothed off and exposed to heat, the lines of compression will swell or expand again, and thus give a relief plate. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 252.

(4556) E. N. A. asks how to make Pharaoh's serpents. A. These are little cones of sulphocyanide of mercury which, when lighted, give forth a long, serpent-like, yellowish-brown body. Prepare nitrate of mercury by dissolving mercury dioxide in strong nitric acid as long as it is taken up. Prepare also sulphocyanide of ammonium by mixing 1 volume sulphide of carbon, 4 strong solution of ammonia, and 4 alcohol. This mixture is to be frequently shaken. In the course of about two hours, the bisulphide will have been dissolved, forming a deep red solution. Boil this until the red color disappears and the solution becomes of a light yellow color. This is to be evaporated at about 80° Fah. until it crystallizes. Add little by little the sulphocyanide to the mercury solution. The sulphocyanide of mercury will precipitate, the supernatant liquid may be poured off, and the mass made into cones of about ½ inch in height. The powder of the sulphocyanide is very irritating to the air passages, and the vapor from the burning cones should be avoided as much as possible. To ignite them set them on a plate or the like, and light them at the apex of the cone.—From the "Scientific American Cyclopedia of Receipts, Notes and Queries."

(4557) P. A. F.—For Silvering Brass.—The first essential is that the metal be chemically clean, which is best done by the use of dilute nitric acid, followed by a wash with clean water, and then with dilute aqua ammonia, drying in sawdust. If the metal be then rubbed with chloride of silver dissolved in ammonia and then washed and again dried in sawdust, the result will be fine. It should, however, be immediately lacquered in order to preserve the surface. The chloride of silver is preferable to the nitrate. No battery is used. Or for thin plating dissolve in 10 or 12 drops of water and add nitrate of silver, 2 parts, cyanide of potassium 6 parts. Rub on the object.—Deslivering.—The following is a liquid which will dissolve silver without attacking copper, brass, or German silver, so as to remove the silver from silvered objects, plated ware, etc. It is a mixture of 1 part of nitric acid with 6 parts sulphuric, heated in a water bath to 160° Fah., at which temperature it operates best.

(4558) J. L. C. and F. P. ask how to make oleate of soda referred to oleate of soda, referred to page 162 of the SCIENTIFIC AMERICAN. A. To make the pure acid, 2 ounces of pure soap (almond oil is the best, but Castile will answer) are dissolved in 20 ounces of boiling water. One ounce of sulphuric acid, previously diluted with 2 ounces water and allowed to cool, is added. The fatty acids rise to the surface in an oily layer. The water is siphoned off, and they are washed three times with boiling water. The mass is allowed to cool, and is removed from the surface of the water, where it floats. It is weighed, mixed with ⅓ its weight of litharge, and heated (212°-225° Fah.) until complete combination is effected. This may be known by the cessation of any evolution of bubbles from the mass. The resulting lead plaster is allowed to stand mixed with 10 to 15 times its weight of ether in a tightly corked bottle until completely disintegrated. Then it is filtered, and to the filtrate hydrochloric acid is added as long as any lead is precipitated. The ethereal solution is poured off, and the ether recovered by distillation, leaving pure oleic acid. Two fl. drm. of the acid is added to somewhat less than 1 pint of boiling water, and solution of caustic soda very carefully added, drop by drop, until complete solution of the acid is effected, very carefully avoiding an excess of soda, and after cooling, water is added to make it measure just 1 pint. A standard soap solution is thus obtained. To this add ½ its bulk of the best glycerine. Shake long and well, and the mixture is ready for use.—From the new "Scientific American Cyclopedia of Receipts, Notes and Queries."





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