ANSWERS TO CORRESPONDENTS

C. S. A. can improve his rancid butter by the process described on p. 368, vol. 26.—J. P. W.'s correction to the problem on p. 11, vol. 30, has been anticipated.—W. W. will find directions for making earthenware and porcelain on p. 3, vol. 30.—C. H. C. will find recipes for yellow and blue lights on p. 58, vol. 30.—For answers to your other queries, consult the booksellers who advertise in our columns.—J. W. C. should address the makers of emery wheels.—S. D. L.'s answer to the ship and cannon problem is correct.—C. P. B. Jr.'s query is incomprehensible.—L. G. G. will find directions for transferring engravings on p. 138, vol. 30.—G. M. H. will find a description of the preparation of platinum sponge on p. 330, vol. 25.

J. W. H. asks: 1. Can a paper pulp be used instead of several layers of paper in making images for the stage? A. Probably it could. 2. How can I make the pulp? A. Old paper may be made into a pulp with a solution of lime and gum or starch, pressed into the form required, coated with linseed oil, and baked at a high temperature.

J. M. says: I have a boiler 42 inch by 20 feet; it is two years old and there are two holes eaten in it by rust, right over the fire; they are eaten from the inside. What can I do to prevent rust doing any more damage? A. If the corrosion be caused by scale, change the feed water, or use some substance that will prevent the formation of scale.

W. L. N. says: I find that all matter that makes scale in a boiler is at one time a floating scum on the water, till, by attracting more particles, it becomes heavy and precipitates to the bottom. I propose to take that scum from the boiler while in the fluid state. Is the idea a good one? A. It is not a fact that the principal incrustations in a boiler are caused by substances that float on the water as a scum.

D. C. asks: I. What will be the approximate velocity of steam at 200 lbs., flowing into another body of steam at a pressure of 100 lbs. through a pipe 3 square inches in area and 3 inches in length? What would it be under the same conditions if discharged into steam of 50 lbs.? Would not the work performed by the steam on entering the respective pressures be about equal? Will Professor Rankine's formulas, given on p. 113 of your volume 29, apply to these cases? A. The rules given in the article referred to are as accurate as any that have been deduced. 2. Would a polished plate with no uneven surfaces encounter much loss of power if revolving rapidly in steam at a high pressure? A. No. 3. How is it that steam will expand to twice its volume and half its pressure when the heat of one volume with a pressure of 2 is not equal to that of 2 volumes with a pressure of 1? A. The law that the volume is inversely as the pressure is only true of a perfect gas whose temperature is maintained constant during the expansion.

A. B. says: 1. It is stated that daguerreotypes may be made by the electrotype process. Can a printed page of a book be made in a similar way? A. Electrotype copies of daguerreotypes can be made. 2. It is said that a sheet of paper folded into two leaves is called a folio, into four leaves a quarto, etc. What is the size of the sheet so folded? A. It differs greatly, being elephant folio, demy folio, etc. 3. Is magneto-electricity the same in kind as the electricity produced by any of the numerous forms of the galvanic battery, such as Grove's or Bunsen's? A. The electricities obtained from magneto-electric machines and batteries have similar heating, lighting, and electrolytic powers, but differ greatly in quantity and intensity.

H. J. B. asks for a recipe for plating small articles of silver without a battery. A. The metallic surface intended to be silvered, having been well cleaned, is rubbed, by means of a smooth cork, with a with a mixture of 1 oz. chloride of silver, 1 oz. common salt, ½ oz. chalk, and 3 oz. carbonate of potash, made with water in to a creamy paste.

R. J. asks: 1. What are the proper proportions of salt and ice to freeze ice cream? A. Twice as much pounded ice as rock salt, but the proportions may be changed somewhat without destroying the efficiency of the mixture. 2. For keeping ice, which is best, dry or wet sawdust? A. Dry saw dust. 3. I have a large amount of charcoal and ashes, being the *debris* from a furnace. Will it be of more value as a fertilizer, or as an underlying bed for an ice house? A. It depends upon circumstances; but ordinary coal ashes and charcoal not being remarkable fertilizers, you might better use in the way indicated.

A. B. C. asks: 1. What is shown by chemical analysis to be the composition of coal? A. The Pennsylvania anthracites consist of 1·34 per cent water, 3·84 per cent hydrocarbons, 87·45 per cent carbon, 7·37 ash. The percentages of these constituents vary greatly, the bituminous coals having more hydrocarbons and volatile combustible matter with less fixed carbon. 2. Is fire or flame a material thing? A. The flame of a candle or gas burner is composed of gaseous matter in a state of ignition. This gaseous matter, generally speaking, consists of various compounds of carbon and hydrogen. By carefully looking at a flame, it will be found to consist of three parts: the lowest of a bluish color, where the hydrogen is uniting with the oxygen of the air. The heat given out by their chemical union is very great, and raises the particles of carbon to white heat. These white hot particles give out the light. Around these is a thin shell of carbonic acid, and the spent gases arising from the combustion.

C. M. F. asks: 1. Has the use of the microscope any injurious effect on the eye? If so, how can I avoid it? A. It has when frequent intervals of rest are not permitted to the eyes, or when the observations are prolonged for several hours at a time. A little practice will enable the observer to keep both eyes open, while looking through the eye piece with one eye, and at the same time see as distinctly as if the other eye were closed with the hand. This, and using the left and right eye alternately, afford great relief. 2. Is there any way of throwing the light upon an opaque object under the microscope, other than the lens? A. By means of a Lieberkuhn, which is a highly polished speculum of silver, and reflects the light down upon the surface of the opaque object. 3. Will the use of the lens injure the eye, and why? Will the use of the mirror by lamp light injure the eye? A. Used properly, with a lamp which does not flicker, in such a way as to get a good illumination without either blinding the eye with its intensity, or taxing it by too long an observation: both the lens and mirror can be used without any injury. 4. If I should replace the three smallest lenses of a microscope by three others of higher powers, would it answer the same as a higher priced instrument, without altering the other parts? A. It would answer the same purpose, provided the other parts would give a corresponding delicacy of adjustment of the focus and of the stage.

C. R. M. asks: 1. Where is carbon black diamond found? A. In Brazil. 2. Could arsenic be substituted for Paris green in the poisoning of potato bugs? A. Arsenic is equally or more poisonous, but experiment would tell whether the bug would as readily eat a white powder as one which is of the same color as the leaf.

C. F. D. asks: Is there anything which will cement broken coral? A. Apply powdered sandarac or mastic with a small brush, heat until it melts, and press the broken pieces together. Or mix boiled linseed oil and red lead; and after applying, let it harden quietly for some weeks.

J. D. W. asks: 1. Is there an easy method of extracting pure hydrogen from house gas? A. Large quantities of pure hydrogen can be easily and simply made from other materials, but from house gas its extraction is difficult. 2. How can I get more pressure on house gas as it comes from the burner? A. The plan usually followed is to receive the gas from the mains in a small gas holder, and connect this with the burners. 3. What causes it to explode? Is it dangerous to handle 15 or 20 gallons at a time? A. Mixture with air. When the air is prevented from mixing with the gas there is no more danger than in handling gun powder or other explosive.

H. J. B. says: I have made an explosive powder composed of 2 ozs. chlorate of potash, 1 oz. prussiate of potash, and 1 oz. white sugar, which has 3 times the force of common gunpowder. Is it dangerous? A. This powder has been known since 1849. It has the following advantages. It can always be obtained of uniform strength and quality, by weighing out the proper quantities of each ingredient. It does not attract moisture and is not acted upon by exposure to the air. The manufacture requires but a short time, the projectile force is far greater, and the powder need not be granulated. Its disadvantages are that it is more readily fired than ordinary gunpowder, therefore more dangerous, that its manufacture is very expensive, and that during its ignition it acts so very strongly upon iron and steel that it can only be used in bronze ordnance, and in the fillings of shells, etc.

B. F. C. says: In your pamphlet containing the United States patent law and other information, you give a recipe for making liquid glue which is as follows: "Dissolve gum shellac 3 parts, and caoutchouc 1 part, in separate vessels, in ether free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solutions." I have tried to make some of this glue, and could not make the rubber dissolve. I had no trouble with the gum. Do you think the fault was in the ether? What kind of rubber is required? Will an old car spring do? A. Use rectified sulphuric ether that has been washed to remove alcohol and acidity, and india rubber that has not been vulcanized. When the caoutchouc has become well softened by the ether, break it up into small pieces and stir well until a homogeneous soft mass is obtained. It will be as well to cut the rubber into small pieces before pouring the ether on them, but the mass must be frequently and well stirred. Pour the solution of shellac into that of the rubber, and incorporate them thoroughly by stirring.

D. E. asks: In your issue of January 10, 1874, a correspondent gives a problem with a diagram. From his statement I infer that the annular space, 4·4 is airtight. This being the case, how is it possible for either piston to fall, even though the balance of the cylinder 5 contains only air and not a denser fluid? A. Under this supposition, it is impossible for motion to take place.

S. asks: Is there a simple and easy method of extracting perfume from flowers, etc.? A. Yes. The fresh flowers are placed between layers of cotton wool, saturated with sweet olive oil; in some cases, pure lard is employed. The essential oil thus obtained is separated from the sweet oil by agitation with strong and highly rectified alcohol. The essential oils of jasmin, sweet violets, hyacinths, etc., are obtained in this manner The perfumed extract is then prepared from the essential oil by dissolving it in very pure alcohol; and in order to blend the mixture and render it mellow, it is kept several months in a bottle before being sold. This also answers A.

M. B. C. says: I have a building of frame, 70 feet long, 33 feet wide, 2 stories high: the second story is used for drying stock. It is lined and ceiled with hemlock floor boards, and heated by steam, with 8 rows of 1 inch pipe extending across one end and 48 feet along each side, making about 1,000 feet of pipe. I desire to have my stock dry faster; can I accomplish this by making an opening in the floor of about 144 square inches, connecting with a wooden chimney at end of building 12 inches square and extending 3 feet above the roof? Would it be practicable to box in about 48 feet in length of the pipe along one side for heating the air as it comes in? And would there be any draft inwards by admitting air from outside, by an opening at one end? Or must I run a tube down to the bottom of next room to secure a draft? Will such an arrangement supply the room with sufficient warm dry air, and also relieve it of the damp air by the first named arrangement in the floor connecting with the wooden chimney? A. There is a popular fallacy in connection with this subject of drying by heated air, that needs correction. It is supposed generally that to dry anything we have only to confine air in a close room and then heat it to a certain temperature, and keep it so for an indefinite length of time. The true theory is as follows, and the best success is assured when our practice accords with it: Air has the greatest capacity for absorbing water when expanded by heat of the sun or otherwise; but when saturated, is incapable of further absorption. When it has the appearance of being the most dry, it is then much charged with water, and is still absorbing water from everything it touches; when it has, on the contrary, the appearance of being very wet and humid, it is not much charged with water and is giving off that which it has. In regard to this case, it is evident that by charging the air in the room with caloric, we prepare it for the absorption of water, and so cause it to have a drying power upon the stock; but when it is fully saturated with the water it has taken up, its drying power is overcome and its action is passive. It, however, we drive this air out of the room and take in fresh air, we can again expand it with heat, and again give it a drying power equal to its capacity for the absorption of water; and thus proceed more rapidly with the operation of drying the stock. Instead, however, of having a continuous current passing through the drying room, it will answer as well to periodically open all the windows for a short time, and let the air be totally changed in the room; then close them, heat up again, and keep them closed for a period sufficient to fully saturate the air with water. This might be determined by the feeling of dryness or humidity which the air presents, not opening the windows until the air appears very damp; and a few trials would soon determine the length of time best to work with one volume of air.

D. C. B. asks: 1. Can you give me recipes for making transparent colors? A. It will be cheaper and more satisfactory for you to buy them. 2. How can I make a good transparent varnish for brasswork? A. With copal and alcohol.

W. D. asks: Where is the deepest artesian well in the world? What is its depth? A. The deepest artesian well of which we have seen an account is at Louisville, Kentucky. Its depth is 2,086 feet.

G. asks: 1. How shall I construct a fire escape, suitable for a lady traveling? A. Try your inventive skill. 2. How shall I draw an oval? A. See p. 299 vol. 29.

T. & H. ask: How can we make a joint in a brass pipe, so that it can be bent in any direction? We have been told of a knuckle joint, but no one knows what it is. A. The joint consists of a ball and socket, the latter being something more than a hemisphere.

G. L. H. asks: How can I construct a rain gage? How can I tell the amount of evaporation? A. The rain gage ordinarily used consists of a cylindrical vessel having a funnel-shaped cover, in which there is a very small hole. A glass tube connected to the bottom of the vessel shows the hight of water. In accurate operations, it is customary to ascertain the evaporation daily, usually in a separate vessel.

J. McJ. asks: Is a house properly rodded for conducting off lightning, where the rod is fastened to the finials of the roof by means of copper wire not insulated? A. It is correct to attach the rod directly to the roof or building without insulators. But no building can be said to be properly rodded or protected against lightning, unless the lower part of the rod or terminal under the ground is made quite extensive. The extremity of the rod should connect with masses of old iron, or iron ore, or coke, or charcoal, laid in trenches, or the rod itself should be elongated and carried off one hundred or more feet from the building, and put in connection with water, if possible. The particular method of attaching the rod to the building, whether with or without insulators, is of far less importance than the terminal arrangements of the rod. The golden rule for safety is: "Provide the largest possible area of conducting surface for the terminal of the rod."

C. W. C. asks: 1. How can I make the best black writing ink? A. What is the best black ink is probably a matter of opinion; but you will find a good recipe on p. 203, vol. 29. 2. How can I make red ink? A. Dissolve pure carmine in caustic ammonia. 3. How can I estimate the horse power of a boiler? A. The term "horse power of a boiler" is so indefinite that we cannot give you any good rule.

G. H. B. asks: Is rolled sheet zinc pure metal? If composition, what are the proportions and ingredients? A. It ordinarily contains small quantities of lead and iron, a little tin and cadmium, and sometimes traces of arsenic, copper, carbon, and sulphur.

J. L. H. asks: 1. How can I readily tin iron rods ½ inch square and from 12 to 18 inches long? A. Cover the rods with muriate of zinc, and put them into a tin bath. 2. What is the process of electroplating, access being had to a telegraph battery? A. You should consult some standard work on the subject, as we have not space for the details in these columns.

M. W. B. asks: What causes the light and dark stripes on a ceiling, the light stripes corresponding with the laths and joists, and the dark stripes with the space between? A. The moisture in the wood.

F. M. S. asks: In the manufacture of gun cotton, is the use of chemically pure acids imperative? A. No. The commercial acids are frequently used. 2. What proportion and strength of acids should be used? A. 105 parts by weight of sulphuric acid at 66° B., to 50 parts of nitric acid at 42° B. 3. Is gun cotton an article of manufacture or commerce to any extent, and has it been put to any practical use? A. It is used for projectiles, in the art of photography, and in surgery. 4. Is there any mechanical arrangement by which the electric current of high tension can be reduced to a more voluminous one of lower tension? A. Yes.

G. A. P. says: I am running a grist mill with two sets of bevel gears, using about 30 horse power. I wish to throw the gears out and use a belt. Will a 20 inch belt be sufficient, if it be driven from a four foot to an eight foot pulley? The belt will run 720 feet per minute, on upright shafts. A. We think the belt will be large enough. We have already given rules by which the proper width of belt can be determined approximately.

D. N. C. R. asks: About what size would a boiler require to be to run an engine 300 revolutions per minute, the size of the cylinder being 5 inches stroke and 3 inches diameter? A. It would probably require from 35 to 40 square feet of efficient heating surface.

J. F. D. asks: How can I make small articles of india rubber? Is there a book on the subject? A. Hancock's "Manufacture of India Rubber" will give you considerable information on the subject; but probably you would best acquire the art by practical experience at a manufactory.

A. S. S. asks: Is this the correct way of finding the actual horse power of a high pressure steam engine? Diameter of cylinder 7 inches, length of stroke $1\frac{3}{4}$ feet, revolutions per minute 80, with steam power on pistonat 60 lbs. per square inch, and allowing $1\frac{1}{2}$ lbs. per square inch for friction: $7\times7=49\times58\frac{1}{2}=2866\frac{1}{2}$. The length of double stroke is $3\frac{1}{2}$ feet $\times80=266\frac{2}{3}\times2866\frac{1}{2}=764400\div42017 = 18\frac{8094}{42017}$ horse power. A. The solution is correct for the assumed *data*.

S. asks: 1. How thick would iron have to be to withstand a pressure of 30 lbs. to the square inch? A. It would depend upon the form of the vessel. 2. I have a small steam engine. Bed plate is 15½ long by 3 inches wide, with a 10 inch wheel. Cylinder is 1½ inches diameter by 3 inches stroke. What would be the horse power, with 30 lbs. of steam to the square inch and running as fast as possible without injury to the engine? A. Multiply the pressure on piston in pounds, by speed of piston in feet per minute, and divide by 33,000. 3. How can I calculate where to drill the hole where the shaft goes through in the eccentric, so as to give the right travel to the slide valve? A. Make the distance, from center of eccentric to center of hole, half the travel of the valve. 4. What is the best way to seat or grind the slide valve so as to make it fit steam tight to the cylinder? A. Use a scraper to face off the valve and seat. 5. What is the best polish for iron castings which are tolerably smooth? A. Fine emery will answer well for the iron.

W. L. P. asks: 1. Who was the engineer of the Suez canal? A. Ferdinand de Lesseps. 2. What is its length, breadth, and depth? A. About 100 miles long, 300 feet wide at the top, 100 to 150 feet wide at the bottom; average depth 24 feet. 3. In what years was it commenced and completed? A. Commenced in 1854, and completed in 1869. 4. What was its cost? A. About ninety million dollars. 5. Does it pay? A. It pays its expenses, but has not yet yielded anything to its original shareholders. See p. 119, vol. 30.

C. W. A. asks: 1. How many grains of chloride of gold will a given number of grains of metallic gold make? A. This is found by first adding together the combining weights of chlorine and gold, and dividing the result by the combining weight of gold alone. Thus Cl=35·5, Au=196, Au Cl=231·15. $\frac{231\cdot5}{196}=$ 1·18+. Therefore one grain of metallic gold will make 1·18+grains of chloride of gold, 2. Are iodide and bromide of potassium soluble in a mixture of equal portions of absolute alcohol and *ether. sulph. com.* to the extent of 6 or 10 grains to the oz. of the mixture? What is the process? A. This is a question which you can determine by experiment. Agitate the powdered bromide or iodide in the mixture of alcohol and ether, carefully applying heat if necessary,

E. R. W. asks: What two substances, elements or compounds (ice and snow excepted) possess the least amount of friction when brought into contact with hard substances? A. It is not possible to answer this question in its present very general form, because it is necessary in the first place to know how the substances are to be brought in contact, and secondly, what the hard substances are, for much depends upon the adaptation of lubricating materials to the circumstances under which they are to be used. The softer greases, as oil, hog's lard, etc., diminish the resistance under small pressures more than under high pressures. The harder greases, as tallow, soft soap, and mixtures of grease and plumbago, produce less effect with small pressures than with large ones.

J. H. S. asks: What do the words sin., cos., and tang., and the sign Σ, in algebra mean? A. Sin. = sine of an arc or angle. Cos. = cosine. Tan. = tangent. Σ = the sign of the summative, and means that terms of a series are to be added together. Thus $\Sigma(x)$ = sum of all the terms of the series of this general form: $x+x'+x''+x'''+$ etc. 2. Would it be profitable to construct a winged steam valve, so as to give the engine power from the valve instead of requiring power from the engine to run it? A. As we understand this question, it would be very profitable, if it could be done.

L. P. C.—For replies concerning the assignments you mention send your address to Munn & Co., and send ten dollars.

S. M. M. asks: Is there an instrument by which any mineral of value in or under the ground may be found? If there is anything of the kind that you know of, please inform me. A. The presence of iron ores below the surface of the ground can in many cases be determined by a magnetic needle; but there is no instrument for indicating other metals.

G. S. D. asks: Is a process by which milk can be preserved for several weeks, the cream separated and churned at convenience into an extra quality of butter free from incipient rancidity, therefore little prone to deterioration, patentable? A. Probably it is.

E. L. asks: How or where are the wires concealed or put out of sight in connecting an electric burglar alarm with the doors and windows of a dwelling house? A. In new houses, the wires are frequently placed behind the plastering. But ordinarily they run along the base boards of the apartments.

F. H. B. asks: What will remove ink and fruit stains from paper, linen, etc., without injuring the fabric? A. For ink, rub the spot with a weak solution of oxalic acid. For fruit stains, make a mixture of ½ lb. chloride of lime and 3 pints water, add 7 ozs. crystallized carbonate of soda dissolved in 1 pint of water. Mix thoroughly, allow to settle, and pour off the clear liquid. This will remove fruit stains from linen.

J. F. asks: What is the correct theory about the formation of ice? Does it form from the bottom of the water or from vapor escaping and congealing on the top? A. It forms at the top, by the production, at the freezing temperature, of innumerable crystals, which interlace one with another until at last there results a solid mass.

W. H. W. M. asks: 1. Can sugar and sirup be made from rags and sawdust by the aid of sulphuric acid? A. Yes. 2. By pouring sirup into the tea, the tea turns a black color; does it denote that the sirup is made from rags, etc.? Would the action of the acid in the sirup operate on the tannin in the tea, and produce the black color? Will not good sirup without acid affect the tea in the same manner? A. It is more likely that there was a trace of iron present, which formed a tannate of iron and caused the inky appearance. Sirup manufactured in a proper manner will not blacken tea. 3. The following is another test: Mix the sirup with a solution of muriate of baryta. If there be any acid in the sirup, its presence would be denoted by a white precipitate. This is reputed to be a sure test. I have tried the tea test myself, and it became of such a black color that I could not see the bottom of the saucer. A. It is true that a solution of muriate of baryta will detect the slightest trace of sulphuric acid, and form with it an insoluble white compound.

C. O. E. asks: 1. How can I silver plate iron? How can I make the best silver solution for iron? A. Wash in weak lye to remove grease. Dip into weak *aqua fortis* to remove rust. Scour with a hard brush and fine sand. Then, having fastened to a wire, dip in strong nitric acid and, as quickly as possible, afterwards in the silver bath. This may be made by dissolving silver in pure *aqua fortis*. Afterwards a solution of cyanide of potassium is added until nothing more is thrown down. The liquid is poured off, fresh water added and poured off several times until the cyanide of silver is well washed from the acid, and then solution of cyanide of potassium is added until it is all dissolved again. A silver plate is used for the other pole of the battery. 2. How can I get different colors of gold by galvanic plating? A. The process is too complicated to be published in these columns. Consult a good book on electroplating. 3. How can I plate iron with nickel? A. Make a bath of ¾ lb. of the double sulphate of nickel and ammonia to a gallon of hot water. Use a Smee battery. The articles to be plated require, according to the power of the battery, from six to ten hours, but the average will be eighhours. After being plated, they are washed with hot water and polished on a cloth buff with crocus, rouge, Vienna lime, or other polishing powder, and oil. Two points must be attended to: 1. To have the solution always kept neutral; 2. to clean the iron perfectly, which may be done with muriatic acid.

A. B. C. asks: How can I make a cheap and efficient induction battery for medical use? A. By wrapping a coil of stout insulated wire around a core of soft iron, and connecting the ends of this wire with a galvanic battery. Around this coil another coil consisting of fine insulated wire is wrapped, and of much greater length. The ends of this wire are the poles to be used. An arrangement like a toothed wheel must be introduced somewhere in the circuit for making and breaking the connection.

D. B. W. says: In the SCIENTIFIC AMERICAN, December 3, 1873, I find a recipe for making a rubber cement by dissolving rubber in benzine, which fails to work; the rubber does not dissolve. Can you tell what the difficulty is? A. Try pure unvulcanized rubber and stir the ingredients well together frequently, with a stick or knife. The benzine must be highly rectified and pure. Sulphide of carbon is also a solvent of rubber.

E. B. asks: Is there a sure and simple test for distinguishing between genuine and artificial butter? A. There are sure tests, but they are too complicated for any one but a practical chemist to apply. For answers to your other questions, consult a stationer.

H. W. J. says: 1. I wish to make a telescope with a four inch lens, 72 inches focus. What must be the size of my eyepiece? What can I see with such a telescope? A. You can apply an eyepiece of one inch focus; but unless the object glass be achromatic you cannot employ the full aperture, nor in any case have a very satisfactory field of view. 2. How can I polish articles that I have silver plated, and how many Calland cells will be necessary? A. You can polish silver with fine chalk, applied with chamois leather or a soft wool en rag. For plating a few small objects, one or two cells are sufficient.

P. H. M. asks: Is the cause of the existence of the Gulf stream known? If so, what is it? A. It is caused by the heating of the waters of the Atlantic ocean under the equator, which makes them lighter, and causes them to flow over the top of the water lying to the northward, this water flowing in below towards the equator.

F. C. B. asks: Is there any process to restore blackberry wine or any other liquid that has become musty by putting it in a musty barrel? A. Mustiness in wine, it is said, may frequently be removed by violently agitating the wine for some time with a little coarsely powdered charcoal, freshly burnt, or even some slices of bread toasted black. A little bruised mustard seed is occasionally used for the same purpose.

E. S. M. says: I am about to construct a reflecting telescope, the mirror being formed by silver chemically deposited upon glass. Can you give me some recipe for a solution to deposit the silver in a proper form? A. There are various methods of depositing silver upon glass. Here is one which you may make available by practice: A solution of gun cotton in caustic potash is added to a solution of nitrate of silver, followed by sufficient strong liquor of ammonia to redissolve the precipitate. The resulting argentiferous liquid is applied to the glass which is then slowly heated over a water bath until effervescence ensues and the deposit of silver is complete. Let a chemist prepare the solution of gun cotton, which requires care in hand ling.

G. E. R. asks: What substances are used with extract of logwood to make a cheap red color? A. In a decoction of three pounds sumac, the goods are steeped over night, and then spirited at 2° Twaddle; wash and work through a decoction of three pounds Lima wood and one pound logwood for thirty minutes, then raise with a gill of red spirits; work for fifteen minutes more; wash out and finish.

S. asks: What colored light is best for persons to read by, and how can I impart that color to lamp chimneys? A. Blue. It can be painted over with a thin coat of Prussian blue.

H. R. R. asks: 1. How can a handsome purple color be made for druggists' show bottles? A. Make a solution of permanganate of potash in distilled water. 2. Can I make two different colors in the same bottle, that is, two colors that will not mix, as, for instance, red and green? A. Aqueous solutions alone will not answer. Dissolve some sulphate of nickel for the green, and upon this pour some oil colored with cochineal.

F. P. C. asks: Is there any satisfactory way of testing adulteration of linseed oil with cotton seed oil? If so, what? A. We are not aware of any reliable experiments on this point. Consult some good practical chemist.

W. says: I have bought 100 square inches of water, to be taken from the raceway under a 2 feet head. When the water is used, the surface in the pond and raceway lowers about 4 inches. If I draw my water through a 10 inch square hole, how deep must I put my flume, so that I can get my 100 inches of water and no more? A. See article on "Friction of Water in Pipes," p. 48, vol. 29.

V. T. asks: How can I make a fuse that will burn at the rate of about 200 feet per minute, and that will take fire at a temperature of about 150° or 200° Fah.? A. Consult the specifications of the recently patented fire alarms.

J. B. asks: How is a person affected by laughing gas? Is it injurious? How is it administered? A. Taken in moderate quantities, it exercises a strong influence upon the muscles which are brought into play when there is laughter: but in larger doses, of five gallons and upwards, it produces unconsciousness and insensibility to pain. When manufactured from pure nitrate of ammonia, and washed by passage through water, solution of green vitriol, and solution of potash, it may be taken without danger by persons in good health, if administered in a proper manner. It is breathed through a stopcock which admits the gas from the bag to the lungs, but sends the gas issuing from the lungs out into the atmosphere.

N. S. asks: 1, How can I seal the ends of small glass tubes? A. Use a blowpipe. 2. What is the process of silver plating? A. See pp. 299, 315,, vol. 29.

E. C. M. asks: 1. Are the Cornwall (England) tin mines the only ones in the world? A. No. 2. Is it true that one has been discovered in California? A. Yes. For answers to your other questions see books on metallurgy, frequently advertised in our columns.

W. R. asks: 1. How many figures denote a billion, and how many a trillion? A. A billion is 1,000,000,000,000. A trillion is 1,000,000,000,000,000,000. 2. Has the earth two revolutions, one on its axis, the other round the sun? A. The earth rotates on its axis, and revolves round the sun. 3. Is the sun the center of the solar system? A. Yes. 4. Are the stars inhabited? A. Nobody knows. The approximate constitution and condition of many of the stars has been determined by the spectroscope, and the results show that none that have yet been examined present the conditions necessary to support human life. For example, our moon is found to be without water or air and intensely cold. Saturn and Jupiter are red hot. It is thought some of the moons of this planet may possibly be inhabited.

F. H. S. says: 1. I want to cast a small steam engine of brass: what is the composition that the founderies use to put in their flasks? Can I melt brass in a common stove? A. A good composition is 7 lbs. copper, 3 lbs. zinc, 2 lbs. tin. Probably you will find a forge better for the purpose. 2. How much power would an engine cylinder 1½x4 inches, with 10 lbs. of steam have, and also with 30 lbs.? A. See article on "Indicating Steam Engines," page 64, vol. 30. 3. Would a crank do instead of an eccentric for the slide valve? A. Yes. 4. Can you recommend me a good book on molding brass, and one on the steam engine? A. Byrne's "Practical Metal Worker's Assistant," and Bourne's "Catechism of Steam the Engine." 5. How thick should a small boiler (about 2 feet x 1 foot) be to withstand a pressure of 10 lbs. and also one of 30 lbs.? How thick would brass have to be? A. Sufficient *data* not sent. 6. How does a steam gage tell the pressure in a boiler? Must the pipe leading to the gage be one inch? A. The gage is so graduated that a pressure of 1 lb. per square inch gives a corresponding indication. The size of the connecting pipe makes no difference.

G. N. K. says: We wish to heat a factory (30x80 feet and four stories high) with exhaust steam and are advised to put in 4 inch tin pipes, one tier in each room, painting those where the most heat is wanted some light color, and where less heat is wanted, a dark color. Will this answer as well as iron pipes? Why will the tin pipe radiate heat when painted? A. A tin or iron surface covered with lampblack radiates more heat than the plain metal. When coated with white lead, it radiates about the same amount of heat. Tin is a fair conductor of heat, having about one third of the conducting power of gold.

C. V. asks: If an engine crank pin suddenly breaks, thereby destroying the connection between piston and crankshaft, what will follow? A. The piston would strike against the cylinder head; and if the latter be not strong enough to resist the blow, it would be broken.

A. O. B. says: In answer to a correspondent, you say that "eyestones are not alive." I think so too, but would like to know why they move about when placed in strong vinegar. A. We suppose it is on account of the generation of carbonic acid. For answers to your other questions, see "Friction of Water in Pipes," p. 48, vol. 29.

E. says: I have a double acting engine of one nominal horse power, speed 300 revolutions per minute. What would be the proper width of belt to connect engine to line shaft? A. Probably about an inch.

W. H. G. asks: Why is it that oxygen and hydrogen, when mixed in certain proportions and ignited, explode? The product is water, but does not an expansion take place? A. When these gases unite, the volume of the combination is much less than the original volume of the gases; so that a vacuum is produced, into which air rushes with great rapidity.

P. O. T. asks: Will a leaden ball, if thrown into the sea, sink to the bottom? If not, why not? A. Yes. 2. What is the depth of the deepest sea soundings? A. About 30,000 feet.

H. T. L. asks: Is there any chemical compound that will unite with or dissolve the albumen on albumenized paper? A. If the albumen is that of the white of eggs, it may be dissolved in alcohol containing a little alkali in solution,

"Erfinder," St. Louis, Mo.—Please send your name and address.

P. W. L. says, in reply to the query: "Can the four roots of the following equations be obtained: $x^2+y=7$, and $y^2+x=11$?" Certainly they can, and are as follows: $x=2$ and $y=3$, or $x=3{\cdot}131812+$, and $y=-2{\cdot}805118+$

H. D. M. says, in answer to N. F. T., p. 123, vol. 30: It is the soot on the bottom of the kettle that prevents it from burning the hand. It will prevent it only for a short time, probably until N. L. T. thinks it quits boiling. A bright bottomed kettle will burn the instant it touches the hand.

E. says, in reply to M. who asked for a good metal for models: Melt 6 lbs. tea lead, ½ lb. tin, and ¾ lb. antimony. This will be a good stiff metal.

E. S. says, in further explanation of the board question, propounded by D. M. A. (see p. 91, vol. 30): Let W and w equal the two widths. Then will $\left(\frac{W^2+w^2}{2}\right)^{\frac{1}{2}}$ = the width of the board at the dividing point. Application to your question: $\left(\frac{12^2+4^2}{2}\right)^{\frac{1}{2}}=(80)^{\frac{1}{2}}=8{\cdot}9442+$. This formula is simple, and applies to all cases.

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

J. A. S.—Rounded fragments of quartz, the one of a yellow color being ferruginous quartz.

J. C.—This product appears to be a fair specimen of lard. To determine whether it is adulterated or not will require a chemical analysis. Lard oil is a commercial product and burns well in lamps if the wick tube be kept cool. It is chiefly obtained as a secondary product in the manufacture of stearin.

S. B.—The shining particles are mica and are mixed with rounded fragments of quartz.

M. McK.—It is white sand of superior quality, and is useful for making glass.

COMMUNICATIONS RECEIVED.

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

On Healing Wounds by Charcoal, etc. By P.

On American Inventions in Europe. By H. S.

On Pavements. By S. S.

On Detecting Gold and Silver in the Earth. By G.

On the Curvature of the Earth. By G.E.W.

On the Thousand Feet Tower. By E. C. M.

On American Silk Manufacture. By H.C.F.

Correspondents in different parts of the country ask: Where are cotton seed linters sold? Where can the seed and cuttings of sumac be obtained? Who sells machines for making broom handles? Who makes the best clothes wringer? Who makes waterproof gloves, for use in handling strong lyes, etc.? Who makes a cider press that will get four gallons of cider from a bushel of apples? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

February 10, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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