Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. A. P. asks: How long will galvanized cast iron stand exposed to the weather (such as an iron fence) without signs of rust? A. If the iron is perfectly galvanized, it will last for a long time. If the union of the zinc and iron is imperfect, rust will appear very soon.

(2) C. M. W. asks: 1. When two spur wheels rolling in contact are partly worn out, are the teeth the proper shape for a uniform transmission of motion? A. If the metal of which the wheels are composed is homogeneous, the wheels will wear so as to transmit uniform motion. 2. Will the teeth of two pairs of spur wheels of same diameter, same pitch, and conveying same power wear to the same shape, when one pair had involute and the other epicycloidal teeth when new? A. Yes.

(3) C. J. H. writes: In the process of amalgamation of gold bearing ores, it is desirable to reduce the ore to a very fine state of subdivision by abrasion or trituration, after having been roasted and crushed with Cornish rolls. Buhr millstones are sometimes used for grinding the ore. I have suggested that cast iron disks faced with heavy plates of soft copper be used instead of buhr stones. In your opinion, would copper faces be as efficient for the purpose as buhr stones? What would be the probable result in using the copper faces? I wish to reduce the ore to the finest state attained by mechanical process, wet or dry. A. It is possible that some of the harder particles of the ores might embed themselves in the copper and act something after the manner of diamond dust on a lap, but we fear the results would not be very encouraging. You could test the matter experimentally.

(4) L. C. M. writes: I wish to ebonize some maple by boiling it in a dye, so as to have it penetrate into the wood. I can dye the pieces, but cannot season them after taking them out of the dye without nearly all of them becoming checked. The wood is kiln dried before it is put into the dye, and stays in the dye about twenty-four hours. Does immersing wood in a solution of caustic soda have any tendency to toughen it? A. Your difficulty is probably due to some lack of proper manipulation, which could only be detected by seeing you work. The following, if properly conducted, might give satisfactory results: Into a quart of boiling water put 1½ ounces of copperas and 2 ounces of logwood chips. Lay on hot; when dry, wet the surface again with a solution of two ounces of steel filings dissolved in half a pint of vinegar. When dry, sandpaper down the grain and get a smooth face, and as the work to be ebonized must be quite free from holes, oil, and fill in any of these with powdered drop black mixed in a filler. Then give a coat of quick drying varnish (made by dissolving black wax in spirits of wine), and finish the work by rubbing down with finely pulverized pumice stone and linseed oil until a good surface is acquired. We fail to understand how any advantage can be gained by using caustic soda.

(5) W. S. N. asks: 1. Can you give me a receipt for the preparation of washing blue in powder, similar to what is now put on the market in boxes with perforated tops? A. We give herewith 4 receipts for the manufacture of liquid bluings, any of which will answer: (*A.*) Dissolve indigo sulphate in cold water and filter. (*B.*) Dissolve good cotton blue (aniline blue 6 B.) in cold water. (*C.*) Dissolve Prussian blue in cold water, adding one-eighth part oxalic acid in water. (*D.*) Dissolve Tiemann's soluble blue in water with 2 per cent of oxalic acid. See also SCIENTIFIC AMERICAN, page 261, for April 28, 1883, for formula of disinfecting wash blue. 2. Can you give me a receipt for a washing compound, such as is put on the market as pearline, etc.? A. Pearline is simply a trade name given by James Pyle to a soap manufactured by him, and it would be impossible to say anything about its composition, unless it were definitely analyzed and its exact ingredients ascertained. Morfit's work on soaps will give you numerous receipts to select from.

(6) A. T. D.—You could not compress gas in a balloon. It would not help the lifting power if you could. You can make hydrogen gas in barrels, by charging with zinc, 25 or 30 pounds to a barrel. Then half fill the barrel with a mixture, 10 parts of water to 1 part sulphuric acid. Attach a rubber tube to the bung, with its other end attached to another barrel partly filled with water to catch any acid vapors that may come over. A half dozen barrels, attached to one receiver, and the receiver connected with the balloon with a larger tube, will answer your purpose. A description of how hydrogen gas is made is to be found in SUPPLEMENT 241.

(7) F. W. G. asks: 1. What appliance is used in drawing room coaches and cars to store carbon gas for illuminating purposes? A. The Pintsch (German) system is used in Europe on railroads; in this country on the Erie and the New York, Providence, and Boston railroads. 2. If it is compressed in a cylinder, and how much will cylinder hold? A. Illuminating gas for portable purposes is not compressed in this country; it is flowed into India rubber bags from street gas mains at the ordinary pressure, and its outflow is governed by weights pressing on the flexible bag. 3. Is it patented, and who is the patentee? A. We do not know that it is patented.

(8) A. M. F.—We know of no cheap process of reproducing maps and drawings in black lines. The ordinary photographic method is as good as any. Twenty to twenty-five cells of Bunsen battery will light a room with a small arc light. For an incandescent light more battery power would be required. We cannot advise the plan of lighting by means of batteries. Write dealers in electrical supplies who advertise in our columns.

(9) C. H. P. asks the safe velocity for fly wheels of different sizes and weights, and the rule for calculating it? A. Cast iron fly wheels well proportioned and fitted, and of good material, may be run safely with speed of 60 ft. per second, and frequently have been run at a greater velocity for special purposes. You will find rules for fly wheels in "Bourne on the Steam Engine," "Bourne's Catechism of the Steam Engine," "Marks on Proportions of Steam Engines," and "Regg on the Steam Engine."

(10) H. G.—There is nothing so cheap or convenient for a freezing mixture as pulverized ice and salt. In chemical laboratories other materials are used for experimental refrigeration. They are too expensive for general use. The following are some of these combinations:

Sal ammoniac	5 parts.
Niter	5 parts.
Water	10 parts.
Nitrate of ammonia.	
Water	equal parts.
Sulphate of soda	5 parts.
Diluted sulphuric acid	4 parts.

See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 89, for methods of freezing mixtures.

(11) S. B. asks: If in a dynamo machine constructed like the one in SUPPLEMENT No. 161, but with field magnets 6 inches wide (and consequently an armature 6 inches long), it would do to wind the armature with No. 30 wire to a resistance of 35 ohms for a current of the highest possible tension? If not, please give the best size of wire and the best resistance for the armature of a high tension machine like the above. A. You can get a high tension current in the manner proposed.

(12) F. A. R. asks: What is the best kind and size of battery, and how many cells will it take to operate a telegraph line half a mile long? A. Use four cells of gravity battery.

(13) J. G. H. asks: What is the best and most durable preparation to paint smoke stacks and other surfaces subjected to heat? A. Coal tar makes a good paint for smoke stacks. If it is thin enough to add a little finely ground plumbago, it will keep its color better for it. A paint made with boiled oil, lamp black, and plumbago is also good, and will keep its color fairly on heated iron work.

(14) J. E., Jr., asks: 1. What is the best means to secure uniform power from a wind wheel? A. The use of a governor to change the sails according to velocity of wind. 2. How can I estimate the power of a wind wheel with sails square to the wind? The *average* power can only be determined by experience, so as to obtain the average velocity of wind at any given location. 3. To what density is it practical to compress air in cylinders to be used as steam? A. It has been carried to 1,000 pounds per square inch.

(15) W. H. B. asks: 1. How much greater area of cross section should an iron lightning rod have than a copper one, to give the same conducting power? A. The sectional area of the iron rod should be six times as great as that of copper to secure the same conductivity. With roof surface of 1,000 square feet, copper rod one-half inch square, and a wet clay soil, how far ought I to continue the rod underground, through a bed of charcoal 1 foot deep and 1 foot wide, to give a proper ground connection? A. Carry the rod down till you strike soil that is permanently damp.

(16) F. M. S. writes: I am told that when one is some fifty feet or more down in a well, if he will look up toward the heavens he can see the stars. Will you please be so kind, at your convenience, to explain to me through your able paper the philosophy thereof? A. In the darkness of deep wells and mine shafts the eye becomes very sensitive, and thus is enabled to see the larger class of stars. It is the glare of daylight that blinds the eye to delicate sight. One or two of the largest stars have been seen in open daylight under favorable conditions of the atmosphere. The planet Venus is sometimes seen in broad daylight. Stars can be seen with telescopes in a clear atmosphere during the day.

(17) W. T. B. asks: How can the exhaust from a small steam engine be utilized for heating purposes? A. The exhaust of your engine can be entirely condensed and all its heat utilized by conveying the steam through iron pipes around your room or rooms, in the same manner that you would do for heating with live steam, only with this modification: keep the area of all the pipes combined and all the feed branches fully equal to, if not larger than the area of the main exhaust. Put a back pressure valve in the main exhaust to turn the steam into the heating pipes, arrange all the coils so that the water of condensation will run naturally with the steam to the drips and the vent pipe at the further end of the circulation from the engine, from which point a generous vent pipe should be carried outside or to the roof.

(18) S. A. H. asks: If a tree were to fall on an uninhabited island, would there be any sound? A. Sound is vibration, transmitted to our senses through the mechanism of the ear, and recognized as sound only at our nerve centers. The falling of the tree or any other disturbance will produce vibration of the air. If there be no ears to hear, there will be no sound. The effect of the transmission of the vibrations upon surrounding objects will be the same, with or without the presence of sentient conditions for recognizing them. Hence there will be vibration, but no sound to the things that cannot hear.

(19) J. M. A. asks: Could I use the lenses of a quarter size camera tube to make a magic lantern? Would the object glasses of a field glass be of use as condensers to intensify the light from an oil lamp? A. The lenses of a camera are suitable for a magic lantern. Your object glass is not suitable for a condenser. It has too long a focus for its diameter. The condenser should be composed of two plano convex lenses, convex sides together, 4 inch diameter, 6 inch focus, for a quarter size camera. See SCIENTIFIC AMERICAN SUPPLEMENT 173, "How to make Lantern Slides;" also 236, "Lenses;" 87, "Magic Lanterns."

(20) A. C. McK. writes: I have a machine that I would like to run at a high rate of speed. The balance wheel is 10 in. in diameter, 5 spokes, 1 in. by ½ in. thick, rim 1 in., rounded and securely fastened by a set screw let into the shaft. Please let me know in your answers to correspondents the greatest rate of speed I can attain with safety. The machine does better work the faster it is run, and runs better with a balance wheel than without one, but I don't want to take chances. I have heard of wheels bursting when run at a high rate of speed, so would like to know what rate such a wheel would safely stand. A. If your wheel is of cast iron, we would not recommend greater than 1,450 to 1,500 revolutions per minute; if cast steel, the speed might be increased to 1,750 or 1,800 revolutions per minute. In any event, have a good, strong case fastened over the wheel to limit damage, as all cast metals are very treacherous.

(21) G. W. W. writes: I have a portable engine with a driving pulley 24 in. diameter, making 200 revolutions per minute, and cannot keep steam. If I take off the 24 in. pulley and substitute a 48 in. pulley, and make 100 revolutions, what will be the result? How much more steam will it require, and give rule or method of calculating the same? A. To do the same amount of work with the 48 in. pulley and 100 revolutions that you are doing with the 24 in. pulley and 200 revolutions, you will require double the pressure in the boiler. If you are now carrying the limit of pressure in the boiler, this change cannot be made. You will gain power by increased pressure and slower speed with proper expansion. You may make the pulley 36 in. with a speed of 133 revolutions, which will require 50 per cent more pressure, to great advantage. You may find that the slide valve is not properly set for expansion, or that the piston is leaking steam. This should be examined by some good engineer. The next is good water for the boiler, and clean fines. In the absence of essential data we cannot give further advice.

(22) F. W. C.—We believe the fastest printing presses can make 32,000 impressions per hour, using two impression cylinders, and giving one impression on each side of the sheet. Think there is no press that will do 60,000 in this way.

(23) S. B. asks: What is the real name of the white, spongy part of the bread? A. The crumb.

(24) J. C. Z. asks if an inch piece of bar iron, say 10 feet long, will bend under less pressure than an inch gas pipe, outside measure, of the same length? A. Iron pipe is *much* stiffer for a given weight than solid iron. For a given outside diameter the iron bar will bear the most weight. We cannot tell how much, as there is a great difference in the condition of hardness in both iron and pipe.

(25) J. M. M. says: Please give me the cause of a "poll parrot," of the gray African species, 12 years of age, who lived her life *alone* in a cage, laying two eggs? A. To which another correspondent, J. W. C., replies as follows: The "African gray parrot 12 years of age, who has lived her life *alone* in a cage," has made her mark by "laying *two* eggs." This is the first instance coming to our notice where a bird of this species *gave an ovation* under such peculiar circumstances. The common fowl, *Hermipenna domestica*, has a habit, we are told, of occasionally doing things in this way. But no amount of incubation will bring forth chickens from the eggs she lays. The parrot in question has not only been extraordinary in specific performance, but in the act has *revealed a secret regarding* her sex, which birds of her kind and feather generally keep to themselves. All African gray parrots are wonderfully similar in appearance, and do not seem to age after the *fourth year*, and as to their being *male* or *female*, "no fellow," this side of Africa, "has ever been able to tell" until this one *let out* the facts. Our querist being a dentist, seeks naturally for the *cause* of this ovarian outbreak. We may sound the depths of being, and not find it; but this case suggests *mental impression* as a primal motor. Disturbance, commotion, eruption, are links in the chain of evolution as apparent in the progress of an egg as of a tooth. This Mattoon bird is a treasure, and by way of enhancing her value we observe that she has an obvious talent for *ciphering*, as shown by her *putting down two* and *carrying*—how many? Pretty, pretty polly! Let her beat the hens at *hatching*, if she can.

(26) C. R. asks how to make chloride of gold? A. Gold is dissolved in nitro-hydrochloric acid, and evaporated until all the nitric acid is driven off, and the result is gold chloride. It is best, however, to evaporate the solution to crystallization, and then dissolve the mass in water.

(27) G. L. T. writes: In a late number of your valued journal, SCIENTIFIC AMERICAN, date Jan. 26, 1884, I noticed under head of Notes and Queries (No. 17), W. J. wishes directions for making nickel electrotypes; for his benefit I will state that it is only necessary to proceed in the same manner as for copper, using of course a nickel bath. Nickel is much less injured by friction and pressure, and type faced with it can be used for any color, whereas copper faced type is corroded by some bright colored inks; another advantage of nickel is its hardness, which is almost that of steel, and will therefore last ten times as long as copper faced type. Another circumstance worthy of consideration is this: Copper deposited by electricity from solution has a matte, dull surface, which inclines to crystallization; if a thin coat is used, it is rough and uneven. Nickel, on the contrary, is deposited in an even layer, with a smooth surface, and in consequence it reproduces the lines, in fact the very finest, with a uniformity that never fails. The nickel plating may be as thin as required, and its surface is always equally smooth. A galvanic battery with one liquid may be new to some of your readers; it is composed of zinc and carbon placed in a mixture of 40 parts water, 4·5 bichromate potash, 9 parts conc. sulph. acid, 4 parts sulph. soda, and 4 parts of the double sulphate of potassa and iron. This produces a very regular current, the zinc needs no amalgamation, and no sulph. hyd. gas is evolved.

(28) C. W. asks: What filler should I use for pine wood, which is stained before varnishing; also a good filler for hard woods, as ash? Can it be bought prepared, if so, what should be asked for? What is the process to give cherry the beautiful red finish? Is it in the varnishing, if so, what varnish should be used? A. For filling use whiting, 6 oz.; japan, ½ pint; boiled linseed oil, ¾ pint; turpentine, ½ pint; corn starch, 1 oz. Mix well together, and apply to the wood. On walnut wood add a little burnt umber, on cherry a little Venetian red, to the above mixture. In the SCIENTIFIC AMERICAN for May, 28, 1881, is an excellent receipt for a filler for hardwoods. They can be bought of paint houses in the city. The price varies from 10 cents to 12 cents. The red finish of the cherry is brought about by the use of dragon's blood, which is applied in the varnish or a a stainer.

(29) H. S.—Creosoting, or treating the wood with creosote, is considered the most satisfactory means of counteracting the influence of the teredo in timbers located in the water.

(30) A. G. asks how the gold lettering is put upon the back of books, etc., and what is put on to cause the gold leaf to adhere? A. The letters or design are coated with size or white of egg and stamped into the cloth or leather; gold leaf is then applied to the book, and it adheres where the size is, and the surplus gold is rubbed off with a rag. 2. How the gold printing is done upon cards and paper? A. Gold printing is similar; the design is composed with type, and a size is used instead of ink on the printing press. Bronze or gold powder is dusted over the printing before the size is dry, generally with a piece of cotton, and adheres where the size has been printed on the paper.

(31) T. J. H.—There is no metal of greater power of dilatation by heat under a temperature of 400° than zinc, under moderate pressure.

(32) P. M. S.—Patents cannot be antedated.

(33) D. McR.—Your drain system needs ventilating. The *blind well*, if air tight, does not make room for the water that is suddenly plunged into the pipes. This makes a pressure which breaks the seal of the weakest trap. Make an air vent at the well, if there is no trap between the sink and the well. If there is a trap in the main, then a vent pipe leading from the top of the main vertical pipe to the roof will be requisite to prevent the blowing of the trap seals.

(34) A. T. asks if German silver is injurious to use for a smoking pipe or cigar holder, if so, what other metal would answer for same? A. German silver is not necessarily poisonous or injurious, but we should prefer to recommend some non-metallic substance, such as celluloid or artificial ivory. A silver plated piece could be used.

(35) J. S. asks for a receipt for a lacquer that will put a gold color on copper plated work? A. A pale gold lacquer can be made as follows: 1 gallon methylic alcohol, 10 oz. of bruised seed lac, and one half oz. of red saunders; dissolve and strain. A deep gold lacquer can be prepared of 3 oz., seed lac turmeric 1 oz., dragon's blood one-quarter oz.; alcohol, 1 pint. Digest for a week, frequently shaking, decant, and filter. By using a diluted solution of the latter or by increasing the color of the former, the exact shade wished for can be obtained.

(36) H. C. A. asks how to condense metallic sodium after having put the different ingredients in the retort and heated, or in other words how to collect the sodium? A. The metal will become condensed to a liquid in running along the tube of the retort. It is collected in rock oil or naphtha. A description of the process is given in Lippincott's "Cyclopedia of Chemistry," page 848, vol. ii.

(37) J. R. J. asks: What do you base your calculation on for the pressure on the surface of an ordinary slide valve? Do you take the whole surface of the valve or only the area of the exhaust port in combination with such part of steam port that may be covered, etc.? A. We take the whole area of the exhaust cavity of the valve and one steam port while closed. The moment that the steam port is opened the pressure is neutralized for its area. 2. What size siphon will it require to discharge 15,000 gallons water in 30 minutes, with a lift of 8 feet? How much water will a siphon with 5 in. suction and 4 in. discharge, with 2 in. steam pipe and nozzle reduced to 1 in. or ¾ in. with 10 ft. lift, discharge in one hour, steam pressure 60 pounds? A. The best form of siphon ejector upon the market, of the largest size, with a 2 in. steam pipe and 3 in. discharge pipe, lifting 8 ft. with 60 pounds steam pressure, has a capacity of 8,000 gallons per hour. This is nearly the capacity that can be obtained from a 2 in. steam pipe with larger water pipes. We cannot recommend a larger size in one jet. For a discharge of 15,000 gallons per hour you will require four such jets as above described. We know of no trials with larger pipes.

(38) J. S. B., of Virginia, writes: The text bookson physics state that the barometer at the level of the sea stands at 30 in. My aneroid barometer yesterday at this place stood at 31 in. As I suppose 30 in. at the sea level means when the atmosphere is free from moisture, please explain under "Notes and Queries" how the barometer can be at any place higher than 30 in. Please give also height of Washington City above sea level. Also state whether there is any method of telling the height of a place above sea level by barometer, except by observations on some day and some state of weather at the sea level, and at the place whose height is desired? A. The *mean* height of the barometer at the sea level is about 30 in. If your barometer was correctly adjusted, it indicated a high wave of pressure in the atmosphere. The annual mean pressure at Washington for 1879 and 1880 reduced to the sea level was 30·107 in. The same for nine years, 30·058 in. Add for your height above the sea 0·001 of an inch for each foot in height, to the *mean* of your station observations corrected for temperature and instrumental errors.

(39) W. B. H. asks: Will you kindly inform me what resistance a spiral spring 1 in. in diameter and 6 in. in length may be made to bear? A. There is no measure for the strength of small spiral springs. Their strength depends entirely upon the size and shape of the wire, and the material of which it is made. A square steel wire or bar makes the strongest spring. A 1 in. diameter with three-sixteenths square steel of the best quality, well tempered, might be relied upon for 100 pounds.

(40) P. L. H. writes: 1. Will you give your reasons for your answer to second part of question No. 14 in your issue of Feb. 2, 1884? A. The answer to the second partalluded to is correct for thesame reason that the answer to the first part is correct, both coming under the same conditions. The strain upon all cylindrical vessels, whether tanks for holding water, air, gas, or steam under pressure, is inversely as the diameter. In the case of the water tank, the strain is greatest at the bottom and *nil* at the top. The practice among engineers is to make the courses of plates thicker toward the bottom. This is notably so in the great standpipes of water works. The great mistake among people not familiar with engineering is their failure to understand the *cumulative* strain of *unsustained* walls, due to increased diameter. They seem to compare the conditionsof *thin* walls in the distribution of the direction of the thrust directly with walls of masonry, where gravity derived from the weight of material becomes the retarding power. 2. Suppose a wrought iron lap welded pipe 6 in. in diameter and ⅜ in. in thickness be used as a water main with a maximum pressure of 110 pounds to square inch, the same to be buried in the earth at a depth of about 30 inches, what length of time will such a pipe last under the conditions stated? A. Wrought iron pipe is largely used for water, and will last many years. The only difficulty is the gradual decrease in efficiency of discharge by the accumulation of rust nodules upon the inside, which sometimes entirely fill the smaller pipes. Cast iron pipe is the best for water underground. An experience of 40 years has failed to find cast iron water pipes rusted out.

(41) J. C. R.—Aluminum has been used in alloys of copper and zinc and silver, and possibly some other metals. It has been sold as aluminum bronze, and used for jewelry, mathematical and optical instruments, screws, and all. It would probably be a novelty as wood screws, and possibly patentable. You might try it. It costs in Europe about 50 cents per ounce. In this country, about 75 cents to $1.00 per ounce. It is not as ductile as yellow brass—more like gun metal in the form of alumina bronze. If a small portion was mixed with yellow brass, it would not materially affect its ductility.

(42) N. H. asks why will an injector refuse to inject water into a boiler above the line of water level? A. Injectors will feed above the water line. There is no reason for their failure if in perfect order. The only difficulty arises from leaky valves allowing the steam to set back and heat the injector, when it will refuse to start until cooled. There is much difference claimed by the makers of injectors for the power of their various makes. It is possible that some of the 15 kinds now upon the market may fail to feed above the water line from some inherent defect in their construction.

(43) E. H. R. asks: What are the proper chemicals to put into the jars of a battery to run an electro machine or motor to drive a sewing machine? The machine is made for that purpose. The battery is a piece of zinc between two pieces of carbon. The machine has been tried with some kind of acid, but failed to work satisfactorily. The battery is composed of six jars. A. Makea saturated solution of bichromate of potash in hot water. Allow it to cool. Some of the bichromate will crystallize out. Add slowly to the bichromate solution one-sixth its volume of sulphuric acid. This will render the solution hot, and redissolve the bichromate. Add about half an ounce of bisulphate of mercury to every five pounds of solution.

(44) A. L. S. asks for the best method for silvering and oxidizing metals, especially electroplates? A. For information on electro-metallurgy see SUPPLEMENT 310. To "oxidize" silver dip it in a weak solution of sulphate of potash.

(45) A. S. Co. ask whether the moisture could not all be taken out of a damp room heated at the bottom 150°, by ceiling the room with galvanized iron and having a steady stream of cold water flowing over the iron ceiling, and a system of troughs underneath to catch the drip? Would not such an arrangement create a circulation, and convey all the moisture out of a room quickly and thoroughly? A. Heating the air to 150° will largely increase its capacity to hold water; air at 75° that is moist becomes dry at 150°. Your ceiling will require to be much colder than the air before heating it, in order to condense any moisture. A cold room may be made moderately dry by condensing the moisture upon a colder surface and dripping the water into gutters leading out of the room with a siphon.

(46) C. M. H. writes: It is stated that an incombustible paper has been invented by Mr. G. Meyers, of Paris, and that its resistance to heat is so great that fire will not alter its appearance? A. Fireproof paper for writing and other purposes has been made in France by mixing asbestos and wood fiber with a small portion of borax and size, that is said to resist a white heat. The German method is to treat the asbestos with permanganate of potash and then with sulphuric acid before mixing with wood pulp, borax, and glue size. Asbestos and borax are the foundation of all fireproof papers.

(47) S. W. L. asks: What is meerschaum composed of, and where is it found? A. Meerschaum is a silicate of magnesia, and is found in Natoli, Asia Minor. The mines are owned by the Turkish government.

(48) G. L. A.—Petroleum is a preservative for wood. If you can keep it in your fence posts after they are saturated with it, they will be durable.

(49) W. H. T. writes: I wish to make "idler" pulleys 1½ in. diameter with groove for ½ in. round belt to run at 6,000 revolutions per minute. The speed to be kept up from a half minute to five minutes at a time, and pulleys to run noiseless. Of what metal or alloy shall I make them to run with the least amount of oil, and to wear the longest? A. Never run idler pulleys loose on a shaft. Make them of iron or steel fixed on a shaft, and run the shafts in metalline boxes; they will run noiselessly and without oil, or at least with the minimum amount that will moisten the journals.

(50) G. E. E.—It is impossible to form any opinion in regard to the possible amount of silver that a mineral may contain without first assaying it. The larger of the two specimens may contain silver, but the smaller one is simply a piece of iron ore. Cost of assay for silver, $5.00.

(51) F. H. B. asks the best way to case-harden gas pipe, the diameter of pipe 6 in., and 4 in., corrugated on the outside with 18 or 20 corrugations per inch, about three thirty-seconds of an inch deep. I wish to know the most thorough manner regardless of cost. A. All casehardening is superficial, as its name implies. The best method of case hardening is packing the article to be treated in a tight box of iron with ground bone, prussiate of potash, and charcoal, and heat for several hours to a red heat. Then plunge into water. The longer the exposure to the heat, the deeper the coating.

(52) G. C. S. asks: What amount of air can be ejected in one revolution of the piston, say the cylinder is 12in. in diameter and the stroke 18 in? Also, which possesses the greatest power—steam or atmospheric pressure? A. Your cylinder 12 in. diameter, 18 in. stroke, will discharge 1·177 cubic feet for each stroke of its piston, or twice this amount for a revolution of the driving shaft, *without* compression. If you wish to compress air, say to 15 pounds pressure per square inch, then but one-half of the above amount can be discharged without clearance at the ends of the stroke. For equal conditions there is no difference in the power of steam or air.

(53) A. M. B. writes: All old water-mill men insist that a saw runs faster and stronger, and will cut more lumber, at night than in the daytime. Is there any reason for this that can be accounted for scientifically? A. We never could appreciate that water was any heavier, or that machinery runs any lighter, at night than by day. We think that the difference would perhaps be due to the change in the temperature, whereby there will be less friction of the parts.

(54) W. G. F. asks: 1. In making rubber stamps is the rubber melted or dissolved? A. It is softened by heat and pressed into the moulds, and afterward vulcanized. 2. What kind of rubber is used? A. The rubber is mixed with sulphur. It is sold already prepared. 3. How may sticking to the mould be prevented? A. By dusting powdered soapstone thereon. Plaster moulds are generally used, and destroyed after use.

(55) F. A. asks: How much weight can a magnet needle of a ship's compass carry without refusing to do its duty? A. Any weight added to the needle tends to increase friction on its pivot and to make its action heavy.

(56) R. T. M. writes: We have a dispute about a coal burning boiler having no furnace. Is not the plate that separates the steam from the fire the line that distinguishes the furnace from the boiler? A. A locomotive or marine boiler or any internally fired boiler is said to have a furnace, because the fire box forms part of the boiler construction. A cylindrical or brick set boiler comes under the opposite signification. 2. Is machine riveting as strong as hand? Don't hand riveting crystallize the iron? A. Machine riveting if carefully done, so that the rivets are set square and fair, is fully as strong as hand riveting. Crystallization takes place afterward, and is a slow process. We have seen it in old rivets, not often in new.

(57) F. H. C.—The Fuller battery will not readily freeze, and is well adapted to ringing door bells. It will work a long time without attention.

(58) O. N. L. asks the best point of the cylinder of the gas engine to explode the gas? A. Ignite the gas when the piston has completed about one-third of its stroke.

(59) H. J. H. asks: 1. What are the numbers of the three samples of wire inclosed, by the Brown and Sharpe wire gauge? A. The largest is between 23 and 24. Probably intended for 24. The others are respectively 30 and 36. 2. Are the four coils in the Dr. Bradley's improved tangent galvanometer (as described in "Haskins' Galvanometer") wound one on the other? If so, which one is wound first—the fine or the coarse? And how large is the bobbin or tube upon which they are wound? A. There are four coils. The finer wire is wound first. The bobbin is flat and about 1½ inches long. 3. And also how the needle for the same is made, how large the little magnets are, and how many? A. The needle proper is a disk of magnetized steel with aluminum pointer attached. The little magnets are no longer used. 4. How many coils, how wound, and how connected with each other in Queen's universal galvanometer? A. If built according to Bradley's pattern, there are four coils, whose resistances are respectively 150, 25, 3, and 0 ohms. One terminal of each coil is connected with the ground or return wire binding post. The opposite ends are each provided with a binding post. 5. What is the outside lever and inside arm in Bradley's galvanometer? A. It is an arrangement for lifting the needle and clamping it to the cover glass when not in use.

(60) S. McI. writes: I have a Corliss engine, 3 ft. stroke; how near to end of stroke should piston be before exhausting? A. The best point can only be determined by applying the indicator; the proper point depends largely upon size of ports, clearance, and speed of engine; in your case we should judge about 1¼ or 1½ inches. The larger the ports the nearer the point of exhaust can approach the end of the stroke.

(61) J. N. G. asks: 1. How can I hermetically seal the alcohol in a level glass, as it is done at the factories? I find that a sufficient heat from the blow pipe to anneal the glass tube will generate a gas and break before closing. A. Before introducing the alcohol, draw the ends of the tube into a very fine tube close to the bulbs, then fill the tube by expelling the air by heat and drawing in the alcohol by means of the vacuum. The small tube may be readily sealed without bursting the bulb. 2. How is the black, glossy finish put on tintypes used by photographers, and would the same finish do upon a gun barrel? A. It is japan baked on. It might be applied to a gun barrel. 3. In making an induction coil such as are used in microphones, etc., is it necessary to introduce an iron core? A. Yes.

(62) S. H. J. asks: Whether the zinc in a gravity battery is being acted upon when the circuit is open? A. Yes.

(63) A. M. J.—The wire is covered with gutta-percha.

(64) W. C. P. asks: 1. What are the dimensions of a Ruhmkorff coil such as is used in the laboratories for exploding gases, etc? A. The smallest coil that will give a spark will explode gases. 2. What is the rule for computing the length of the spark from any coil? A. The length of the spark depends upon so many conditions that it cannot be accurately calculated.

(65) J. R. asks: What is the simplest way to obtain the electric spark for igniting gas? What is best to ignite with? A. Use the spark of the extra current of an electro-magnet.

(66) J. W. G. asks: Is the name of the wheel barrow's inventor known? A. The wheel barrow is a very old invention. Its inventor could not have been far removed from Adam. We don't know his name.

(67) A. R. B. asks: 1. What term is used to describe the process of either grinding down the deep cuts between the teeth of cross cut timber saws, with emery wheel or file? A. Gumming is the technical name for the operation described. 2. How can I best get the painting and gilding of large letters on plate glass off without scratching the glass? A. Try a warm solution of caustic potash. 3. After using one of my finest paint brushes in shellac varnish, I find that the alcohol will not clean it well. What will do it? A. Ninety-five per cent of alcohol will do it.

(68) C. E. B. asks: 1. What is the length of the armature in the dynamo electric machine of Geo. M. Hopkins' design in SUPPLEMENT, No. 161? A. Four inches. 2. Do the magnets, A and B, require to be charged before being placed in position, if so, how can I charge them? A. The magnet needs no charging. The residual magnetism is sufficient to start the machine. 3. Can you give me a receipt for black ink, one that will be very black, and have the appearance of being varnished when dry? A. See ink receipts in SUPPLEMENT, No. 157. 4. Is the small boiler described in SUPPLEMENT, No. 182, on good principles, and a practical boiler for an engine 2 x 4 in.? A. Yes.

(69) C. M. L. says: Bisulphide of carbon vaporizes at 118, and expands a little rising 400 times, when we have added 94 degrees of heat and brought it up to the boiling point of water, which expands nearly 1,700 times; is it as good, all things considered, as water as a motive power? A. The bisulphide of carbon would be more economical, but all things considered not as good as water for a motive power.

(70) H. M. E. writes: 1. How can I finish induction and other coils in hard rubber? A. The small coils are usually inclosed in rubber tubing such as may be procured of rubber manufacturers in this city. The larger coils are wrapped with very thin sheets of hard rubber, the seam being located on the under side of the coil. 2. Does the incandescent light require a vacuum? If not, what size and length of platina wire should be used with five cells bichromate plunge battery plates 2½ x 6? A. A vacuum is necessary to prevent the carbon filament from burning. Platinum may be used in the open air, but it is very treacherous, being very liable to melt. Use two or three inches No. 34 wire 3. Does this lamp (incandescent) require as much power as the arc light of equal brilliancy? A. For the same quantity of light the arc light is far more economical than the incandescent.

(71) J. H. M. asks: What kind of wax and chemicals is it that map engravers use in making cuts of maps? Or do they use chemicals, but take a plaster of Paris transfer after the map is drawn in the wax? A. When the maps are made on copper the following wax can be used: White wax, 2 oz.; black and Burgundy pitch, of each, ½ oz.; melt together; add by degrees powdered asphaltum, 2 oz., and boil till a drop taken out on a plate will break when cold, by being bent double two or three times between the fingers; it must then be poured into warm water and made into small balls for use. Nitric acid of 15° B. is the liquid used for eating the copper. Electrotypes are taken rather than plaster of Paris moulds.

(72) W. E. W. says: I have a 56 in. circular saw that has not been used in over a year (a smaller one used in place, one side of which is very rusty. What will take off the rust and make it bright? I cannot sell it as it is, but could if I can get off the rust? A. If kerosene will not remove the rust, try spirits turpentine and rottenstone. If the rust is deep, it must be ground out with emery. To preserve the concentric polish mount it on an arbor and rotate it, using emery and oil on a pine or other soft wood stick.

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

Mrs. L. D. R.—The specimen is quartz (pure anhydrous silicic acid).—T. F. R.—The sample consists chiefly of pyrites (iron sulphide). It may carry gold. An assay costing $5.00 would be necessary to determine the value of the ore.

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March 18, 1884,

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