black mixed with thin glue or mucilage. 2. Of what material is the wrapper made that is used for spreading the solder? A. Very generally of bed ticking. 3. What grade of solder is the best for fastening lead pipe? A. For wiping, equal parts tin and lead.

(10) D. A. H.—We know of no compositions cheaper than the metals they are composed of. Common yellow brass is the cheapest that can be made with copper. Cast iron is the cheapest metal.

(11) E. T. S. asks the best polish for the brass on steam engines. A. Whiting or chalk mixed with engine oil is the best to keep the brass work bright. When the brass work gets black or stained, use oxalic acid mixed with tripoli. Rub in all cases with a woolen cloth.

(12) A. R. asks if Bessemer steel has, when rolled, any more spring than iron. A. It depends on the amount of carbon contained. As usually made, it has very little more elasticity than iron; has a little spring when rolled or hammered hard; will not harden, but may be casehardened.

(13) D. E. S. asks how deep it is practicable to go down in diving bells, and with submarine armor. A. 75 to 100 feet is about the working limit, though divers have thus been down over 200 feet.

(14) O. M. C. asks the process for writing or making objects on glass that can only be seen when you breathe upon it. A. The drawings are made with pencils of talc or soapstone. They are sometimes very lightly etched with hydrofluoric acid.

(15) W. F. asks: 1. What is the cause of blue vitriol turning into powder? A. It is due to efflorescence, or the giving up of its water of crystallization. 2. Does it have any strength when it is so turned? A. It is stronger.

(16) H. M. E. asks: At a given temperature—20° C.—how many volumes of gas will a given volume of liquefied CO_2 yield when the pressure is removed? How much at 0°? A. All measurements being taken at 20° C., one volume of liquefied carbon dioxide will give 450 volumes of the gas; all measurements being taken at 0° C., one volume of the liquid will give 480·4 of the gas. These are approximate, but nearly right.

(17) R. B. asks: What is the receipt for putting quicksilver on the back of a looking-glass? A. This is usually done by coating the glass with an amalgam. For this purpose a large, perfectly flat stone table is provided; upon it is evenly spread a sheet of tin foil without crack or flaw; this is covered uniformly to the depth of one-eighth inch with clean mercury. The plate of glass perfectly cleaned from all grease and impurity is floated on to the mercury by sliding, so as to exclude all air bubbles. It is then pressed down by loading it with weights, in order to press out all the mercury which remains fluid, which is received in a gutter around the stone. After about 24 hours, it is raised gently upon its edge, and in a few weeks it is ready to frame.

(18) B. L. A. asks what temper steel should be to make a strong permanent magnet. A. Tool temper; draw to about a straw color.

(19) W. M. H. asks: What bodies are the poorest conductors of heat? A. Silk is the poorest conductor, and the resins, glass, and wood are all poor conductors. 2. A recipe for a violin varnish. A. Use mastic varnish; or, 12 parts sandarac, 6 parts shellac, 6 parts mastic, 150 parts 95 per cent alcohol, 6 parts Venice turpentine; mix and dissolve warm.

(20) J. B. B. asks: What can I put in water to lower the boiling point to 185° Fah., so that the temperature will not rise any higher, whatever fire is under the copper? A. The addition of alcohol will lower the boiling point of the mixture; but will evaporate so that the boiling point will continually rise.

(21) R., D. & Co.—For etching on cutlery you will require a ground wax composed of equal parts asphaltum, Burgundy pitch, and beeswax, melted together and thoroughly incorporated. In applying it, use a dabber, or ball of cotton covered with silk. Warm the piece of cutlery so that a stick of the wax will readily melt by touching. Smear a small quantity of the wax on the blade or articles, and dab it evenly all over the surface. When cold, scratch the required design or name on the surface and touch the parts with acid (nitric acid 1 part, water 4 to 6 parts), using a camel's hair pencil to cover the surface and bring the acid into contact with all the lines. In a few minutes the biting is done. Dip in hot water to wash off the acid, and the surface may be cleaned by wiping with benzine. Another way is to make a varnish of asphalt and turpentine, with a few drops of linseed oil to make it tacky. Have a rubber stamp made of the required design, with a border, so as to stop off around the design. Stamp the goods, and with some of the varnish thinned down with turpentine and a brush stop off the surrounding parts; or surround the design with a small rim of beeswax, and apply the acid as above.

(22) Reader asks: 1. What will remove warts from the hand with little or no pain? A. Get a piece of sal ammoniac about the size of a walnut; moisten the warts, and rub the sal ammoniac well on them every night and morning for a fortnight. 2. If I manufacture an article or compound, have I a right to sell it anywhere and everywhere, without paying license or tax? If I take orders for a book which is sold by subscription only, have I a right to take the books along with me and deliver them as I secure orders without paying license or tax? A. You must pay license for some kinds of business in certain localities, but the different laws for taxing drummers in several of the States have been decided unconstitutional. 3. A recipe for making hair dye from walnut juice? A. This consists simply of the expressed juice of the bark or shell of green walnuts, to which a little rectified spirit is commonly added for the purpose of preserving it, with a few bruised cloves, and the whole digested together with occasional agitation for a week or fortnight, when the clear portion is decanted, and if necessary, filtered. 4. A SUPPLEMENT containing receipts for making cosmetics, cements, blackings, etc.? A. See Cements, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158; for cosmetics and blackings, see "Techno-Chemical Receipt Book," which we can send for $2. For special treatment of freckles, moles, etc., see SUPPLEMENT, 507.

(23) T. G. C. asks: 1. Why does churning make butter? A. Agitating the milk causes the rupture of the coating of the butter globules contained in the milk, and their fatty contents then collect together. 2. What can I use to clean carpets. A. Use about 3 gills of ox gall in a pailful of water; rub with a soft scrubbing brush some of the ox gall water on the carpet, which will raise a lather. When a convenient sized portion is done, wash the lather off with a clean linen cloth dipped in clean water. Let this water be changed frequently, and when all the lather has disappeared, rub the part with a clean dry cloth. Mixtures of magnesia and fuller's earth made into a paste are used to remove grease spots.

(24) E. M. D. asks how he can prepare water for fire extinguishing purposes, to be used with a common pump. What will be the advantage over ordinary water? A. We doubt whether there is anything practical to use in the way you propose. Water saturated with alum or sulphate of soda or various other salts has superior value in extinguishing fires, due to the coating it gives to objects wet with it, which prevents contact with the oxygen of the air, and thus diminishes the rapidity of the combustion.

(25) H. B. H. asks: If we take say 100 or 1,000 Winchester regular cartridges, take out the bullet and leave the powder in, or say part of the powder, and put them in a crucible to melt the metal, do you think that when the cartridges begin to get heated they will cause an explosion capable of injuring the building or the crucible? We maintain that it will not do so, but that the cartridges will discharge gradually with the heat, as it is impossible that they should all get heated at the same time. A. You will have a number of explosions, which on account of the fulminate of mercury in the shells will be almost instantaneous, or equivalent to a single great explosion, capable of doing much injury.

(26) R. S. writes: 1. The velocity of electricity is said to be 288,000 miles per second. What kind of electricity has that velocity, and what kind of a conductor should it have? A. This is the velocity of a current of dynamic electricity on the best possible conductor, suspended in air so as to avoid all dielectric action. 2. Does the entire current on a wire flow in one direction, viz., from the copper pole to the zinc pole? I think that electricity flows from the earth through the negative pole. Am I right? A. The term current is purely conventional. It is assumed to flow from carbon to zinc (or equivalently) on the outer circuit. This would make it flow from the earth to the zinc pole. 3. If light is admitted through glass of any color, the rays appear of the same color as the substance through which they have passed. They are not separated in a prismatic way. How is it that light passing through red glass will appear red? A. The true color of a body that transmits colored light is the complement of the light it transmits. A colored glass acts like a screen or sieve, and sifts out and absorbs or reflects all rays except those that pass through it.

(27) H. P. P. R. asks: 1. How many units of heat are given out in the burning of one ton of average steam coal, under conditions the same as in heating the boiler of a ship's engine? How many units of heat are given out in the combination of 2,000 cubic feet of hydrogen with 1,000 cubic feet of oxygen to form water? A. One part of carbon in burning gives off heat enough to raise 7,273 parts of water one degree C. in temperature; one part of hydrogen enough to raise 34,462 parts of water one degree C.; 2,000 cubic feet of hydrogen weigh 73,958 grains, or 10.565 pounds, at standard barometer and thermometer readings. Taking coal as representing 95 per cent carbon, one ton of 2,240 pounds would raise 15,476,944 pounds of water one degree C., and 2,000 cubic feet of hydrogen would raise 364,091 pounds of water one degree C. From these factors you can deduce heat units of any desired system. As long as the coal is completely burned, the conditions have no influence on the heat evolved. They only affect the heat collected.

(28) G. M. asks how to prepare the mercury for a barometer? Also how expel the air from the tube after it is filled? A. If the mercury is not free from other metals, it should be distilled. This is best done in an iron retort. If contaminated with dirt, it can be purified by passing through an inverted cone made of a sheet of paper containing a very small hole at its apex. Your best plan is to buy pure mercury, and not attempt to distill it yourself. The air bubbles may be gathered by introducing a clean iron wire and drawing the bubbles together with it. When they acquire a sufficient size, they will rise and escape. The air may be much better expelled by boiling in the tube, but unless experienced you will probably break the tube. The mercury for this operation should be added three or four inches at a time, and each addition boiled.

(29) H. N. B. writes: I am about making an induction coil, but would like to ask a few questions: When the core of an induction coil is magnetized by a current passing through the primary coil, the core is rendered magnetic only at the poles, and not in the middle. When the current is broken, and the soft iron core discharges its magnetism, do the magnetic lines pass from the poles only, or do they come from the middle of the core as thick as from the poles? If the middle is neutral when magnetized, I think no magnetic lines would come from the middle when discharged. Why do they wind the secondary wire all across the spool? When they come to the center, why don't they skip over that part of the core where there would be no magnetic lines, and resume the winding after they pass little beyond the middle, thus saving wire and resistance? A. The magnetic lines of force that radiate from the core of an induction coil are most numerous at the ends. Coils have often been constructed without wire in the center as you describe, but just how much is gained by this is not known. The saving is not very great.

(30) F. N. R. writes: 1. You gave a formula for a freezing mixture, viz., 5 parts nitrate of ammonia, 6 parts sulphate of soda, and 4 parts dilute nitric acid. Will such a mixture preserve the freezing properties indefinitely or for any length of time if kept inclosed in an airtight space? A. It will reach a low temperature, and maintain it for a varying length of time, according to the non-conducting power of the materials surrounding it. It cannot in your sense be preserved for future use, but must be mixed at the moment of application. 2. Will the liquid stove polish receipt given by you some time ago in your paper, viz., pulverized black lead, turpentine, water, and sugar, keep its consistency as when first made, or will it have a tendency to settle after standing a while? A. There will be a natural tendency in the black lead to settle out, and we would advise it to be shaken before use.

(31) J. P. S. says: In your issue of 26th of March, in answer to No. 17, J. W. P., you say wet the edges of the paper to overcome electrical attraction between the sheets. I run a cylinder press, and was troubled the same way. The jobs were such that I could not wet the edges. I took a large type "galley" and laid it on the delivery table, where the sheets would fall on it. A copper wire from it to the steam pipes just behind it carried off all electricity, so the sheets could be straightened easily.

(32) T. H. N. asks where he can find a full account of the composition and manufacture of aluminum bronze alloys produced by electrical methods. A. In SCIENTIFIC AMERICAN, May 22, 1886, and November 13, 1886. Also in Richards on Aluminum, very recently published, which we can mail for $2.50. [Such replies as the foregoing we usually prefer to send by mail, or at least to exercise the privilege of so doing, but there are those, whom we much regret to disoblige, who are continually forgetting to send their names and full address.—ED.]

(33) G. H. W. asks: 1. Will a cubic foot of air under pressure of say five hundred pounds be more buoyant under water than of simple atmospheric pressure? A. Air at a pressure of 500 pounds to the square inch will be less buoyant than air at normal pressure. 2. Can water be compressed to any perceptible amount? A. Water is compressed 0·00005 vol. per atmosphere of pressure (15 pounds to square inch) to which it may be subjected.

(34) A. B. asks (1) how to glue or cement German silver on to wood. A. Use the marine cement recommended in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, under title of "Cements." 2. How to polish German silver by hand. A. Use a mixture of 1 part olive oil, 1 of spirit of sal ammoniac, 2 of lime, and 1 of water as a thick paste.

(35) D. H. asks: What fluid can be used in card writing, that will retain gold dust or bronze? A. Use gold size or albumen.

(36) W. H. B., Greenville, Tenn., asks: Can you give me a recipe for making wax to polish hickory handles with? A. Take of seed lac 1 ounce, gum guaiacum 2 drachms, dragon's blood 2 drachms, gum mastic 2 drachms, put into a bottle with one pint spirits of wine, cork close, expose to a moderate heat till the gums are dissolved; strain into a bottle for use with ¼ gill linseed oil; shake together.

(37) J. A. H. asks if there is any flux for brazing cast iron. A. We know of nothing better than borax ground in water until it assumes the consistency of milk.

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

B. D. B.—The yellow substance sent is a clay, and might be available for earthenware, terra cotta, or brick making. Lignite or brown coal can be used as fuel if of sufficient purity. It cannot be accepted as an indication of better coal underneath, except in the sense that better lignite may exist below it.

INDEX OF INVENTIONS

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April 5, 1887,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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