ANSWERS TO CORRESPONDENTS

S. C. C. will find a description of Mure and Clamond's thermo-electric battery on p. 24, vol. 29.—C. R. H. can temper steel plow molds by the process for case hardening described on p. 362, vol. 25.—S. C. C. can brown gun barrels by following the directions on pp. 154, 266, vol. 26.—T. T. C. and others write to point out that the explanation of the compound lever on p. 11, vol. 30, should be "36×17·5×20, weight balanced at A," and not "36×13×20," etc.—N. K. L. will find recipes for brass lacquer and dip on pp. 219, 282, vol. 29. Booksellers' addresses appear in our advertising columns.—A. W. can arrange his lenses in a wooden telescope, according to the description on p. 7, vol. 30.—H. E. S. will find directions for making pasteon p. 280, vol. 28.—A. G. S. will find directions for making cider vinegar in our answer to J. F. A. on p. 58, vol. 30, the process described in which will serve as well with cider as with malt.

H. C. asks: How large should a cylinder be for a circular wrought iron boiler 18 inches in length, 14 inches in hight, with 5 two inch flues, capable of standing 75 lbs. pressure to the square inch? A. Diameter one inch, stroke three.

J. G. asks: What is the percentage of fuel saved by feeding water into a boiler at 200° when before it was fed in at 125°? A. You do not send enough data to enable us to answer this question. We can give you the general method of finding the gain by increasing the heat of the feed water, and you can apply it to your case. Let H = total heat of the steam. F = one temperature of feed. f = a higher temperature of feed. Then $\frac{f-F}{H} \times 100$ = per cent of gain by increasing the temperature of the feed water. EXAMPLE: Suppose, in the case mentioned by you, that the steam has a pressure of 60 lbs. by gage. H = 1207·8 per cent of gain = $\frac{200-125}{1207{\cdot}8} \times 100 = 6{\cdot}2+$

N. G. asks: Can I transmit the power to a grist mill by friction bevel wheels, one on the horizontal shaft which runs at 225 revolutions per minute, the other on a perpendicular shaft whence a belt leads to the spindle? What would be the dimensions of the wheels, and of what should I make them? A. You do not state how much power you desire to transmit. We think, however, that you would experience trouble in the use of wooden wheels.

J. H. O. says: One of your correspondents states that the heated hydrocarbon vapors are liable to spontaneous explosions when mixed with atmospheric air. May not such explosions occur in ordinary temperatures in the use of any of the light hydrocarbon oils? A. From the great volatility of some of the hydrocarbon compounds, we are inclined to think that what seemed like spontaneous explosion was really caused by some hydrocarbon vapor coming in contact with flame at some distant point. In this respect impure or imperfectly refined kerosene is sometimes more dangerous than gunpowder, the volatile inflammable vapors even at a great distance taking fire in contact with flames, and leading like a train to inflammable fluid. We think, however, that there is a field here for careful experiment to determine the precise conditions under which these volatile compounds inflame or explode.

H. A. W. says: "I read that, to make imitation sapphires, I should take one ounce of paste and mix with two grains of precipitated oxide of cobalt. What does the paste alluded to consist of? What is oxide of cobalt?" A. The paste you mean is a very fusible, highly transparent, dense glass, also called strass, frit, etc., and is the base of all artificial gems. There are various recipes for making paste: the following is an imitation of the diamond: Rock crystal, 1,600 grains, borax 560 grains, carbonate of lead, 3,200 grains, oxide of manganese ½ to 1 grain. Powder each separately, mix together, fuse in a clean crucible, pour into water, separate any reduced lead, and again powder and remelt. Precipitated oxide of cobalt is prepared by adding a solution of carbonate of soda to a solution of sulphate of cobalt, washing, drying, and igniting the powder which falls. This is what gives the transparent paste the blue color, characteristic of the oriental sapphire.

N. A. T. asks: 1. What is the best compound for making artificial ice, and how must it be applied? A. A very convenient freezing mixture without ice may be made by rapidly dissolving 1 part nitrate of ammonia in 1 part of water. This is said to cause a reduction of temperature of 46° Fah., or from 60° to 14° above zero. 2. What is the average cost per hundred lbs. of ice frozen by artificial process? A. Ice in New Orleans manufactured by artificial means is said to be produced for $3 per ton; but with improved machinery the time is probably coming when it will be made in our great cities for $1 per ton. 3. Where can I get the best advice on pisciculture? A. See the *Science Record* for 1874.

A. H. W. asks: 1. What sized wire (insulated) and how much should be used for a helix made of iron one inch by two feet, and bent in the common U shape? Should the iron be painted? A. 1. It is not necessary to paint the iron. The force of an electro-magnet varies in proportion to the number of convolutions of the wire, the quantity of electricity in circulation, and the square root of the diameter of the soft iron. 2. Why does water feel so cold, after having peppermint in your mouth? A. It may be because the nerves are rendered more sensitive.

G. S. R. asks: What is the stowage capacity in cubic feet of a tun of Franklin coal, also of Lehigh coal? A. We gave average values for the space in feet occupied by a tun of coal on p. 60, 135, vol. 29, and stated then that there was so much difference of weight in the various qualities that it was impossible to give definite figures without more data.

W. S. M. asks: 1. How shall I proceed to fill the boxes for a foot lathe spindle with Babbitt metal? Should the spindle be wrapped with a thickness of paper before the metal is poured in? A. It will be better to use a piece of paper. 2. Please give directions for making a hard, heavy, black paint for the unfinished cast iron parts. A. There is a black varnish made from petroleum that answers very well. 3. How much should the back gears diminish the speed so as to turn wrought iron 3 inches in diameter? A. You should arrange the gears to give the iron a surface velocity of about 30 feet a minute. In regard to your other questions, they are rather indefinite, as the dimensions you ask for are dependent upon many circumstances. It would be well for you to inspect some good lathes, and take measurements.

A. R. G. asks: 1. Should I gain any power in a small turbine water wheel by continuing two of the buckets spirally up the shaft to the top of the penstock, or would the wheel run too fast for the water at the top of penstock? Would a close fitting or a wide penstock be best if the wheel is used under heads from 16 feet upwards? If this is an improvement, would it be patentable? A. These matters could best be determined by experiment. An examination of previous patents (see prospectus in our advertising pages) would be necessary to enable us to answer your last question.

R. C. M. asks: Could a steel saw be used with economy in sawing stone, using adjustable teeth? "I have been experimenting with black carbons, but find it is impossible to make them stay in their places." A. We believe the diamond tooth saw is found to be more economical.

S. A. C. says: We have a 30 horse engine, with a cut-off, and we find that the cylinder has worn more at each end than at the center. We have been told that this is a common occurrence with cut-off engines; is it so? As we have a good deal of trouble with the cut-off, we thought of doing away with it, and using a governor to regulate at throttle. Will this cause the cylinder to wear in the center so as eventually to make it more uniform? A. We think the best way to remedy the trouble will be to re-bore the cylinder.

H. R. says: We are engaged in a manufacture requiring iron of great tensile strength. What kinds would you recommend? A. Pure gray cast iron, and Ulster wrought iron.

P. J. D. asks: 1. How do you calculate the thickness of a horizontal stationary engine frame? A. It is treated as a beam. 2. In your answer to J. O. R. about the length of lever for a roll valve, what does the decimal 0·672 represent, and how do you get it? A. There is a slight mistake in this example, which occurred through an oversight. Referring to the figure, the chord R C is equal to twice A B, multiplied by the sine of half the angle B A C. B A C = 97° 31′. A B = 3 inches. Hence, B C = 2×3×sine 47° 45′ = 6×0·74 = 4·44 inches and lever A E = 3×11÷4·44 = 7·66 inches, nearly.

A. C. F. asks: What is tinsel? How could I make the red kind? A. Tinsel is thin metallic foil coated or plated with silver or gold. The red kind of which you speak is probably copper. You could not make it without expensive machinery and skill. The makers and dealers in fancy boxes could probably supply you.

R. A. McL. asks: 1. What pressure of steam will a tin boiler of the following dimensions stand: Hight one foot, diameter of top and bottom respectively four and eight inches? A. Treat it as a cylindrical boiler having the diameter of the largest part. 2. Has a rotary steam engine ever been constructed on the principle of the turbine water wheel? If so, did it work? 2. Such engines have been made and have worked, how economically we are not able to state.

M. H. P. asks: Is coal tar good to put on an old tin roof to keep it from rusting? How shall I apply it? A. Coal tar is often used for roofing purposes. For particulars as to its preparation, correspond with some manufacturer of roofing materials.

C. asks: 1. Can you give me a description of the circular slide valves for steam engines? A. There are several patent valves of this description in the market, and, by addressing their manufacturers, you can obtain the necessary information. 2. Why is it that they have not succeeded in navigating submarine boats with men in them? Is it because there is no motor suitable to propel them, or because they roll over and become unmanageable, and are likely to turn upside down? A. We believe this has been accomplished on several occasions.

Z. E. H. asks: 1. What is the simplest way of drawing a meridian line? A. We gave a method on page 409, vol. 29, which is quite simple and tolerably accurate. 2. How is mean time calculated? A. Mean time is calculated by supposing that an imaginary sun, called the mean sun, moves uniformly with the mean velocity of the true sun. 3. What is meant by "sun fast" and "sun slow" and "true midday?" A. The difference of time, as given by the true and mean suns, shows a correction of "sun fast" or "sun slow." True midday is the time of the passage of the sun over the meridian. 4. What is equinoctial time? A. Equinoctial time is reckoned from the moment when the point of *Aries* passes the vernal equinox. 5. What is the simplest method of finding the variation or error of a watch or clock? A. By observing the meridian transit of the sun. 6. Have we a national standard of time? A. The calculations in the *Nautical Almanac* are generally made for Washington time.

J. C. S. asks: When the strain is between the head of a bolt and the nuts, which of the nuts bears the strain, the first or the jam nut? A. A great deal depends upon the adjustment. With the threads accurately cut, the strain might be equally divided. 2. I have a little girl who often amuses herself by looking in my eyes. We sit facing a lighted lamp. She places her right eye as close as possible to my left, and we turn our eyes toward each other. They are then partially shaded, and we see all the interior fluid and optic nerves. Do I see her eyes or the reflection of my own? A. We suppose you see into her eyes.

A. R. P. asks: How far is it possible for the naked eye to see any object at sea, above the curvature of the earth? How far is it possible for the naked eye to see on land within a radius of 200 miles of Pittsburgh, at an elevation of 1,000 feet. A. In general it may be stated that a white object illuminated by the light of the sun can be seen at a distance of 17,250 times its own diameter. A red object, under the same circumstances, would be seen only half as far, and a blue object a still less distance. An object can be seen in ordinary daylight only about half as far as it could be if directly illuminated by the rays of the sun. These figures will of course vary somewhat with different eyes.

W. H. G. asks: 1. How does the duplex telegraph work? A. Consult some good work on the electric telegraph for particulars. 2. Must I wind the wire around the core of an electromagnet in one direction? A. The wire must be wound in one direction.

R. H. G. asks: 1. Is there any method of keeping powdered alum and bicarbonate of soda together, without destroying the properties of either? A. You can mix dry powdered alum and dry bicarbonate of soda together without any fear of decomposition taking place. 2. How can alum be dried, as in its commercial condition it contains about 50 per cent water? A. By exposing ordinary alum to heat, as by throwing a piece upon a hot iron plate, it melts, loses its water of crystallization, and becomes reduced to what is termed burnt alum. At a white heat, alum decomposes.

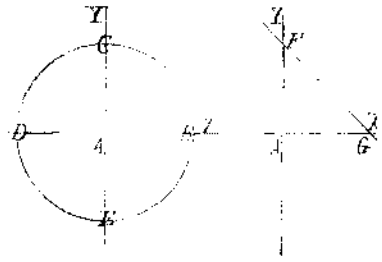
G. B. asks: Which is the most injurious to drink, Japan tea or Java coffee? What effect has te upon the nervous system when drank at night just before retiring? Does coffee of moderate strength produce thickness of the blood and cause dizziness and headache? A. Very strong coffee and tea are considered injurious when drank to excess, and the effect of either when taken by a person not accustomed to their use before retiring is to stimulate the nervous system and cause sleeplessness. They may cause dizziness and headache in some constitutions, but we have doubts about their thickening the blood.

G. W. C. says: I wish to make a sand paper with considerable grit. What can I use better than sand or emery? I want something that will last, to rub down a hard substance. A. Perhaps an emery wheel will answer your purpose.

O. M. C. asks: What is the process of making potato flour? A. The tubers, after being washed and peeled, are rasped by a revolving grater, and the pulp washed on a hair sieve to free it from feculous matter. When a sufficient quantity has passed through the sieves, the starch particles are allowed to subside, and the water is drawn out. Fresh water is let in, and the whole stirred up and again allowed to subside; this process is repeated till the starch is pure. It can be dried in perforated boxes, or placed on porous bricks to absorb the moisture, or dried by heat or the air.

J. S. H. asks: Where was the first locomotive built and run in the United States? A. Mr. Cady Staley mentions, as the first locomotive in the United States, one constructed by Oliver Evans, in Philadelphia in 1801.

W. L. C. says: The teacher of our geometry class asserts that "an infinite circle is coincident with an infinite straight line." He argues that, as long as a line is in the least curved, if produced, it will form a circle; and that the curve may be made less, and therefore the circle is not infinite, and from this conclusion argues that an infinite circle is a straight line. I hold that if it is possible to come to this, the circle ceases, and the line is neither an infinite or any other kind of a circle. 1. According to his definition, is an infinite circle possible? 2. If so, which is right? A. The circle is



a line of the second order, and the straight line is of the first order; hence they can never coincide. This may be shown from their equations: $x^2+y^2=r^2$ is the equation of a circle, B C D E, referred to rectangular axes with origin at the center. $y=ax+b$ is the equation of a straight line, F G, referred to rectangular axes. Make $r=\infty$, then $x^2+y^2=\infty$. Make $x=0$, then $y=\pm\infty$. Make $y=0$, then $x\pm\infty$. This shows that the circle cuts the axis of Y in two points, on different sides of the origin, and at an infinite distance from it; also the axis of X, in two similar points. Now, in the equation of the straight line, make $b=\infty$, then $y=ax+\infty$. Make $x=0$, then $y=\infty$. Make $y=0$, then $x=-\infty$. Hence the straight line cuts the axis Y in one point, and the axis of X in one point, at an infinite distance from the origin.

J. C. K. says: A press with movable type suitable for desk use, not larger than an ordinary seal press, would meet with a ready sale. A. Such presses are commonly sold in our large cities.

A. W. C. asks: 1. How can I tan bear skins with the hair on, so that the hair will not fall out? A. Pulverize and mix one part alum and two saltpeter; sprinkle on the flesh of the skins, and lay two flesh sides together; fold up tight and hang in a dry place. Rub over the edge of a board to make them supple. 2. How can I paste labels on tin or iron, so that they will not fall off? A. Add 1 tablespoonful of brown sugar to every quart of flour paste, and mix thoroughly.

D. R. S. asks: How can I ventilate show windows, so as to prevent sweating and freezing in cold weather? A. Make some small holes at the bottom and top, so that the exterior air will circulate through your show window.

M. W. J. asks: I. Is there any machine for breaking stone for railroad beds, macadamized roads, etc.? A. Yes. 2. Can I raise fish, such as bass, trout etc., in a large artificial pool, by running a small stream of spring water through it? A. Yes.

H. N. asks: 1. If any one invents an article which is partly made of rubber, has he to pay a royalty to a rubber company? A. There are several patents in force which protect the use of certain processes of treating rubber. 2. Can anything be done with old scraps of tin? A. The tin may be melted off the iron by heat, or dissolved in hydrochloric acid, making muriate of tin. 3. Is broken window glass valuable? A. Glass makers buy it to melt up.

L. M. C. asks: What is the weight of an ordinary passenger engine of 4 feet 8½ inches gage? A. From 25 to 40 tuns. How long a circuit will the Tom Thumb telegraph operate? A. 15 or more miles.

W. T. R. asks: Will the Tom Thumb battery answer for silver plating on a small scale? A. Yes

M. M. asks: If I hang a rope over a loose pulley and put my feet in a loop in one end and take the other in my hands to elevate myself, what proportion of my weight do I pull down with my hands? My friend says I have no advantage over a single rope. I say I gain nearly half. Which is right? A. We think that your friend is right.

E. M. C. asks: 1. Can you inform me of any process by which steel springs exposed to the action of sea water may be prevented from rusting, which will not impair the temper as galvanizing does? In response to a similar enquiry some time since you advised plating with nickel. But nickel plating does not protect iron or steel when exposed to sea water or sea air. Articles so plated seem to have even an increased tendency to rust, owing possibly to a slow galvanic action. A. Sea water is a compound that few metals (and those are rare and expensive) can successfully resist for a great length of time. Zinc and iron are rapidly corroded. This is probably owing to the affinity which chlorine possesses for the metallic elements. Gold and platinum, the most unalterable of metals, are rapidly dissolved in nitro-muriatic acid, where the attacking element is nascent chlorine. We would suggest some strong transparent varnish for the steel. 2. I have been told by a plater that the passage of a current of electricity or galvanism through tempered steel (as in electro-plating) destroys the temper. Is this correct, or an error? A. We are not aware of any reliable experiments on this point. 3. Can you give a reliable recipe for marine glue? A. In making marine glue, the india rubber and naphtha should be heated and agitated in a covered vessel until solution is complete, and then the powdered shellac added, and heat and stirring continued until liquefaction has taken place.

A. H. D. asks: 1. What is the process of japanning on iron to get a finish like that on sewing machines? Is the varnish baked on or not? A. Japanning consists merely in covering the surface of the metal with a black varnish. The principal ingredients of this varnish are amber and asphaltum dissolved in oil. Oil of turpentine is afterwards added to promote drying.

Is bronze or gold leaf used most in ornamenting? A. We should say bronze leaf, from its cheapness. 3. Is there any book that gives explicit directions for the same? A. Ure's "Dictionary" will give you some information.

W. B. says: "If a galvanic battery consists of a number of cells, each cell containing a lead and a zinc plate, with a solution of sulphate of copper, will any electricity be generated if I join all the lead plates together and the zinc, or will I have to join a lead to a zinc and so on through all the cells before any electricity will be generated? A. By joining all the lead plates together, and all the copper, we obtain a quantity current, and by joining the lead of one cell to the copper of the next, and so on, an intensity current is produced.

E. V. asks: Is there any trustworthy means of making benzine or benzoline non-explosive? A. The dangerous nature of benzine and similar hydrocarbons is due to their volatility, and the fact that their vapors form with the oxygen of the air a mixture which explodes on the application of flame. We can only prevent this by enclosing these compounds in airtight vessels, or by combining them to such an extent with non-volatile substances of which they are natural solvents that their vapors have but feeble tension. We know of no chemical means to preserve the chemical constitution of pure benzine intact, and yet deprive it of one of its most characteristic properties.

J. L. A. asks: 1. How is adhesive court plaster made? A. Dissolve 1 part of isinglass in 10 parts of water: strain and add gradually 2 parts tincture of benzoin. Apply the mixture, gently warmed, to the surface of thin silk, black or white, by means of a camel's hair brush. Give as many coats as necessary, allowing each to become dry before applying the next, and lastly give the prepared surface one coat of the tincture of benzoin alone. The silk should be stretched on a frame. 2. How can I dissolve copper, nickel, brass, and other metals easily, so as to mold them? A. You can melt the metals named by exposing them to a strong heat, in crucibles made of a mixture of plumbago and clay. They can then be cast in molds.

J. B. H. asks: How can I remove black ink stains from a white plaster wall? A. Rub the spot with a cloth dipped in a weak solution of oxalic acid, until the stain is removed, and then with a damp cloth. Afterwards rub dry with a dry cloth.

D. M. asks: What metals expand on cooling? A. An alloy that expands on cooling may be made by melting together 2 parts antimony, 9 parts lead, 1 part bismuth.

C. D. M. asks: What gums or equivalents are insoluble in coal oil? A. The ordinary vegetable gums, properly so called, of which gum arabic is the type, are insoluble in alcohol, ether, and oils. Their action with coal oil might properly be made the subject of experiment.

V. R. C. asks; What quantities each of acetate of lime, sulphuric acid, and water are necessary to make acetone, such as is sometimes used for corroding lead? A. You have reference, we suppose, to the production primarily of acetic acid, from which acetone is formed. An ordinary acetic acid may be made without distillation by pouring 60 parts sulphuric acid, diluted with 5 parts water, on well dried acetic lime, 100 parts. Digest well in a close vessel, with a gentle heat, stirring occasionally: and afterwards pour off the clear liquid. Acetone is formed by passing the vapor of acetic acid through an iron tube heated to dull redness, and condensing.

J. O. T. asks: 1. How can I remove common india ink from mechanical drawings without injuring the paper? A. India ink must be removed by the edge of a sharp eraser or penknife, and the part carefully rubbed over with any hard smooth substance. Fine sand paper is also useful for this purpose. For small errors, it is perhaps best to paint them out with thick Chinese or lake white. 2. How can the drawings be cleaned, without injury to either paper or ink? A. A good quality of fine vulcanized rubber should clean your paper without leaving dirt. Try stale bread. 3. Can the four roots of the following equations be obtained? If so, how? $\left.\begin{matrix} x^2+y=7 \\ y^2+x=11 \end{matrix}\right\}$ A. These equations involve the higher mathematics, and we could not publish the solution in these columns. A glance will show that $x=2$ and $y=3$. 4. How can I best secure a place as assistant to some civil engineer? A. Under the circumstances, we can offer little practical advice. There is always a fair demand for skilled and experienced engineers, but in order to start in this, as well, indeed, as in any other profession, the influence and aid of friends is of incalculable advantage. You might make it a point to call upon the superintendents of railroads in your vicinity and prefer your request in person for a place, or perhaps endeavor gain room in the office of some well known engineer, where you could learn much of the profession, and besides form acquaintances which would lead to a more lucrative position.

F. M. D. asks: Is there any invention, patented or otherwise, for the purpose of aiding pedestrinism, such as a spring attached to the foot? A. Devices to assist the feet in walking have been made.

L. E. G. asks: 1. What is the idea of amalgamating the zinc of a galvanic battery? Can I use common sheet zinc? A. The object of amalgamating the zinc is to prevent the action of the acid upon it except when the electric current is passing. You can use common sheet zinc, but it will soon wear out. 2. How can I make porous cups? A. The porous cups are made of unglazed earthenware. A potter will probably bake them for you, of any shape desired. 3. Does the acid of the porous cup flow into the fluid of the zinc, or does it evaporate? A. In Grove's battery the nitric acid in the porous cup is gradually decomposed. It merely comes in contact through the porous cup with the fluid in the zinc cell, and this is necessary to allow the passage of the electric current. 4. How is Smee's voltaic battery constructed? A. Smee's battery consists of a strip of silver or platinum suspended between two plates of zinc, and the whole immersed in dilute sulphuric acid.

G. B. G. asks: What is the composition and mode of preparation of the enamel, black and white, used on clock and watch faces, and are the letters and figures printed on or put in with a pen by hand? A. Black enamel: Peroxide of manganese 3 parts, zaffre 1 part. Mix, and add as required to white enamel, which is: Washed diaphoretic antimony 1 part, fine glass, free from lead, 3 parts. Mix, melt, pour into water, powder, melt again; and repeat this three or four times. Figures are put on white enamel as on china, while in the "biscuit" state, before vitrification.

A. & B. ask: If there were a hole through the earth, and a ball were dropped in the hole, would the ball everstop, or would it pass through and through as a pendulum swings? B. says that the ball would stop as a pendulum does when it has no power to move it, that is, shorten its stroke every time it swings until it stops. A. We think B. is right.

F. L. K. asks: How can I find the weight of a solid ball 15 inches in diameter? A. Multiply the cube of the diameter of the ball in inches by 0·5236, and by the weight of a cubic inch of the material of which the ball is composed.

F. P. H. asks: Why does a star, seen with the naked eye, look irregular? When viewed through a telescope, it appears round. A. The twinkling of stars is due both to the varying density of the atmosphere and to the defects in the eye. Stars do not appear round through the telescope except when the latter is out of focus, and then the cause is obvious.

J. C. asks: How can I exterminate red roaches? A. Take flowers of sulphur ½ lb., potash 4 ozs. Melt in an earthen pan over the fire; pulverize and make a strong solution in water, and sprinkle the places which they frequent.

J. A. asks: How can I bronze small iron castings? A. Take 1 pint methylated finish, 4 ozs. gum shellac, ½ oz. gum benzoin; put in a bottle in a warm place, and shake occasionally. When the gum is dissolved, let it stand in a cool place two or three days to settle; then pour off the clear into another bottle, cork it well, and keep it for the finest work. The sediment left in the first bottle is to be thinned with spirit to make it workable for first coats or coarse work. It must be strained through a cloth. Then take ½ lb. finely ground bronze green, varying the shade as required by adding lampblack or red or yellow ocher. Let the iron be clean and smooth: take as much varnish and bronze powder as required, and lay on, with a brush, in a thin coat, having slightly warmed the articles to be bronzed. When dry, add another coat if necessary, and touch up where required with a little of the bronze on a pencil. Just before it is dry, gold powder may be put on. Varnish over all finally.

J. A. asks: How can I separate albumen from blood? A. By receiving the blood in moderately deep vessels and allowing it to coagulate, much of the serum or albumen will separate and rise to the top, whence it may be skimmed off.

R. M. W. asks: What does "Patented, S. G. D. G." mean? The paper on which I saw it came from Europe, and I think the article patented is a French or Belgian invention. A. The French authorities require these letters to be marked on patented articles. They stand for "*Sans Garantie du Gouvernement*," "without guarantee of the government." 2. Is there any patent on the rubber handstamp? A. You can readily find this out by examining one. Patented articles are required by law to be marked "patented," with date of patent. We believe it is patented. 3. Is there any successful stump extractor? A. We have illustrated several stump extractors. 4. What is the best compound for printer's rollers? A. You can make composition rollers by dissolving with heat, in two pounds of treacle, one pound of good glue, previously soaked a night in water. For greater hardness, use more glue. 5. Is it possible to analyze a mixture of chemicals in order to tell what the ingredients are? A. Yes.

C. W. says: I had occasion to mend a topaz ring, and I did it in the usual manner, using a round stick of charcoal and imbedding the stone in plaster of Paris. The stone was a dark one and was changed through the operation to a very light one. What was the cause of its changing, and how can I restore it? A. We suspect that heat has had something to do with the change of color. The yellow Brazilian topaz, strongly heated, becomes rose red, and the Saxon topaz, when gently heated, white. We are afraid nothing can be done to restore the color.

H. G. B. asks: 1. Will platinized silver do for the negative metal of a Grove battery? If so, what is the best way to platinize it? Will it do to platinize copper instead of silver? A. Either platinized silver, lead, or copper will answer in Grove's battery, but it must be well plated. The platinum solution used is the double chloride of platinum and potassium, dissolved in a solution of caustic potash.

G. H. J. asks: 1. What are the so-called glass cards made of, and how are they colored? A. You probably mean cards glazed with soluble glass. This can be applied in the liquid state like a varnish. When dry, it forms a hard, glassy, transparent surface. Various pigments can be used for coloring. See our advertising columns.

J. D. says: I produce an orange color with bichromate of potash, alum, litharge, acid, and soda. What must I add to deepen it? A. This is a matter to be determined by experiment. Consult some practical chemist, who may have facilities at hand to make the necessary experiments.

W. V. D. asks: How much worm surface is required to condense a gallon of proof spirit in an hour? I am told that, to condense 200 gallons of proof spirit in 12 hours, about 180 feet of 2½ or 3 inch copper pipe would be required. A. This is a question which we can hardly dismiss satisfactorily in a few lines in this column. You should read the article on evaporation in Ure's "Dictionary."

M. T. asks: Why does coffee, either ground or in the berry, even if closely kept in a tin can, lose its aroma, and become disagreeable and bitter? A. The aromatic principles of coffee, on which its flavor depends, are volatile, and consequently, unless the roasted coffee is rigidly excluded from the air (which is almost impossible in ordinary vessels), the flavor is soon lost, and the bitter principles, among which is tannin, are left behind. The best coffee is made from the freshly roasted and ground berry, by infusing it in boiling water for a few minutes. The coffee should not be boiled in the water.

W. C. asks: What is tungstate of soda, recommended for making clothing uninflammable? Would it make wooden tobacco pipes uninflammable? A. Tungstate of soda is a compound of tungstic acid and soda. Tungstic acid can be readily made from the native tungstate of lime. The compound in solution, to which a little phosphate of soda has been added, has long been used in England for the purpose of rendering fine fabrics uninflammable. It does not prevent charring from the action of fire, however; its only use being to prevent substances burning with flame. It would be difficult to permeate hard wood with the solution.

S. B. R. asks: On what stuffs can the aniline dyes be used? How can I dye cotton goods with aniline black? A. All fabrics of silk, wool, and cotton can be dyed with aniline preparations. To get an intense black, it is necessary to mordant in chloride of manganese, working the cotton in it for about an hour, wring out well and, without rinsing, pass into boiling soda lye, holding lime in suspension. After the fixation of the manganese salt, wash the cotton in water and pass into a lukewarm chloride of lime bath, taking care that the chloride be not used in excess.

H. A. C. asks: What is the best manner of sticking tinfoil to glass for Leyden jars, disks, etc.? A. We think gum tragacanth will answer very well.

P. says: I wish to be an engineer. Which would be the best city for me to go to, to get instruction? Is mechanical drawing taught free at the Cooper Institute in New York? Is there anything of the kind in Boston, Philadelphia, or any other large city? A. You can obtain all necessary instruction, including drawing, at the Cooper Institute. We scarcely think you will find as good a free school in any other city in this country.

E. B. W. says: On page 43 of your current volume, W. S. B. asks if a block can be squared on all sides. It is quite common for mechanics to affirm, in the most positive manner, that this cannot be done. There are a few points connected with this question, which, not being generally understood, cause them to come to this erroneous conclusion. If a good workman will take a try square, such as is commonly found in machine shops, and commence on a block of metal say two inches square, and work as close as possible, he will find that when he has reached the fourth side, it and the blade of his square will not coincide. There is a cause for this, and it lays mainly in the angle of the square being a small fraction less or more than 90°. When he has reached the fourth side, this error in the square has been multiplied by four, and becomes plainly visible. The whole experiment, then, becomes simply a delicate test of the square. If he will take a piece of sheet steel and form a try square out of it, and with this commence and square the block, noting, when he has reached the fourth side, which way his square is out, and carefully correct it with a fine file or scraper, he will, after several patient efforts, have it so nearly perfect that no error will appear at the fourth side of the block. In a word, he will have made a perfect try square, and with it he can square other blocks, coming out at the fourth side correctly the first time. The secret of the "impossibility" in this problem rests in the inexactness of tools and workmanship; for certainly if the four corners of the block are just 90° each, the opposite sides will be parallel.

J. S. says, in reply to L. and H., who have difficulty in burning sawdust: "I have a boiler of similar dimensions and I burn my sawdust successfully. I use a fan (costing only about 12 or 15 dollars) of 24 inches diameter, with 6 inch wings, driven at 1,000 revolutions per minute. I also employ a trunk made of inch boards to conduct the blast into the ash pit. I use a grate bar which is lighter than the common bar, with the spaces (½ inch) running crosswise and of zigzag shape. I use also a little wood or slack coal to keep the fire going."

A. J. K. says, in answer to J. W. B.'s query as to calculating machines: There are machines which add, divide, subtract, and multiply six figures into six figures. "I used one in San Francisco. There are two in use in that city now. They are manufactured in Paris."

J. C. says, in reply to J. F., who inquired about a certain clock with a glass dial on which the hands turn without any apparent motive power: "I believe the timepiece is nothing but Robert Houdin's clock, which works as follows: At one end of each hand there is a large disk; these seem to be only counterpoises, but, in reality, they contain concealed watch movements, which, working on the center by means of appropriate levers, cause each hand to move on the dial and mark the correct time in a mysterious manner. If J. F. looks closely on these disks, he will probably see, on some part of their surfaces, squares, used to wind them up with a key, like an ordinary watch."

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

C. L. McC. & Co.—Your specimen is galena in quartz.

H. M. H.—Your specimens contain copper and iron. 2 and 4 contain carbonate of copper and copper pyrites. No 1 is white pyrites. No. 3 resembles quartz and white pyrites.

E. G. A.—Your specimen did not reach us. Send us a small sample.

T. M. B.—This is a specimen of earthy chlorite, consisting chiefly of silica, magnesia, alumina, and oxide of iron. The term chlorite is derived from a Greek word meaning green, on account of the greenish appearance of the mineral. It is of no economical importance, although the compact variety was employed by the Indians for pipes.

J. W.—Your specimens are ochers, that is, clays charged with oxide of iron, to which their color is due. The red especially seems to be a valuable mineral paint. You should correspond with some one who is interested in the use or sale of such articles.

S. B. B.—Your mineral is decomposed hornblende.

J. W. Jr.—The enclosed is blue clay, a silicate of alumina. When clay burns white, it is used in the manufacture of white earthenware.

R. M. L.—Your mineral is specular oxide of iron.

S. C.—Clay containing much free silica and brown oxide of iron.

B. F. M.—Dark colored clay, a silicate of alumina.

J. E. S.—Your mineral is white quartz, sometimes, though improperly, called diamond. The purest variety, which is crystaline and transparent, is used by jewelers, and is also made sometimes into spectacle lenses, called pebble lenses. Quartz is silica, while the diamond is pure carbon. Quartz will scratch and sometimes cut glass, but not with the facility of the diamond.

M. R. L.—The minerals sent are oxide of iron, chiefly micaceous oxide, so called from its occurring in small bright spangles like mica. From its glimmering, splendent appearance you have probably mistaken it for silver. The other ores are galena, a valuable ore of lead This sometimes contains a paying quantity of silver but this can only be estimated by an analysis.

J. E. G.—1, epidote; 2, quartzite; 3, copper pyrites; serpentine; 5, chlorite schist: 6, carbonate of lime.

G. S. R. asks: How can I reduce leather, buffalo hides, for instance, to a pulp, which will set into a hard and durable mass?—A. M. asks: How can I find the weight of a person's head without cutting it off?—J. V. B. asks: Is there any substance with which I can coat cardboard, to make a white slate, to be written on with a lead pencil?—G. W. F. asks: 1. Can you give me a rule for setting out circular saw teeth? 2. How can I temper a burr for gumming out saw teeth?—C. P. asks: In taking impressions of the human head in plaster, I have trouble in making the hair and whiskers stand out naturally. What can I do to remedy this?

COMMUNICATIONS RECEIVED.

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

On the Morse System of Telegraph Signals By W. L.

On Utilizing Coal Dust. By J. H.

On the Preservation of Timber. By J.H.M

On the Principles of Ventilation. By C. A. W.

On Asphalt. By C. F. D.

On the Relative Attraction of the Earth and Sun. By W. M. D.

On a Substitute for Mica in Stoves. By A. A. H.

On Mr. R. A. Proctor and the Million Dollar Telescope. By S. H. M. Jr.

On Preventing Incrustation in Boilers. By E.

On Ocean Towers. By W. K.

Also enquiries from the following:

S. H. W.—H. C. A.—H. S. W.—H. B.—W. W. A.—L. A. C.—G. S.—W. W. S.

Correspondents in different parts of the country ask: Who makes a centrifugal clothes wringer? Who make smoke-consuming devices for boiler furnaces? Who makes corn-shucking machines? Who makes wood-working machinery bits? Who makes an instrument, other than the ear trumpet, for helping the partially deaf to hear? 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

January 13, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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