Business and Personal.

The Charge for Insertion under this head is $1 a Line.

G. X. D. will find directions for removing stains from cloth on p. 171, vol. 30.—C. N. F. will find directions for preparing sumach on p. 71, vol. 30.—G. F. will find a recipe for printer's ink on p. 154, vol. 30, and directions for galvanizing sheet iron on p. 59, vol. 24.—M. W. C. will find a recipe for gelatin (isinglass) cement on p. 27, vol. 30, and for cleaning brass on p. 102, vol. 25.

J. S. asks: How small a circle can a small locomotive turn on without causing friction enough to overcome the power of 2 one inch cylinders? The driving wheels are 4 inches in diameter and 6 inches between each driver from center to center, and 14 inches from the back driver to the forward truck wheel. The truck wheels are 4 inches from center to center. A. It will depend upon the play of the wheels on the track. You can strike arcs with different radii, and determine the question after a few trials. By making the intermediate wheels without flanges, you can turn the locomotive in a very sharp curve.

R. M. says: The present method for sawing marble is with sand and water, acted upon by a soft iron blade. 1. Can the teeth of a steel blade be hardened enough to saw marble and stand the wear for any time? A. It has not been found practicable. 2. If this would not answer, how would it do to use the steel blade instead of the iron, as we could put a great deal more pressure on it, and naturally do more sawing? A. There would not be any advantage, in our opinion. We believe the diamonds are the only cutters that are practicable.

J. B. F. R. asks: How long do you suppose a vacuum could be maintained if formed in an airtight cylinder with a rubber leather piston? A. For ever, if the cylinder were perfectly airtight.

J. H. A. asks: What is the rule for calculating the blow of a steam hammer? We have a 300 lbs. steam hammer with a 5 inch cylinder and 12 inches stroke, working at a pressure of 100 lbs. to the square inch. What is the weight of the blow with the hammer working at full stroke? A. We do not know of any rule by which you can calculate this.

R. G. R. asks: Can you inform me of a cheap method of consuming the smoke, or part of it, from soft coal, in a furnace under two tubular boilers 42 inches by 12 feet each? A. A common plan, which is frequently successful, is to admit air to the products of combustion, after they leave the furnace. Others admit air to the furnace, above the fire. You will find a great deal of interest, in this connection, in Mr. Charles Wye Williams' works.

V. A. says: I have lately had an argument with a friend on the subject of the ball dropped down a hole through the earth's diameter. The subject, being conjectural, cannot of course be submitted to experimental research; but inasmuch as some of the well known principles of matter may be involved, we have agreed to abide by your opinion. He asserts that the ball, on arriving at the earth's center and losing its weight, also loses its momentum, and will come to rest without passing the earth's center. I am inclined to disagree with him on the ground that his assertion is at variance with the theory of conservation of force, and am of the opinion that the ball will oscillate for ever from end to end of the diameter, provided that frictional or retarding media, such as air, etc., be excluded. Your opinion is respectfully sought on the question. A. We incline to your opinion.

W. S. B. asks: 1. Is the use of tobacco by smoking it injurious to the teeth? A. Yes. 2. If so, what part of the tooth does it first affect? A. It affects the upper part of the teeth, near the gums. 3. What effect does it have on the brain, if any? A. There is no doubt that the use of tobacco has an injurious effect upon the brain. "Tobacco smoking excites an abundant secretion of saliva; hence some persons maintain that tobacco smoking aids digestion. Smoking acts on the intestines as a slight purgative, and no doubt a pipe or cigar smoked after breakfast is beneficial to some persons. Smoking to excess is no doubt a very harmful habit; it disorders digestion, greatly lessens the appetite, produces much restlessness at night, and weakens both mind and body. Chronic pharyngitis, and chronic dyspepsia in some instances, may be clearly traced to smoking in excess. Even amaurosis is said to be sometimes produced by excessive smoking. Kölliker teaches that nicotine quickly paralyzes the brain and destroys voluntary movement."—(*Ringer.*)

L. C. T. asks: With what tasteless composition can I coat the inside of a keg to make it air and gas tight? I have tried rosin 8 parts to 3 of beeswax, melted and poured in, but without any good effect. I think that the heat from the composition causes shrinking of the staves, which cannot be tightened after the composition sets or cools. A. Take an aqueous solution of gelatin, about 1 quart of gelatin to 3 quarts of water. Heat the barrel and pour in the gelatin solution boiling hot. Revolve the casks several times until you are satisfied that the gelatin has reached every part of the cask. Draw off the remainder. Allow the cask to become cold. Then pour a solution of tannin in water into the cask, in the same manner as the gelatin, except that during this process everything must be cool. Draw off the tannin solution and allow the cask to remain undisturbed for two or three hours, when you have a solid coating, upon the inside of the cask, of tannate of gelatin.

How can I make root beer? To make root beer, take 3 gallons of molasses, add 10 gallons of water at 60° Fah. Let this stand 2 hours, then pour into a barrel, and add powdered or bruised sassafras and wintergreen bark, each ½ lb., bruised sarsaparilla root ½ lb., yeast 1 pint, water enough to fill the barrel, say 25 gallons. Ferment for 12 hours and bottle.

J. T. P. asks: 1. How much greater would be the heat in a box, filled with steam through a perforated pipe, with the pressure in the boiler at 40 lbs. than at 20? A. Temperature at 40 lbs. would be 287° Fah.; at 20 lbs., 259° Fah. 2. Is there any instrument for measuring the heat in such a box? A. The temperature can be measured with a thermometer.

J. B. R. asks: What is the best method of extracting tannic acid from new white oak wine casks, so as to make them perfectly wine clean? A. Ether is the best solvent, but being expensive you can use alcohol in its place. The alcohol can be used again, if purified by distillation.

L. G. D. asks: How can I prevent the bodies of butterflies and moths from becoming oily, and secure those that are already oily from becoming more so? I do not wish to cut out the intestines, as that makes the body look unnatural. A. Soak the insect in benzine by dropping the liquid upon its thorax, continuing this until the insect is thoroughly impregnated even to the tips of its wings; then dry in the wind. Pin the insect under a window raised a few inches, or any other place where a sufficient draft of air can be obtained. The moth should be placed with its head pointing inside, so that the inrushing air may blow up the feathers of the insect and prevent them from becoming plastered or stuck to each other.

S. L. asks: Can you give me a simple process for making bone black or animal charcoal, used in the manufacture of blacking? A. Put clean bones in a crucible, close, and expose to strong heat till calcined. Cool the crucible, remove and powder the contents, wash them in warm water, and dry.

G. H. asks: What is the process of staining glass, such as is used for church windows, etc.? A. The different compounds for painting on glass are glasses of easy fusion, colored with ground metallic oxides and laid on the glass with spirits of turpentine.

Will light, in passing through such glass, assume its color and transmit it to any object upon which it may be reflected? Will liquids so transmit their colors? A. Yes, in both cases.

G. K. asks: How can I mix a cement that will harden under fresh or salt water, in 24 hours or less, and be of a hard and durable nature? A. You do not state what use you want to make of the cement. There are several hydraulic cements; the following is one: Powdered clay 3 lbs., oxide of iron 1 lb., boiled oil to form a stiff paste.

P. J. K. asks: I do not quite understand how it is proved that the earth is round, by viewing a ship on the ocean. The geography books say that the first part of a ship that is seen is the tip of the mast. How can this be, as water cannot be round, as it always seeks its level? A. Your idea as to water "finding its level" is erroneous. Water, by gravity, assumes the spherical form on the earth's surface; and the rotundity of the earth can be demonstrated by the means you describe as well at sea as on land.

R. S.—The phosphorus light you mention is well known, and has been described in our columns.

C. W. says: On August 3 a brilliant star was seen in the west, immediately after sunset; it was as bright as the sun, and gradually faded away till nothing could be seen of it. What was it? A. Probably one of the meteors which are so very numerous during this month.

J. C. S. says: I wish to make some marine glue; in your excellent book of "Instructions for Obtaining Patents" you give directions for making the same, namely: Gum shellac 3 parts, caoutchouc 1 part; dissolve in separate vessels in ether free from alcohol, applying a gentle heat. An encyclopædia says, respecting ether: "Its odor is peculiarly powerful and penetrating if inhaled, producing insensibility to pain, etc. Great care should be taken not to pour it out with a flame below it, otherwise an explosion of a dangerous character might ensue. Mixed with certain proportions of air, it forms a highly explosive compound." I must confess that, in the face of the above, I should be afraid to use ether for making glue until I hear further about it. A. If proper care be taken, the danger is small. Keep in airtight vessels in a cool place. We cannot see the necessity of pouring the ether out with a flame beneath it.

W. A. P. says: Please give me a recipe for glue that will be tough and strong, to fasten emery to leather. A. Marine glue, made of shellac and india rubber dissolved in naphtha, will probably answer well. It is recommended by some to add a little milk to ordinary glue, in securing emery to leather.

H. W. N. asks: Which goes the fastest, a shell boat pulled by two persons, using two oars apiece 10 feet long, or one pulled by two persons using one oar apiece, 12 feet long, weights being equal? A. This is scarcely a matter of theory, but is one of those questions which should be decided by direct experiment.

G. E. H. asks: Can a belt be laced so that the lacing will not be crossed on either side, and at the same time be strong enough to hold from pulling out on a belt that has to be so tight as to be stretched on to the pulley by clamps? A. We think it is better for the lacings to cross.

C. M. P. asks: How can I keep metal boxes from getting loose? Is there anything you can put on the iron before you run the metal that will make the latter stick? A. The iron should be recessed or provided with holes to retain the Babbitt metal in position.

C. H. H. asks: What is wire drawing in a steam engine? A. It is a reduction of the pressure of steam by contracting the opening through which it passes.

How is the hammer test applied to steam boilers? A. By tapping the boiler gently with a light hammer, and judging by the sound whether the iron has deteriorated.

B. asks: Is not an asymptote a line which, approaching a circle, continues to infinity without touching it? A. An asymptote is a straight line which continually approaches nearer to a curve, but never meets it. The straight line is continually dividing the distance between itself and the curve, so that, between two successive equal lengths of the straight line, the distance between the curve and the straight line is only a fraction as great as it was before; but as there will always be some distance to divide, the two lines will never meet.

Can two bodies approach each other from opposite directions in the same line, without meeting? A. The possibility of the two balls continually approaching, and never meeting, might be conceived. Imagine them to be subject to a law by which the space through which they moved in one second was always half the distance between them at the commencement of that second. Then if the distance between them at any given point were 2 feet, it would be after 1 second, 1 foot; after 2 seconds, ½ foot; after 3 seconds, ¼ foot; after 4 seconds, ⅛ foot, and so on; and if the law were unchanged the balls would never meet.

L. B. asks: Will a common cotton boat, usually called in South Carolina a mountain boat, propelled by an engine instead of poles, be subjected to United States inspection, and be required to have a licensed engineer aboard? A. Yes.

A. W. S. asks: Having run an engine for two years, I want to learn to be an engineer. Can you tell me where to go to learn more of the business? A. You need shop experience and education. Cornell University furnishes both. You could enter a machine shop and employ your spare time in study.

J. H. N. asks: What horse power steam engine is necessary to perform work on a farm, such as grinding, sawing, etc.? A. From 3 to 5 horse power.

What is the capacity, in the indicated horse power of a steam engine, of a two horse tread power, elevated and driven by horses, in the manner usually done by threshers? The horses are to be of medium size and capacity. A. From 3 to 4 horse power.

I. asks: A friend of mine affirmed that the revolutions of a wheel could be indefinitely increased by the use of a number of multiplying wheels, without increasing the motor power. I averred that this could not be done without increasing the motor power, for the weight of the wheels would counterbalance the rapidity of the motion; and that finally the mechanism would become so heavy that the number of revolutions would no longer be increased. Who is right? A. Every additional connection would require some power to drive it, and therefore your friend is in error.

J. R. S. asks: Is it a fact that ice houses take fire by spontaneous combustion? If so, I would like a scientific explanation of the matter. I have noticed that there have been quite a number of ice houses burned this season, and that the cause was attributed to spontaneous combustion. One was burned in Massachusetts on the night of July 31. The building was 40x30 feet, with 20 foot posts made as tight as possible, with no means of ventilation; it was filled to the plates with ice packed in fine sawdust. The parties owning the ice had a quantity in another building packed in small hay: after using the ice that was packed in hay, they dried the hay and spread it upon the ice in the ice house. Four days after the building was discovered on fire, the fire bursting from the roof. A. We are not aware of any other case in which the origin of a fire in an ice house has been attributed to spontaneous combustion, although the burning of ice houses is a somewhat frequent event. Workmen so commonly smoke pipes about their work that we would be inclined to attribute the origin of these unfortunate disasters more to this cause than to any other. We would be pleased, however, to receive from our correspondents any additional facts bearing upon the subject. As to providing special means of ventilation for ice houses, we understand that it is considered by many essential to the proper preservation of the ice to do so,

S. E. J. says: If we have a plane surface containing a square foot or yard, how much more pressure will there be onit when it is placed so that the wind can blow square against it, than when it is placed at an angle of 20°, 30° or 45° to the wind? A. Experiments have not been sufficiently extended to enable this question to be answered exactly. Robins and Borda's experiments, however, seem to show that the pressure on oblique surfaces varies nearly as the sine of the angle of incidence.

C. D. says: Please give me the number of figures that it requires to make a billion. A friend says that 3,750,340,240 stand for three billion, seven hundred and fifty million, three hundred and forty thousand, two hundred and forty; and by consulting the arithmetic I find that he is right; but when I go to Webster, I find that it requires a million of millions to make a billion, which would be 1,000,000 000,000, or 13 figures. A. In French numeration, commonly employed in this country, a billion is a thousand millions. In the English numeration, as given by Webster, a billion is a million millions; and the first example, read by the English numeration, would be three thousand seven hundred and fifty millions, three hundred and forty thousand, two hundred and forty.

A. L. K. asks: What are the three and five cent pieces (now in use) composed of? A. Three fourths copper and one fourth nickel. The five cent piece weighs 77 16 grains; and the three cent, 30 grains.

G. A. says: J. S. S. says that he runs one pair of burrs (or rocks, as he calls them) on 40 lbs. of steam. I should like to know the size of his boiler and engine, also the size of stones, and kind and quality of work done. I have a tubular boiler, 10 feet long and 4 feet in diameter, with 72 two inch tubes, with a grate surface of 16 square feet. The engine has two cylinders, 5½ inches bore x 12 inches stroke, running 105 revolutions per minute, cutting off at ½ stroke. We cannot run with 40 lbs. of steam; with 60 lbs., we cannot grind over 100 bushels of corn in 10 hours into feed meal. I think we have a good boiler. The engine will not give us the amount of power we want. Will you give us your opinion, and will J. S. S. further explain his case? A. It might be well to run your engine faster. A good engineer could readily ascertain whether the machinery is doing as well as it should. We should be glad to hear again from J. S. S., in answer to the present correspondent's inquiries.

C. J. W. asks: 1. Given a set of four boilers, placed side by side; the steam is taken from each through a 4 inch pipe which is carried directly to the front and connected with a 6 inch pipe running parallel with the fronts. From about midway between the ends of this last, a 6 inch pipe is taken to the engine. The total distance from the boilers to the engine is about 70 feet, and in this distance there are four right angles. The steam drums and pipe are all exposed to the air. Is there greater condensation on account of the right angles? If so, is it appreciably greater? A. Yes, to both queries. 2. Is the condensation probably much greater on account of exposed condition of drums and pipe? A. Yes.

M. C. H. asks: As to the relative properties of air and steam, which is the most compressible, that is, the most elastic? If two boilers were charged, one with steam and the other with air, each compressed to a pressure of 130 lbs. to the square inch, and one of two engines of the same size be attached to each boiler, which would give the greater number of revolutions, everything else being equal? A. If utilized to the best advantage, the steam would give the greatest number of revolutions, since it can be condensed, while air is a permanent gas.

O S. asks: Suppose a bottle, weighted with shot and so adjusted as to submerge it one inch below the surface of the water, be made perfectly tight, would the bottle continue to sink, until it reached the bottom: regardless of the depth, or would it find its equilibrium, and remain suspended between the bottom and surface? A. The bottle would continue to sink as long as its weight was greater than that of an equal volume of water; when the two became equal, then the bottle would come to rest.

S. S. says: I have two wells, 436 feet apart. Which is the cheapest way to arrange a windmill to pump the water of both wells with one pump? One well is 20, the other 25 feet deep. A. About midway between the two wells, but far enough away from the center, toward the deepest well, to compensate for the greater lift.

R. H F. says: On p. 101 of your current volume, the following passage occurs, in reference to making screw dies: "Make an allowance for shrinkage in hardening, for all holes shrink in hardening." This I believe to be erroneous. Let some of your young readers test it; it may help to teach them methods of careful investigation. Take good steel, soft, and drill a hole accurately in it; take the same steel in the same condition (not having heated it meantime) and fit closely and very accurately the hole thus made, harden the steel with the hole in it, and apply the round steel in the hole; if it will not enter at all, it is clear that the metal containing it has expanded inwardly; if it enters as before, otherwise. Now harden the steel that has been fitted in the hole, and it will be found not to enter the hole, whether the metal of the latter be hard or soft. Suppose that steel of proper dimensions be given an even and finished surface, and a true and delicate circle be drawn thereon; then let the steel be hardened and the diameter of the circle be remeasured. The result, no doubt, would be an enlarged diameter, and that in consequence of the tension of the metal within the circle. I believe that, if no metal were there, the circle would be unchanged: otherwise, if the circle were diminished, it would be contraction of the metal about the margin of the hole, not expansion in hardening. A. If an inch hole be bored in a piece of soft iron or steel, and the iron or steel be then hardened, the hole will be less than an inch. If a piece of round iron or steel, an inch in diameter and 6 inches long when soft, is hardened, it becomes more than an inch in diameter and more than 6 inches long. A circle described on a solid face would enlarge from hardening; but if the metal were cut away round the inside of the circle, it will then become smaller. It is obvious that in the one case the metal inside the circle expands and forces the circle outwards, therefore enlarging it; while in the other case, there being no obstacle to the metal finding room to expand inwards, it does so.

E. H. M. says: I have in daily use twelve tanks (or, more properly, casks), holding about six hundred gallons each. They are built of best Michigan two inch oak, and are used for receiving spirits, about proof in strength. They often times leak. What is your opinion of an application of paraffin outside, and what method would you suggest for an inside application, to be put on without taking end or head out? Would a satisfactory result be reached by placing sufficient paraffin in at the bung and rolling the cask about till the material is wholly taken up? If any remain in the cask, would the paraffin combine with the spirit or give it any flavor? Is it solid or liquid? If the former, how shall I manage for the purpose named? A. Paraffin at ordinary temperature is a solid. It melts at 45° to 66°. We think it would be best for you to try an outside coating of paraffin on the parts which leak. It would be difficult to line the inside without taking out the head. To apply the paraffin, melt it in an iron vessel and pour on the parts to be treated; then use a hot piece of iron to rub the cooled paraffin down smooth.

E. L. S. asks: Why does the German student lamp flicker, even with a new wick? A. You do not use the best of kerosene. These lamps absolutely require it.

J. C. E. asks: Is it beneficial to a heavy rubber belt to keep it well coated with paint? A. It will be decidedly injurious, causing the belt to crack and eventually to tear.

G. B. S. asks: What is the principle of the lactometer? Is it anything like the hydrometer? If not, in what respect does it differ? A. Hydrometers are of two classes. 1, of constant volume but variable weights; 2, of constant weights but variable volume. Hydrometers of the first class are used to determine specific gravity. Hydrometers of the second class (of which the lactometer is one) do not determine the specific gravity, but merely show whether a liquid is more or less concentrated. Pure milk is liable to great changes in strength (owing to change of food, wet, damp weather, etc.), so that the lactometer is not to be relied upon to detect adulterations.

J. M. T. asks: 1. Are resonators made as an article of trade? A. No, not in this country; they can be obtained at Munich. 2. Have they any definite form? A. They generally have a globular shape, resembling in their external form a small mortar. 3. Should they be constructed of any particular suostance? A Helmholtz' resonators, one of which may be seen at the Stevens Institute, Hoboken, are made of plaster of Paris. 4. Is it the mass of air contained or the column that causes resonance? A. The enclosed air is the sonorous body and the substance of the globe has scarcely any influence on the tone. It is the volume of air which causes resonance. 5. Should the opening be of any specific size? A. The opening should have a definite size

M. A. W. says: There are several marks on my face, the result of scratching while having the smallpox at the age of 7. My age now is 19. I have outgrown many of the marks, but the remaining ones give my face a somewhat rough appearance. Is there any possible way of removing them? A. Age is the only remedy.

R. H. P. says: If I dissolve 1 lb. of Malacca tin in muriatic acid, and then precipitate the tin with zinc, how can I recover or bring back the precipitant to metallic tin? Can it be done in a lead crucible, and at what temperature? A. Precipitated tin can be reduced in a graphite crucible by mixing it with cyanide of potassium and a little carbonate of soda, and covering the charge with a layer of common salt. The fire should be a bright red and the crucible should be left in 20 to 30 minutes. The sample sent is not precipitated tin. Two assays of the sample were made, and failed to obtain tin; but instead, obtained iron. Are you sure about its being Malacca tin?

W. H. K. Jr. asks: What ought to be the thickness at top and bottom of two square brick stacks respectively 100 feet and 140 feet high, each having an 8 feet square flue for the entire hight? A. For the 100 feet stack, make the walls 3 feet thick at bottom and 16 inches thick at top; and for the 140 feet stack 3 feet 8 inches thick at bottom and 16 inches thick at top, the brickwork being of hard brick and cement mortar. [This answer was incorrectly given in our last issue. —EDS.]

J. W. M. asks: How can I fasten ornamental center pieces, made of plaster of Paris, on to plastering? A. Stucco center pieces and ornaments of all kinds are put up after the second or brown coat of plastering—and sometimes the finishing coat—is put on. Make a number of holes in the plastering down to the lath, and then fill them with white mortar, gaged or tempered with plaster of Paris; wet the ceiling well, and ornaments, at bottom; you can then stick them on with the gaged mortar as you please; and if well bedded into it, they will adhere. Clean off all loose mortar with a plasterer's brush and plenty of clean water, after they are set.

How can I polish plastering, when the last or white coat is of lime and plaster of Paris? A. In hard finishing walls, plasterers use an oleaginous substance called "elbow grease," by which they imply that the polish is put on mainly by much and hard troweling. Use clean washed white beach sand in your finishing coat of lime and plaster; take your brush in one hand and your trowel in the other: first apply clean water and then follow it with the trowel, and repeat until the plaster sets and shows a polish.

J. P. asks: Has a common underground cistern, well secured with the best of hydraulic cement, ever been tried as a receptacle for wine? When the cement is well set, would it be detrimental to the wine or the wine to the cement? A. We are not aware of any instance of the kind, and would not advise you to try it. The value of wine depending so much upon a certain delicacy of flavor, it would not be safe to subject it to the action of the crude materials of which such a receptacle would be made.

W. G. R. asks: How can I test the effect of frost upon samples of artificial stone? Can I do it with sulphate of soda? A. Experiments of the kind referred to have been made by Professor C. F. Chandler, of the School of Mines, whom you may address at East 49th street, corner Fourth avenue, in this city.

C. M. M. asks: 1. How much power will it take to run a 24 inch planer? A. It depends a great deal on the speed at which you with to run the machinery, and the depth of cut. It would be well to allow at least 10 horse power. 2. How much power is required to run a common wood lathe for turning table and bedstead turnings of walnut and maple? A. Allow 2 horse power. 3. How much power is required for running a 16 inch circular saw for ripping 2 inch white oak plank? A. Allow 15 horse power. Of course, you can use a great deal more or less, as you desire, in each case.

W. P. asks. What size and power of boiler would it take to heat with steam 4 rooms of 7,000 cubic feet each? Are 2½ feet radiating surface sufficient per hundred cubic feet of room? A. Under ordinary circumstances, a boiler that will evaporate from 1½ to 1½ cubic feet of water per hour ought to be large enough.

F. H. asks: 1. On a tramway, 1,400 feet long, will a full wagon, weighing 10,000 lbs., have sufficient tractile force to pull up the empty one, weighing 2,000 lbs., if the incline is only 1 in 400? A. Yes, if properly arranged. 2. What power of engine would be required to convey (by means of endless wire ropes) these full wagons, bringing them on the return, empty? A. About 10 horse power. Your other questions are of purely personal interest, and you should apply for answers to manufacturers and dealers.

H. B. asks: How many cubic feet gas would be required to lift one pound weight? A. Taking it for granted that hydrogen gas is meant, it will require about 11 feet of nearly pure gas, as from the action of zinc upon acidulated water. Of common street gas (carburetted hydrogen), it would require about 30 feet to lift one pound weight.

What would have to be the size of a vessel to contain 20 cubic feet? A. A spherical vessel (balloon) about 3 feet 4 inches in diameter will hold about 20 feet.

F. Y. asks: What will remove tan from the face, hands, and other portions of the body without injury to the skin? A. Take of corrosive sublimate 5 grains, muriatic acid 30 drops, lump sugar 1 oz., alcohol 2 ozs., rosewater 7 ozs.; agitate together till all is dissolved. Apply night and morning.

M. S. H. asks: In boiling (or in keeping in hot water below boiling point) tinned articles in lye water to remove rosin, etc., the tinning sometimes becomes colored or stained dark, like lead. Can this be prevented by anything in solution in the lye water (that will not stain silver), or is there any simple way of brightening up the tinning, otherwise than by polishing? Could the darkened parts be varnished by some bright colored lacquer that would give it a nice appearance? A. We have tried the experiment of boiling the tin with rosin in lye water; but the tin was not discolored. We cannot say, without having suitable specimens of the discolored tin, what would remove the stains in the way you desire.

J. F. asks: Is there any agent except peroxide of hydrogen (which I cannot obtain) by the application of which the whites of paintings (particularly water colors) which have been blackened by sulphuretted hydrogen gas may be restored without injury to the material on which they are painted, or to those pigments with which the white lead is associated? A. Peroxide of hydrogen is the only thing we have seen recommended for the purpose.

C. G. B. says: Please give me a full description of Robinson's anemometer, the size of wheels and number of teeth and pinions, also the size of cups as used in the United States signal service. A. Robinson's anemometer consists of 4 metallic cups in the form of hemispheres, on 4 arms at right angles. They are supported so as to turn freely about a vertical axis. The plane of the base of each cup is perpendicular. The action on the convex surface is less than on the concave surface, hence motion is produced. Making no allowance for friction, the center of each hemisphere moves with ⅓ of the velocity of the wind. An endless screw on the vertical axis gives motion to a series of wheels which can register the wind's progress to 1,000 miles. The anemometer used by the United States signal service is essentially Robinson's, but the special arrangement of the wheels, etc., is a patented improvement.

C. F. C. asks: 1. What are the proportions used to sensitize the collodion for taking photographs by the new method, without using the silver bath, and also the best developer and fixing solution? A. The following are the proportions of the materials as given by Colonel Stuart Wortley in his new dry plate process, wherein the usual bath is dispensed with: Plain collodion 1 oz., pure anhydrous bromide of cadmium 7 grains, nitrate of uranium 30 grains, nitrate of silver 18 grains. To purify the nitrate of uranium: Dissolve one part in two parts of ether, and let stand for some hours. The water of crystalization in the uranium will fall to the bottom, leaving a top layer of pure uranium, and it is this top layer which is used for the preparation of the emulsion. It is desirable that this purified uranium should have an acid reaction; and if it has not, add to it a minim or two of acid per ounce. Nitric acid is to be preferred, taking great care not to use too much. A strong alkaline developer is to be preferred. If very sensitive negatives are required, or very rapid development, use bromide in the developer in minimum quantity; if, on the contrary, you wish to be slow and sure, use plenty of bromide and take time for development. The light in the room must be as orange as possible, more so than for the wet process. The following is the composition of the developer: Carbonate of ammonium solution (ninety-six to the ounce) forty drops; bromide of potassium (same strength) ten drops; pyrogallic acid solution, alcohol (same strength) twenty drops; water, one ounce. 2. I am at a loss to produce good sensitive paper; please to tell me how it is albumenized and how to fume it. A. To albumenize paper: Take chloride of ammonium 200 grains, water 5 fluid ozs., albumen 15 fluid ozs. Take the albumen from nearly fresh eggs, taking care not to break the yolk. Mix the ingredients and beat into a froth. Skim off the froth as it forms and place in a flat dish to subside. When the froth has partially subsided, transfer it to a tall and narrow jar, and allow to stand for several hours, that the membranous shreds may settle to the bottom. Then pour off the upper clear portion, which will be fit for use. To apply albumen, pour a portion of the solution into a flat dish to the depth of ½ inch. Then take a sheet of paper by the two corners, bend it into a curved form, convexity downwards, and lay it upon the albumen, lowering the corners. The upper side remains dry. Allow the sheet to remain one minute and a half, then raise it and pin up to dry. To render the paper sensitive: Take nitrate of silver 90 grains, distilled water 1 oz. Lay the sheet upon the solution in the same way as described for albumen; 3 minutes is sufficient contact for thin paper, and 4 to 5 minutes for thick. Finally hang up to dry. 3. Can positive pictures be taken on the glass with the same process as negatives? I would not trouble you with these questions, but, living in the Sandwich Islands, I am so far removed from civilization that it is difficult to obtain books, and the SCIENTIFIC AMERICAN is my constant companion. A. Collodion positives, taken directly, need an image which is feeble though distinct. Iodide of silver is substituted for chloride, and a developing agent is employed. The surface of the reduced metal must be whitened as much as possible. The developer should consist of sulphate of iron. To produce a dead white tint, use with acetic acid. The addition of nitric acid to sulphate of iron modifies the development, making it more slow and gradual. Too much acid must not be used. It is best that the nitrate bath should be acidified by nitric acid instead of acetic acid. It should be tolerably concentrated. In regard to the collodion, if it is the ordinary iodized collodion, it should have some bromide added to it. The operator must be guided by the aspect of the developed image as to the necessary quantity of bromide to be added. If the high lights appear too dense, more bromide must be added. If, however, the positive is gray and feeble, and this is not due to over exposure, the proportion of bromide may be reduced.

A correspondent sends us the following recipe: "Blacking consists of a black coloring matter, generally bone black, and substances which acquire a gloss by friction, such as sugar and oil. The usual way is to mix the bone black with sperm oil, sugar, and molasses; a little vinegar is then well stirred in, and strong sulphuric acid is gradually added. The acid, acting on the salts of lime in the bone black, produces sulphate of lime and a soluble acid phosphate; the sulphate forms a tenacious paste with the other ingredients, which can be spread very smoothly; the oil serves to render the leather pliable. This forms a liquid blacking: paste blacking contains less vinegar. According to Liebig, in Germany blacking is made as follows: The bone black is mixed with one half its weight of molasses, and one eighth its weight of good olive oil; to which are afterwards added one half its weight of hydrochloric acid and one fourth its weight of strong sulphuric acid, mixed up with water to an unctuous paste." He asks: Is not the acid bad for the leather? A. Bone black consists of carbon 10 parts, phosphate of lime 84 parts, carbonate of lime 6 parts. Assuming the bone black to equal 100 parts, the hydrochloric acid 50 parts, the sulphuric acid 25 parts: there will remain 5 parts of acid not taken up by the bone black. These 5 parts will be held in solution by 50 parts of molasses, and 12 5 parts of olive oil, and water enough to make an unctuous paste. By this great dilution, the acid loses all power to damage the leather.

W. H. S. asks: 1. How can I make white linen or cotton waterproof without discoloring the fabric or covering the texture? A. Pass the linen through a hot solution of weak glue and alum (1 oz. of alum to 2 qts.) with a few pieces of soap added. 2. How can I make an adhesive substance that will not discolor white linen? A. Use white glue. 3. What kind of varnish or other transparent substance will give linen a durable and finishing polish? A. A little paraffin added to starch will give it a brilliant gloss.

M. S. says: I have a 12 inch belt (double thickness) connecting shafts 40 feet from center to center, with an idler 4 feet 8 inches from the driven shaft. What amount of power will I gain by putting the idler half way between the two shafts? A. Unless the belt is very stiff and unyielding, we do not imagine that there will be any appreciable gain.

H. P. asks: Do you think the moon has anything to do with rain? A. We have no conclusive evidence that the moon has anything to do with rain or in any way affects the weather except perhaps in tending to cause the disappearance of clouds under full moon.

Is there any danger in testing a boiler by filling it full of water and then slowly heating it? A. This is a method that we have frequently recommended.

What is the best color for painting the cylinder and steam chest of an engine? A. There is a black varnish made from mineral oil that seems to answer very well.

L. B. asks: Which way will a moving railroad car be brought to a standstill the quickest, by applying the brake tight, allowing the wheels to revolve or by applying the brake so that the wheels will stop revolving and slide along on the rails? A. The former way.

G. P. S. asks: Are there any self-switching engines in use? A. Not that we know of.

Is water compressible by freezing? A. It expands.

What is the velocity of a gale at an elevation of 100 feet above the surrounding country, and what is the pressure per square foot? A. Velocity about 50 miles an hour, and force more than 12 lbs. per square foot.

Are there any self-running solar cameras in use? A. Yes.

C. A. asks: What is the highest speed ever attained by any locomotive or train in the United States? A. Probably not much more than 60 miles an hour, though there are accounts of much greater speed.

Is the dummy engine used to a great extent throughout the State of Pennsylvania, and what is the usual speed? A. It is not very extensively used. The speed is from 13 to 15 miles per hour.

Is there any difference in the speed of the locomotives of this country and Europe? A. The average speed of express trains in England is, we believe, greater than in the United States.

J. R. F. asks: In conversing about the Catline process for making wrought iron, practiced in Northern New York, I was told that the workmen believed that the iron necessarily contained silver; and that if the silver were extracted by means of a loadstone, the iron was thereby rendered worthless. What is the origin for such a belief? A. We never heard of this theory before.

S. L. W. asks: I was once operating a plain slide valve engine, with pendulum governors. I would sometimes check up the speed, which then would run so slow that the governor would not have any effect on the engine. Having one cylinder cock open, the steam would rush out of it at intervals and the speed would increase as if the governor valve were in motion. Was this caused by the eccentric valve not being set correctly? A. This is very common with many governors which are not sensitive enough to provide for great and sudden variations in work. There does not seem, from your account, to be anything wrong in the setting of the slide valve.

Is there any such a thing as a Chinese sensitive leaf or plant? A. There is a sensitive plant, occurring principally in the tropics of America. Any flower raiser could doubtless procure one for you.

1. How many miles per hour will a 10 horse power portable engine propel a flat boat, 60 feet long, 25 feet wide, with side wheel and break water? The boiler is to carry 100 lbs. steam, and the paddle wheels are to be driven with a belt from the engine. What would be the tunnage of such a boat, and how much water would she draw when loaded? A. Probably about two miles per hour. You can readily calculate the tunnage and draft by allowing 35 cubic feet displacement for each tun weight of the vessel and cargo. 2. This boat being my own property and carrying freight for the public, would the steamboat law compel me to have licensed officers, and also to have my boat inspected? A. Yes.

F. H. L. asks: What is the process by which brass is tempered? A. It is done by hammering or rolling.

C. M. B. says: I made me an engine last winter with a cylinder 2x3½ inches, which I am using to run a small wood-turning lathe; the boiler is 12x30 inches and 1-16 of an inch thick. I am working steam at 50 lbs., and a friend tells me that my boiler will explode, for the iron should be as thick for a boiler 1 foot in diameter as for one 4 feet in diameter, the steam pressure being the same in both cases. Is he right, and am I working my boiler at an unsafe pressure? It is strongly made with doubly riveted joints. A. Your friend is in error. A boiler four feet in diameter would only safely sustain one fourth of the pressure that could be maintained in one similarly constructed but only one foot in diameter. The pressure of 50 lbs. is not excessive, if the material and construction of your boiler are first class.

Would it not be advisable to galvanize the sheets for boilers to prevent rusting, and why is it not done, especially in small boilers that are only used occasionally? A. Small house boilers are frequently galvanized. It would probably be difficult to do the work thoroughly enough, in the case of stationary and marine boilers, to ensure protection.

In looking over some back volumes of the SCIENTIFIC AMERICAN, I find (on p. 110, vol. 6) an answer to F. N. B. Is the 250 lbs. correct? A. Yes.

G. T. P. says: How do you find the length of the chord of an arc when the radius and the length of the arc are given, being 15 and 11 781 inches respectively? A. First find the circumference of the circle. It will be radius ×2×3·1416=94·2478 inches. Then the angle at the center of the circle, subtended by the given arc, will be $\frac{11{\cdot}781}{94{\cdot}2478}\times 360^\circ = 45^\circ$. And the required chord will be $\sqrt{15^2+15^2-2\times 15^2\times \cos 45^\circ}$ = 11·45 inches, nearly. To generalize this method: Let R = radius of circle, a = length of arc, C = length of chord, A = angle at center. $A = \frac{a\times 360^\circ}{2\times 3{\cdot}1416\times R}$

$C = \sqrt{2R^2-2R^2\times\cos A}$.

J. S. asks: What metals are used to make white metal and what are the proportions of each? A. Tin 2 lbs., copper 0 4 lb., antimony 1·2 lb. 2. What will make a suitable metal for handles and mountings? A. Tin 14 lbs., copper 0·2 lb., antimony 0 5 lb. 3. What are the proportions of type metal? A. Lead 9 lbs., antimony 1 lb.

H. P. M. says, in reply to H. B., who asks for a solution to remove the sand or scale from castings: The following will do it and is more simple than the one you gave: One part vitriol to four of water. The castings need only be wetted either by dipping them in or pouring it on. In 12 hours, the scale will thoroughly removed. They should then be well clean.

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

A. K.—It is a sample of spiegeleisen. It is a valuable product, produced by smelting, in a blast furnace with charcoal, a sparhic iron ore containing a large percentageof manganese.—W. H. R.—Your supposed animated horsehair is a species of the genus *gordius*, frequently found in still water; it is not thicker than a horsehair, and is popularly considered to be a hair of that description in the act of being transformed into an eel. Linnæus calls it *gordius aquaticus*.—J. P.—It is galena, an ore of lead.—A. B. C.—It is a sample of a fine quality of clay. Shale has the property (which clays have) of capability of being kneaded up with water and fashioned like paste by the hand; but it is a much stronger and firmer clay than the sample sent.—A. H.—It is magnetite, inclosing granules of apatite or phosphate of lime. All minerals are reported upon in the week in which they are received, except such few as require a longer period for analysis. The last have not altogether exceeded a dozen in number.

W. J. B. says: I have constructed two large sliding doors 10 feet high, 5 feet wide, and 2½ inches thick. They run on a round track on the bottom, with small pulleys on the top. I have weighted them so that they will open themselves as soon as unlocked, and I want a device that will shut them after they have been open 2 or 3 minutes. Can any of your readers inform me of one?—D. W. asks: 1. How can I make a cheap sealing wax of a violet color? 2. How can I make a good indelible ink, to be used with a stencil plate, for marking clothing?

COMMUNICATIONS RECEIVED.

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

On Popular Fallacies. By A. D. F. H,

On the Cardiff Giant. By E. X.

On the Movements of a Gum Ball. By R. L. S.

On the Philosophy of Thunderstorms. By J. H. G.

On Swimming with the Clothes On. By W. A. H.

On a Remarkable Prescription. By Z.T.D.

On Strained Honey. By H. W. S.

On a Family killed by Lightning. By P.D R.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Please to inform me where I can buy sheet lead, and the price? Where can I purchase a good brick machine? Whose steam engine and boiler would you recommend? Which churn is considered the best? Who makes the best mucilage? Where can I buy the best style of windmills?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

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Wrench, O. T. Bedell 153,528
Yoke, neck, M. S. Trowbridge 153,638

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,536.—GAS FITTING FINISHING MACHINE.—J. W. Lyon. October 14.

30,987.—OILING SPINDLES.—E. N. Steere. December 2.

EXTENSIONS GRANTED.

29,374.—THRASHING AND CLEANING MACHINE.—I. Hart.

29,409.—RAILWAY CATTLE CARS.—G. W. Chambers.

DISCLAIMER.

133,376.—GLOVE.—J. F. Mason.

DESIGNS PATENTED.

7,589 to 7,595.—CARPETS.—R. Allan, Yonkers, N. Y.

7,596.—PEN RACK.—B. Brower, New York city.

7,597.—INKSTAND BASE.—B. Brower, New York city.

7,598.—BADGE.—R. D. Green, Lowndes county, Miss.

7,599.—URN AND PEDESTAL.—H. F. Wesché, Phila., Pa.

7,600.—GLASS BOTTLES.—C.C. Woodworth, Rochester, N.Y.

7,601.—CHILD'S CARRIAGE.—A. Shoeninger, Chicago, Ill.

TRADE MARKS REGISTERED.

1,899.—MEDICAL COMPOUND.—E.A. Butts, Wash'ton, D.C.

1,900.—MILK PANS.—C. A. Douglas, Franklin, N. Y.

1,901.—PICKLES, ETC.—Du Vivier & Co., New York city.

1,902.—COFFEE EXTRACT.—S. W. Earhart, Columbus, O.

1,903.—THERMOMETERS, ETC.—J. S. F. Huddleston, Boston, Mass.

1,904.—GIN.—Wellington & Co., New York city.

1,905.—WINE.—Wellington & Co., New York city.

1,906.—MEDICAL COMPOUND.—E. K. Al Burtis, Ridgefield, N. J.

1,907.—SAUCE.—Lea & Perrins, Worcester, England.

1,908.—COTTON GINS.—Sanborn Machine Company, Mystic River, Conn.

1,909 & 1910.—KNIT GOODS.—American Hosiery Company, New Britain, Conn.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade Mark $25
On filing each application for a Patent (17 years). $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA JULY 31, 1874.

3,694.—E.M. Davis, Allegheny, Allegheny county, Pa., U. S., and F.J. Rebbeck, Pittsburgh, Allegheny county, Pa., U. S. Improvements on curtain fixtures, called "The Davies & Rebbeck Curtain Fixtures." July 31 1874.

3,695.—P. Griffin, Cork, Cork county, Ireland. Improvement on the manufacture of spirits, called "Griffin's Purified Spirits." July 31, 1874.

3,696.—D. Forbes, Cambridge, Middlesex county, Mass., U. S., assignee of H. Wells, Woburn, Middlesex county, Mass., U. S. Improvements on needle threading hooks, called "The Magic Needle Threader." July 31, 1874.

3,697.—N. E. Wheeler, London, Ont., assignee of C. D. Blinn, Port Huron, St. Clair county, Mich., U. S. Improvements on window blinds or shades, called "A Lap Window Shade." July 31, 1874.

3,698.—A. Lorrain, Bord-à-Plouffe, Lavalle county, P.Q. Improvement on wheel horse powers, called "Lorrain's Horse Power Wheel." July 31, 1874.

3,699.—F. M. Snively, Bellaire, Belmont county, O., U. S. Improvement on trace fastenings, called "Snively's Improved Trace Fastening." July 31, 1874.

3,700.—H. Ing, Hamilton, Wentwtrth county, Ont. A gas regulator, called "Ing's Improved Gas Regulator." July 31, 1874.

3,701.—C. H. White, White's Station, Calhoun county, Mich., U. S. Improvements on railway switches and frogs, called "White's Safety Railway Switch." July 31, 1874.

3,702.—W. Vahey, Forest Village, Lambton county, Ont. Improvement on machines for blocking horse collars, called "Vahey's Collar Blocking Machine." July 31, 1874.

3,703.—W. Murphy, Petitcodiac, New Brunswick. Improvements on organ blow pedals, called "Murphy's Reversible Organ Blow Pedals." July 31, 1874.

3,704.—G. Webster and J. F. Webster, Hamilton, Wentworth county, Ont. Improvements in sewing machines, called "The Webster Hand Shuttle Machine." July 31, 1874.

3,705.—J. Dwyer and J. V. Carter, Detroit, Wayne county, Mich., U. S. Improvements in base-burning heating stoves, called "The Crown Jewel Stove." July 31, 1874.

3,706.—W. Craig, Nunda, Livingston county, N. Y., U. S., assignee of H. C. Grover, same place. Improvements on washing machines, called "Grover's Improved Washing Machine." July 31, 1874.

3,707.—D. N. B. Coffin, Jr., Newton, Middlesex county, U. S. Improvements on capstans and windlasses, called "Coffin's Capstans and Windlasses." July 31, 1874.

3,708.—L. O. P. Meyer, Newtown, Fairfield, Conn., U. S. A certain india-rubber compound presenting a surface against which what are known as safety matches can be ignited, called "Meyer's Igniting Rubber." July 31, 1874.

3,709.—D. C. Kellam, Pontiac, Oakland county, Mich., U. S., and R. and A. Hayes, Detroit, Wayne county, Mich., U. S. Improvement on window screen frames, called "Kellam's Adjustable Window Screen." July 31, 1874.

3,710.—B. Tappan, Steubenville, Jefferson county, O., U. S. Improvement in miners' lanterns, called "Tappan's Miner's Lantern." July 31, 1874.

3,711.—H. Whiteside, Jr., Ottawa, Carleton county, Ont. Improvements on spring slats for beds, called "Whiteside's Improved Spring Slat." July 31, 1874.

3,712.—H. Behning, New York city, U. S., and J. Diehl, same place. Improvements in pianofortes, called "Behning & Diehl's Improved Agraffe for Pianofortes." July 31, 1874.

3,713.—E. S. Waterman, Hamilton, Wentworth county, Ont. Improvement in bed bottoms, called "Waterman's Superior Scrap Steel Spring Bed Bottom." July 31, 1874.

3,714.—W. T. Redding, New York city, U. S. Improvements on metallic or other boxes for blacking or analogous uses, called "The Reading Improved Box." July 31, 1874.

3,715.—W. Morehouse, Buffalo, Erie county, N. Y., U. S. Improvements on ship knees, called "Morehouse's Improved Ship Knee." July 31, 1874.

3,716.—W. B. Hall, Lancaster, Lancaster county, Pa. U. S. Improvements in cartridge-creasing and loading implements for breech-loading firearms, called "W. B. Hall's Cartridge Creaser." July 31, 1874.

3,717.—W. H. Becket, Chelmsford, Essex county, Eng. Improvements in valve apparatus for controlling the flow or passage of fluids, called "Dennis & Co.'s Patent H. P. Valve." July 31, 1874.

3,718.—W. M. Watson, Tonica, La Salle county, Ill., U.S. Improvements on nut locks, called "Watson's Improved Nut Lock." July 31, 1874.

3,719.—C. Comstock, New Canaan, Fairfield county, Conn., U. S. Combined hot air and hot water furnace, called "Comstock's Ventilating Steam Heater." July 31, 1874.