Business and Personal.

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

Answers to Correspondents

A. O. F. asks: Is it ever necessary for a locomotive slide valve to lift from its seat, either on sud, denly reversing the engine, when running down grade, or from any other cause? And if it does lift from its seat, what causes it to do so? How much must it lift under the most extreme circumstances? 2. I have lately made improvements on the balanced slide valve which I had patented through your agency. Will it be necessary in order to secure the improvements by a patent, to have a reissue of the original patent, or can I secure the improvements by a separate patent? A. 1. The valve may rise from its seat whenever the pressure underneath is greater than that on top. A very slight lift would equalize the pressure on the two sides. 2. It is not necessary to have a reissue.

S. G. F. asks: With what substances can I pack a filter to run about fifty barrels of water per day? We are much troubled with muddy water and have tried charcoal and gravel with no effect, as they soon clog up on passing this amount of water daily. A. If your water is very dirty, it will be well to have two filters, so that one can always be kept in operation. It may be that your present filter is not large enough.

H. L. R. asks: 1. How can I take the gold off a silver watch and chain which have been gilded? 2. How can I harden brass, silver or gold wire? 3. What will give gold its natural color after being heated? 4. What will eat steel screws out of a brass or nickel watch movement, without injury to the movement? A. 1. Probably by friction. 2. By hammering. 3. Polishing. 4. We do not know of anything that will answer. You might dissolve the other metals away from the screws.

M. H. P. says: In our old almanacs, we always found the sun to rise and set at 10 o'clock twice during the year, in March and September. But in the almanacs of the last two or three years it has varied 15 or 20 minutes. Is this variation due to a fault of the almanac maker, or has there been variation in the sun's rising and setting during the last few years? How much variation is there in the time of sun's rising and setting on the dates of January 1, 1866, and January 1, 1873? A. A calendar year exceeds the true solar year by 12·38 seconds, so that there is an error amounting to one day in 3,866 years.

W. J. B. asks: 1. Why should a fast motion engine have lead, and why not use the cam instead of the eccentric? Does not the lead work against the engine? 2. If a boiler is not large enough, will a steam drum of 24 inches diameter and 8 feet length increase its capacity more than one 18 inches diameter and 4 feet length? A. 1. Lead has the effect of preventing shocks and jars. The eccentric is a cam. 2. Increasing the size of the steam drum would increase the steam room, but would probably have no effect on the steaming capacity.

J. E. H. L. asks: 1. Why does extending the arms above the head stop bleeding from the nose? 2. Why does pressure on the upper lip just below the nose prevent sneezing? 3. Why does a woolen string tied around the leg above the calf prevent cramps? A. We are not sure that these statements are facts.

P. J. D. asks: 1. Can I learn phonography without assistance? 2. What instrument must I use to engrave letters on coffin plates and other plated goods? 3. How can I make gold leaf stick to glass? A. 1. Yes, with constant practice. 2. A burin specially made for engraving on metal. 3. Use best rum ½ pint, isinglass ¼ oz. Make a solution of these, add ½ pint distilled water, and filter through linen. This size required 24 hours to dry, after the gold leaf is applied.

E. J. O. says, in reply to A. D., who asks how to fill a dent in an iron cylinder with lead: Clean it well, and tin it over in the usual way (using muriatic acid) with a soldering iron, and melt in a little solder. "I frequently stop holes in cast iron patterns in that way with good success."

T. D. H. and several other correspondents ask: How can I make a cement for use in putting an aquarium together? A. Use equal parts, by measure, of litharge, plaster of Paris, fine beach sand, and powdered rosin. When wanted for use, make into a putty with boiled linseed oil.

J. asks: 1. What is the best and most effective plan of furnace which a poor man could erect in order to smelt from fifteen to twenty tuns of lead ores per week, and run the same into pig? The lead ore contains from forty to sixty per cent silver. A. We cannot give you definite advice without knowing more of the matter. It is better for parties who have professional work of this kind to take it to men who make a specialty of such matters.

W. T. V. asks: 1. What kind of material or sizing can I apply to cloth or woolen goods to smoothen the surface, stiffen the fabric, and, at the same time, render it waterproof? 2. How can glue be prepared so that it will remain liquid and fit for use when cold? A. 1. Moisten the cloth on the wrong side first with a weak solution of isinglass, and when dry with an infusion of nut galls. 2. A little nitric acid added to a solution of glue will prevent its gelatinizing.

R. N. asks: How much power is gained by using steel packing instead of rope packing for a cylinder, if any? 2. Can steel packing be used instead of rope after having used the latter for several years without having the cylinder bored? The cylinder appears to be pretty smooth and true. A. 1. We could not answer the question without more data. 3. We suppose so, but cannot tell definitely, as persons' ideas may differ about the meaning of "pretty smooth and true."

R. L. asks: 1. How can I cement whalebone to wood? 2. In what is the Fahrenheit thermometer superior to the Réaumur and centigrade instruments? A. 1. Take isinglass ½ oz., water 4 ozs., let stand for 24 hours, and evaporate in a water bath to 2 ozs.; add rectified spirit 2 ozs., and strain through linen; mix while warm with a solution of 4 ozs. best gum mastic in 2 ozs. rectified spirit: triturate with powdered gum ammoniac 1 dram, until perfectly incorporated. 2. The use of the different kinds is a matter of custom only. Fahrenheit believed his zero to be the point of absolute cold, an idea which is now known to be widely erroneous.

J. A. F. will find the following composition good for journal boxes: Copper, 24 lbs.; tin, 24 lbs.; and antimony, 8 lbs. Melt the copper first, then add the tin, and lastly the antimony. It should be first run into ingots, then melted and cast in the form required for the boxes.

J. W. and other querists for books on atmospheric electricity will find the subject treated in any good text book on physics. Lyon's "Treatise on Lightning Conductors," and Phin's "Lightning Rods, and How to Construct them," will probably be useful to you. See our advertising columns for bookseller's addresses.

A. N. asks: How can I solder broken chisels, files, etc., together? A. Clean off the ends by filing, and upon the joint lay a thin strip of sheet brass. Cover the part with a paste of clay, free from sand, to the thickness of one inch, the coating being 4 inches along on each side of the joint. Dry slowly near a fire, and then heat to a white heat in a blast, whereby the clay vitrifies. Cool very slowly, and knock off the clay.

J. P. asks: 1. Is silver coin pure enough to plate with without refining? 2. What is rotten stone? 3. What is Bath brick, such as electroplaters use for cleaning work? 4. What is water of Ayr stone? 5. Is there anything that I can put upon the surface of glass to render it a conductor, so that I can plate it? I want the surface of the plate when removed from the glass to be as smooth as the glass upon which I have plated. I can use plumbago, but I am afraid it will make the surface rough. 6. What is the best composition for brass gun barrels? A. 1. Yes. 2. It is a native polishing powder, composed of infusorial silica. 3. A polishing material, made in England, and sold in bricks. 4. A kind of hone, found in Scotland. 5. Try gilding, as described on p. 250, vol. 29. 6. Copper 90·5 parts, tin 9·5 parts.

Smoker can mend his amber mouthpiece by smearing the parts whichare to be united with linseed oil, hold the oiled part carefully over a hot cinder or a gas light, being careful to cover up all the rest of the object loosely with paper; when the oiled parts become a little sticky, press them together, and hold them so till nearly cold. Only that part where the edges are to be united must be warmed, and even that with care, lest the form or polish of the other parts should be disturbed; the part joined generally requires a little repolishing.

J. H. S. asks: What are the dimensions of the interspaces of the wire gauze used in the manufacture of Davy's safety lamps? A. One thirty-sixth of an inch = 1,296 holes to the square inch.

J. H. M. says: 1. I think there is some mistake in the answer to Y.E.'s question on horse power of an engine in No. 22 of your vol. 29. You say 63·6×70×63×2×16÷33000×12. I think the last sign should be to divide. 2. Two of us are in dispute about the horse power of an engine. Diameter of cylinder is 16 inches, length 30 inches, working at 100 revolutions per minute with a pressure of 90 lbs. to the square inch. We leave it to your decision. A. 1. In the example mentioned, the stroke of the engine is taken in inches. These must be reduced to feet—or, in other words, the fraction must be divided by 12. It is a general principle that multiplying the denominator of a fraction by any number has the effect of dividing the fraction by that number. 2. If an engine should give an indicator diagram in accordance with the data sent, the indicated horse power would be 28·96×90×5×100 : 33,000 = 91⅛.

F. M. H. asks: How can I find a rule for the heating surface and horse power of steam boilers? I think the following is incorrect; it applies to tubular boilers only: Two thirds the circumference of all the tubes, multiplied by the length, will give the heating surface, and every 15 square feet of heating surface will be equivalent to one horse power. A. The practice of different makers varies so much, and there are so many ways of rating the horse power of a boiler, that we cannot give you any definite rule.

W. A. C.—We cannot answer your question as to pumps in a coal mine from the above *data*. Under some circumstances, we think that the pressure in the 3 inch pipe would be increased.

E. M. J. asks: How can I gild a small wooden flower stand? How can some portions be made bright, the rest remaining a dead color? A. Rub the wood smooth and prime with glue size, then put on two coats of oil paint and one of flatting. Smooth over, when dry, with wash leather. Put on gold size; and when it is sticky to the touch, it is ready for the leaf, which put on carefully and dab with cotton wool. A thin transparent glazing can be used to deaden the gold in places.

W. T. says: 1. We have in our factory a sectional boiler which has been in constant use for about three and a half years. The capacity is fifty horse power, and it is at all times under a pressure of ninety-five pounds. It has commenced to leak badly in three or four of its connections. The leaks are directly over the fire. What can I use to stop them? 2. Is there any danger of rods which run through tubes rusting off? If so, what would be the effect? 3. Do you consider such boilers perfectly safe? 4. We blow off once a week. Should the boiler be examined internally? If so, how often? The water is taken from a natural reservoir, and is both soft and clean. A. 1. Probably it will be necessary to replace the leaky sections, though possibly you may be able to face them off. It would be well for you to address the makers of the boiler. 2. We scarcely think there is much danger. 3. As safe as any similarly constructed boiler. 4. We should suppose that once every three or four months would be quite sufficient.

A. L. A. asks: Are not portable engines much more liable to get out of order and give trouble than stationary, and does not the heat from the boiler cause unequal expansion of the different parts of the work, hence loosening the joints, etc.? A. If proper provision is made for expansion, we think that portable engines can be made quite as durable as stationary engines. It is true, however, that there are difficulties in the arrangement, and hence some builders place their portable engines on a separate support.

C. D. C. asks: 1. Where can I get a very powerful magnet? 2. Are magnets durable? 3. Which has more attraction for a magnet, a point or a flat surface? 4. What is the farthest distance at which a powerful magnet will lift an ounce weight? 5. What difference is there between a magnet and a lodestone? A. 1. From any good maker of philosophical apparatus. 2. Yes, with proper usage. 3. We suppose the magnet will attract either with equal intensity. 4. This could only be determined by experiment for any particular case. 5. One is a piece of metal which has received its magnetic force from another magnet, the other is iron ore which has magnetic polarity.

W. asks: What is the rule for computing the number of tuns of ice contained in an ice house, the length, width, and depth being given? A. Calculate the number of cubic feet in the ice house, and divide by thirty-five. This gives the number of tuns of ice that the building will contain if it be closely packed.

G. A. R. asks: How do you determine the diameter of a steam chest for a roll valve engine? 2. Is the roll valve more economical than the slide valve? 3. Do you know of a good book which treats on the roll valve? A. 1. It will depend upon the width of ports and travel of valve. You will find dimensions of these laid down in any standard work on valve motion. 2. We do not know of any tests which have been made to determine the relative merits of the two styles of valves. 3. None that treats of this, specially.

G. O. asks: Has any account of the government boiler tests at Sandy Hook and at Pittsburgh been published? A. The experiments are incomplete, and probably the detailed report will not be rendered until further tests have been made.

H. P. asks: Is there any known substance that can be put in with hard cast iron when it is being melted, to make a soft casting? 2. Has there been a rotary steam engine invented that is practicable? If not, would the invention be of use? A. 1. We think not. 2. Yes, but there is great room for improvement, and the invention would be of great value.

E. B. asks: 1. By what means was accurate alignment of the Hoosac tunnel attained? 2. It is proposed to cut a tunnel between England and France. As the opposite shores are not in sight of each other, will you explain the manner of making the survey? A. 1. We suppose it was done by running the line accurately across the mountain, and then transferring it by means of angles or bearings. 2. In running a line between England and France, if stations suitable for triangulation could not be found, it might be necessary to use buoys, or some similar device, to locate intermediate stations.

G. S. T. says: I wish to line steam boxes, for steaming stave bolts, with some material, such as roofing felt or sail canvas, and would like to know if there is any kind of paint which I can apply to it which will resist the action of the steam. I use both exhaust and live steam. There will be a lining of boards to protect the canvas from injury. A. Perhaps marine glue will answer. In reply to your other question, see our advertising columns.

W. T. T. asks: What is the greatest power that can be attained by a steel spring, as used in clocks, watches, etc., and the greatest number of evolutions that could be applied to such power, before it becomes exhausted? A. This question is too indefinite. Springs could probably be made of any desired power.

W. L. asks: In burning the cotton dust produced in extracting wool from cotton fabrics, which is impregnated with oil and sulphuric acid, will the fumes have a tendency to harm the tubes of a boiler? A. We suppose this is a matter that could be best determined by experiment.

C. McC. asks: 1. If I place my engine on either center, should the eccentrics be set so that the lead will be the same when the link is shipped to back, as it is when shipped to go ahead? 2. Is tallow the best lubricant for cylinders, if steam is made from alkaline water? 3. What is the best packing for expansion joints? 4. What is the best thing to put on an engine to keep it from rusting when shut down for winter, it being exposed to damp? 5. What will wrought iron pipe expand in length in proportion to size? A. 1. This cannot generally be done. 2. Probably oil would be better. 3. Hemp is commonly employed. 4. A mixture of white lead and tallow. 5. Wrought iron expands about $\frac{1}{100}$ of its length, on being heated from 32° to 212° Fahrenheit.

J. B. H. asks: 1. What is peat and how can it be distinguished? 2. If anything without fertilizing properties is spread on the ground, why does it improve the soil? A. 1. Peat is a mineral fuel, retaining many of the characteristics of its original vegetable structure. 2. Nearly all organic matter furnishes nourishment to the plants by its decomposition, and hence cannot be said to be without fertilizing properties.

J. S. S. asks: Has a locomotive any greater pressure or weight upon the track when exerting her full force to bring a train into motion, than she has when standing at rest? A. No.

J. N. P. says: Auchincloss, on page 33, gives the description of setting the eccentric to cut off at an angle of 150°, and says: "By carrying the crank to the 150° position we observe that the port, S, remains open a distance, C," (which, by the way, is wrong; for the valve ought to be as near the seat, C, on the right as it is now to the bridge on the left) "and the most ready means of closing it is to lengthen the valve face the distance, l." Furtheron, he says: "But on referring to Fig. 6, it is clear that no such addition can be made without necessitating a change also in the eccentric location, for it would render the admission 30° too late. Hence we must unkey the eccentric, advance it 30°, and refasten it." It is to this that I want to call your attention. He says he wants a cut-off at a crank angle of 150°; and he carries the crank to that angle and lengthens the valve face whatever it lacks of meeting the seat. I would ask if he has not got the cut-off where he wants it to be without advancing the eccentric at all. I am not taking the admission into consideration. Now if he moves his eccentric forward 30°, in order to get the admission at the proper time, does he not get a cut-off 30° before the crank gets to 150°? It certainly seems so to me. A. We have looked over the passage in question, and the author's statement appears to be correct. Make a model with two pieces of paper and try the rule.

J. P. Jr. asks: How is plumbago applied as a lubricant on wood? A. Mix it with tallow.

G. S. asks: 1. Is there any work on hydraulics wherein I can find rules to calculate the diameter of pump plungers, suited to any diameter of water ram? I have a 20 inch ram and a 1 inch plunger; will the same plunger do for a 3 inch ram, keeping the pumps at the same rate of speed, etc.? 2. I have had occasion to change a large ram for a small one, and I do not get half the power. Why is this so? A. 1. You will find the subject treated under the head of hydrostatics in any good work on physics. See our advertising columns for bookseller's addresses. 2. Your small ram is not so powerful as the large one, because the pressure, other things being equal, depends on the relative sizes of the ram and plunger.

G. M. W. says: I have a twelve horse power portable boiler, which I use for heating purposes and running a small engine. I only run the engine once a week. Do you think that, if I brick the furnace up with one layer of fire brick inside, I could keep steam up easier and keep the fire all night? A. You might keep up steam more economically.

J. H. F. says: I have two boilers 5×16 feet, each containing 39 four inch flues. The grates are 4 feet 7 inches in length. The water that supplies the boilers is heated by the exhaust steam from engines, passing through a heater and lime extractor, and then introduced into the front end of boilers. The latter are perfectly clean, and yet the plates over the fire bag down from 1 to 3 inches. They have bagged the same way when water was pumped into the mud drum. Boiler makers here do not seem to know the cause, and their opinions vary accordingly. One thinks the iron too thick (⅜); another that there is too much heating surface, not allowing the water to circulate freely; and another, who thinks his opinion infallible, claims that the oil from the engine causes all the trouble. What is your opinion as to the cause? Do you think oil would have any such effect? A. If there is no scale deposited on the crown sheet, we imagine that the bracing is insufficient.

J. & T. G. say: In burning bricks, we find that, by mixing anthracite coal dust with the clay, the bricks are liable to swell, many of them presenting the appearance of large doughnuts. When broken, they have a dark gray metallic appearance, and are hard and brittle. It is usually said, when this happens, that the fire has been pushed too rapidly. No doubt this is true to a certain extent; for if the fires are kept low until bricks are well heated, there is little or no danger of it happening. But it is not absolutely true, because bricks that are in immediate contact with the fire will usually escape this swelling, while others, farthest removed from it, will swell. We think that it is caused by want of a sufficient amount of air to support combustion properly. Our chief reason for this view is that much of the coal in these swelled bricks is not consumed, and yet their appearance indicates that the inside of them must have been in a molten state. They look as if the material of which they are composed had been in a boiling condition, so great has been the heat generated within them. Moreover, in the individual brick, the swelling is greatest at the center; and when set close together, they will swell, while all the bricks around them that are set with space between them will be free from swelling. This exists in various degrees in some bricks; it can hardly be seen in others, as above stated. The discoloration of bricks where they rest on each other, is another objection to the use of coal dust Hence we cannot use it in our front or pressed bricks. Those parts of the brick where they rest on each other will be of a purple color, while the rest of the brick will be red. What we want to know is: Can any substance be mixed with the coal dust and clay that will supply the place of oxygen for the coal dust, so that it will not swell or discolor the bricks while burning, or cause them to become discolored when exposed to the weather? When we speak of coal dust, we mean the refuse or the coal yards. If this were ground fine, we think it would lessen the liability to swelling, but would not prevent the discoloration. A. The swelling of your bricks is due probably either to the escape of moisture in the baking, or the gases generated in the combustion of the coal. The red color of bricks is due to the red oxide of iron, which is formed during the intense heat of the kiln Where they press against one another the heat is less intense, and not sufficient to cause complete decomposition of the iron compound and the formation of the red oxide. This is the cause of the purplish color where the bricks were in contact in the kiln. There is no cheaper source of oxygen than the atmosphere. Grinding the coal very fine might obviate some of the difficulty.

F. E. says: 1. I have two small rooms, about 14x15 feet, which are separated by a closet 5 feet wide. I keep in each room a stove, but I think that perhaps one stove could heat the two rooms, if a drum could be put in one room and the pipe from the stove in the other room be led through into the drum. I wish the drum to be as near the floor as a stove. In order to do this, the pipe from the top of the stove must be lowered about 2 feet, instead of going upwards. Would the draft of the stove be the same? Would the escaping heat of the stove sufficiently heat the room by going through that drum? Is so, of what size and how constructed should the drum be? 2. By what kind of an attachment or connection, can a lever and a wheel be so arranged that, by turning the wheel always in one direction, the lever would move up and down? 1. Probably such an arrangement would answer. Any reliable stove dealer will fit it up for you. 2. A cam and yoke would effect the desired object.

T. D. Q. Jr. says: 1. I have usually cleaned my miniature engines with emery cloth: what is the best way to clean out any emery which may have fallen into the cylinder, steam ways, etc? I usually pour alcohol or benzine to kill the oil, and then let running water through. Is there anything better? 2. Is water, charged with oxalic acid until it will take up no more, too strong for cleaning brass? 3. Is it necessary to clean and polish with whiting, or will leather alone be sufficient? 4. What is about the proportion of muriatic acid and alum in gold coloring? Will the brass require to be washed with water when colored with muriatic acid and alum? 5. What kind of bronzing can be easily applied to brass like that used on gas fixtures? 6. What kind of gilt wash can be easily and firmly applied to iron? 7. What coloring or lacquer is applied to the brass snaps and window raisers which we see in cars, and which look as if they were taken out after being cast, the rough edges filed off, and then dipped into something? What is a good lacquer to apply to brass, already polished, to keep it bright? A. 1. Take them apart, cover the pieces with oil, and wipe clean. 2. We think not. 3. The addition of whiting will probably be an improvement. 4 6, 7. You will find directions about gold coloring, on page 43, current volume. 8. 5. See p.331, vol. 29. Dissolve 8 ounces of seed lac in one quart of alcohol.

J. B. G. asks: In an article in your No. 24, volume 29, on the ventilation of the Senate Chamber, it is said that the exhaust apparatus takes the air from the upper part of the room, which is contrary to the philosophy entertained by many in this part of the country. Indeed, all the buildings I know of have the air taken from openings in the floor, the idea of course being that the vitiated air, being heavier than pure air, is more easily taken from the floor; besides the warm air from the registers, rising immediately to the upper part of the room, is not drawn out before having performed its work. What is your opinion? A. It is impossible to give a general rule as to where the foul air of a room is to be drawn off, independently of all other considerations. The air may be heated before it is forced into the room; and if a current is established from the bottom, there is no objection to removing the air from the top.

H. J. asks: 1. Is it common for persons to lose their memory by fright? I was blown up on a steamboat some years ago, but not injured, and have not had my memory since. 2. I was on board a boat and she was blown up; I am positive there was a full supply of water in her boilers. There were some persons standing within 3 feet of the boilers, and some immediately over them. Some 25 were killed and wounded, yet no one was scalded. What became of the water? A. 1. Such action occasionally takes place, but we hardly think that it is common. 2. The hole may have blown out in the lower part of the boiler.

B. F. T. asks: Has any person a patent on the application of paper pulp to heated surfaces, as non-conductors of heat, as on steam boilers, pipes, etc? 2. Can india rubber be dissolved in water so as to be mixed with other substances and become dry and hard? A. 1. We believe there is such a patent. 2. No.

R. H. asks: How is paper prepared so that, when written with an iron stylus, the electrical current will discolor it? A. Dip common printing paper in a solution of ferrocyanide of potassium. The passage of electricity through the paper, thus prepared, makes blue marks, the salt being converted into Prussian blue.

N. O. J. asks: 1. If I have a round timber out of which I want to cut a rectangular beam, how can I find the sides of the beam expressed in function of the diameter of the timber? 2. What is the formula for the expansion of water by heat? 3. In Ganot's "Physics" there are the following formulas, by Dr. Matthiessen: $Vt=1-0{\cdot}00000253\ (t-4)+0{\cdot}00000083889\ (t-4)^2+0{\cdot}00000007173(t-4)^3$ between 4° and 32° C. and $Vt=0{\cdot}999695+0{\cdot}00000054724\ t^2+0{\cdot}000000011260t^3$ between 30° and 100° C.; but it is not explained what is meant by V and t. A. The side of the greatest square that can be inscribed in a circle is 0·707 of the diameter. 2. The first formula may be thus translated: If we call the volume of a given weight of water, at a temperature of 4° centigrade, unity, the volume at any other temperature, t, between 4° and 32°, is equal to one, minus 0,00000253 times the given temperature, diminished by 4, + 0·00000083889 times the square of the given temperature, less 4, + 0·00000007173 times the cube of the given temperature, less 4. The translation of the other formula is similar. Vt in the first member of the equation means the volume at the temperature, t, which temperature is to be substituted for t in the second member.

A. R. asks: How small in size did Newton say that our globe could be pressed or squeezed to free it of its molecules? A. We do not remember that Newton ever made such a statement.

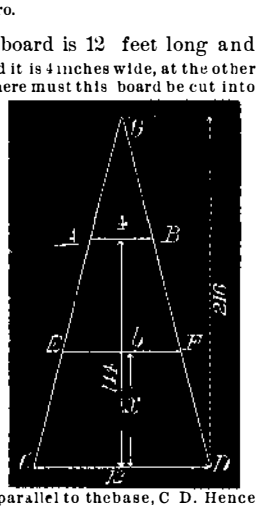
P. P. asks: What is the principal difficulty in running band saws in ordinary lumber mills, and why are they not used more extensively? Is not the power required to drive a band saw less in proportion to width of kerf, the rate of sawing being the same? A. The band saw is comparatively a recent invention, but already it is being largely introduced. We do not think there are any great difficulties in its use. The power required is not less than with a properly arranged saw of the ordinary kind.

W. R. G. asks: 1. In calculating the power of water wheels, is there anything allowed for friction? A. Generally, yes.

R. S. F. asks: Is there such a thing as a recording dynamometer for use on steam engines, water wheels, and other motive powers? A. We believe there are such machines, but they have not come into general use on account of their complications, expenses, etc. The field is still open for the inventor who can produce a better device.

D. M. L. asks: 1. How is the monthly average of a thermometer obtained? On some days, at the hour of observation, it indicates above zero and at others below. 2. What is the mean average of the following record for ten days: 1st, 10° above; 2d, 8° above: 3d, 3° below; 4th, 4° below; 5th, 2° above; 6th, 5° above; 7th, 1° below; 8th, 8° below: 9th, 9° above; 10th, 4° above: A. 1. Take the algebraic sum of the readings, and divide by the number. 2. The mean temperature, as shown by these observations, $=(10°+8°-3°-4°+2°+5°-1°-8°+9°+4°)+10=2{\cdot}2°$ above zero.

D. M. A. says: A board is 12 feet long and 1 inch thick. At one end it is 4 inches wide, at the other end 12 inches wide. Where must this board be cut into between the ends so as to have the same amount of lumber in each piece? A. Let A B C D represent the board. Suppose the problem to be solved, and that E F, or b, drawn at a distance, x, above C D, divides the board into two equal parts. It is thus required to find the value of x. It is easy to see that if the sides of the board were continued upwards until they met, as at G, the length would be 18 feet. We then have a triangle,



G C D, with a line, E F, parallel to the base, C D. Hence 216: 216 − x . : 12: b, and $b=12-\frac{x}{18}$. Having found the top and hight of the piece, E F C D, we can calculate the area, in terms of the sides, and make this equal to half the area of the board. Then $\left(12-\frac{x}{36}\right)\times x=576$. Solving this equation for x, we find the hight above C D, at which the board must be cut, is 4 feet, 7 inches, nearly.

A. L. asks: Can you tell me how to stain hard wood in imitation of ornamental kinds? A. This subject is a very complicated one, and a full description of the processes would occupy too much of our space. Your best course would be to obtain a good book on the subject.

M. asks: What is a good metal that can be melted over a charcoal fire, be easily dressed up for making models, and will be quite stiff when cold? I have been using lead, tin, and antimony, but think that perhaps I do not get right proportions. A. Increase the lead to make the alloy softer, and *vice versa*.

A. B. P. asks: How can I make an amalgam for an electrical machine? A. Take zinc 1 oz., grain tin 1 oz., mercury (hot) 3 ozs. Stir well together, and powder when cold. Mix with a little tallow.

A. Z. B. asks: 1. What treatment should paint brushes be subjected to so as to keep them from getting hard and matted together after using? A. Soak in linseed oil and wash the oil out with soapy water.

F. A. R. asks: 1. What are the meanings of the terms, golden number, solar cycle, and epact, found in an almanac? 2. How is coal tar made? 3. How is apple whisky made? A. 1. The cycle is the period of time after which the same days of the week recur on the same days of the year. This period of the sun (solar cycle) is 28 years, and of the moon's changes 19 solar years. The golden number is the number of the year in the cycle. To find the golden number add 1 to the date, and divide by 19. The remainder is the number. Thus 1874+1=1875÷19=98 and 13 remainder. The epact is the moon's age at the end of the year; and if we take the epact corresponding to the year's golden number, we can obtain the dates of the new moons, and thence the dates of Easter, Lent, and Whitsuntide. 2. It is a by-product of the distillation of coal, as in making illuminating gas. 3. By the distillation of cider.

L. J. O. asks: What are the use and meaning of the marks over certain letters, as in Professor Orton's letters? A. The marks you refer to are the accents on the letter n (ñ) in the Spanish language. The effect of the accent is the same as if g were before the n in French, as in Bologna (pronounced Bolonya). Thus in Spanish, cañon is pronounced canyon, peñas, penyas, etc,

J. S. asks: What has become of the boiler testing board? "I sent them a safety valve for trial, and would like to know what they are doing." A. They have suspended operations until spring.

S. H. asks: On what day of the week did September 21, 1817, fall? A. Sunday.

P. asks: How can I remove oil from a printed paper? A. Apply powdered French chalk, made into a paste with water and allowed to dry on the spot.

F. A. B. sends the following recipe for blackboard composition; Alcohol, ½ gallon; gum shellac, ½ lb.; lampblack, ½ lb.; Venice turpentine, 4 ozs. Dissolve the shellac in the alcohol, and add the other ingredients. If it gets too thick, thin with alcohol.

P. P. P. asks: 1. What makes a person shake when having a chill? 2. What causes the cold and hot feelings during a chill? 3. When death is caused by a congestive chill, what part of the body is so affected that it causes death?—G. B. asks: 1. How is the deep scarlet color of the geranium flower produced on wax? 2. How can I prevent white wax from turning yellow?—S. B. R. asks: How can I dye furs?—A. G. P. asks: Which is the largest pump in the world?—J. S. asks: Can any one estimate the annual cost of the artificial light used all over the world?—T. F. asks: How can I remove the smell of cod liver and castor oils?—J. H. asks: How is a hygroscope (a paper altering its color with the humidity of the atmosphere) made?—G. P. Z. asks: Is there any remedy that will remove hair from any part of the face, without leaving any permanent mark or signs of its application?

COMMUNICATIONS RECEIVED.

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

On a Specific for St. Vitus' Dance. By A. S

On the Phonetic System. By A. F. S.

On a Mathematical Discovery. By T. F.

On Ventilating a Church. By R.

On a Theory of the Origin of the Solar System. By C. D.

On Lunar Acceleration. By J. H.

On Minerals in Tennessee. By A. D. M.

On Steam Power in Philadelphia. By L. B. Jr.

Also enquiries from the following:

T. R. & S.—C. T.—J. J. K.—J. D. B.—G. W. B.—S. M. D.—Z. T. D.

Correspondents in different parts of the country ask: Who makes the best breech-loading shot gun? Who sells machines for making buttonhead rivets? Who makes kilns for burning charcoal? Who makes millstone dressing machines? 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 6, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air cooling, A. Muhl	146,267
Alkalies, package for caustic, H. B. Hall	146,179
Artist's ink slab, W. Keuffel	146,187
Auger bits, die for forming, J. Swan	146,212
Augercoupling, earth, W. W. Jilz	146,257
Bed bottom, Briel & Krieger	146,227
Bed bottom, Deal & Hobbs	146,125
Bed bottom spring, D. W. Whitaker	146,299
Bedstead and crib, C. Morgan	146,265
Bedstead, etc., invalid, I. M. Rhodes	146,281
Belt tightener, S. L. Gould	146,132
Billiard register, C. F. Washburn	146,218
Bit stock, Chandler and Folsom	146,123
Boiler, etc., locomotive, N. F. B. De Chodzko	146,171
Boiler water feed, etc., M. Reeve	146,145
Books, fastening leaves in, L. Messer	146,261
Boot counter stiffener, J. L. Hatch	146,252
Boot heels, G. W. Keene (r)	5,722
Boot heel, forming, G. W. Keene (r)	5,723
Boot heels, etc., nailing, J. M. Watson	146,152
Boot solecutter, H. T. Marshall	146,261
Boot, sole for, Pebbles *et al*	146,276
Boring apparatus, etc., earth, C. Pontez	146,202
Boring machine, G. Gardner	146,246
Bottle stopper, W. T. Fry	146,129
Bridge link bar, J. Christie	146,165
Brush, stove blacking, Inglis & Pinkerton	146,183
Buttons, etc., J. F. Bapterosses	146,223
Cage, bird, W. O. Grover	146,249
Cam sectional, J. F. Mallinckrodt	146,193
Car axle, lubricating, P. Bauer	146,160
Car coupling, X. Krapf	146,134
Car coupling, F. Thorpe	146,214
Car coupling, A. Willson	146,154
Car spring, railroad, J. W. Evans	146,238
Card for wrapping thread, H. Sutro (r)	5,725
Carpet fastener, F. Graff	146,248
Carriage, child's, L. P. Tibbals	146,215
Carriage seat, H. W. Quinn	146,278
Carriage top, J. Catrow, Jr	146,230
Carriage top, C. A. Dearborn (r)	5,720
Chuck, W. H. McCoy	146,262
Cigars, machine for molding, H. Dombrowski	146,126
Clamp, I. Kenney	146,190
Clamp, J. F. Schneider	146,207
Clamp, floor, R. C. Davidson	146,170
Clock dial, J. De Laforgue	146,236
Clothes dryer, F. Lyford	146,260
Clover, etc., thrashing, Lippy *et al*	146,137
Coal, etc., discharging, J. Foreman	146,242
Cooking apparatus, A. E. Neitz	146,142
Corn cob separator, Galt & Tracy	146,245
Corset, G. L. Eason	146,127
Cotton plants, sprinkling, W. T. Robinson	146,205
Cultivator, sugar cane, Von Phul & Mallon	146,21
Curtain tassel clasp, A. A. Lothrop	146,13
Curve scriber, I. Kenney	146,189
Cutter, rod, D. S. Merritt	146,138
Dental plates, alloy for, E. Conway	146,233
Digger, potato, R. B. Evans	146,174
Digger, potato, H. Strait	146,148
Drill chuck, H. M. Olmstead	146,143
Duster handle, etc., E. M. Forrester	146,128
Egg carrier, M. A. Franklin	146,243
Elevator, ice, J. S. Johnson	146,258
Elevator, water, T. J. Christy	146,231
Engine, steam, Field & Cotton	146,239
Engines, packing for steam, W. Beschke	146,122
Faucet, compression, J. T. Hayden	146,253
Fertilizers from waste liquors, B. F. Shaw	146,285
Flue cleaner, H. Freeman	146,176
Flue cleaner, H. Freeman	146,177
Flue cleaner, H. Freeman	146,178
Fork, horse hay, E. Mishler	146,195
Forms, cutting irregular, J. P. Grosvenor (r)	5,721
Fruit gatherer, W. F. Towns	146,151
Furnace mouths, arch iron for, T. Sharts	146,147
Furnace, portable, J. C. Brewer	146,226
Gage for edgers, S. Taylor	146,292
Gas nipples, holding, L. W. Stockwell	146,291
Gimp, covering strands for, R. C. Alton	146,222
Grain binder, Culbertson & Edgar	146,169
Grain, rubber for separating, Andrews *et al*	146,153
Grinding machine, W. J. Reagan	146,279
Grinding rolls, machine for, N. Gavit	146,247
Hammer eyes, forming, H. H. Warren	146,217
Harrow, wheel, E. Bayliss	146,224
Harvester, J. Beach	146,161
Hatchway, self-closing, W. A. Morrison	146,141
Hemming, etc., attachment for, J. T. Jones	146,135
Hinge, A. O'Keefe	146,270
Hook, whiffletree, J. Behel	146,121
Horseshoe blank, J. Russell	146,146
Iron, puddling, F. A. Lelaurin	146,259
Jack, lifting, E. B. Camp	146,235
Jack, lifting, R. Yale	146,303
Jeweler's hinge stock die, H. N. Page	146,272
Ladder fire escape, M. Parent	146,274
Lamp, ship's, Hinrichs *et al*	146,180
Leather, crimping, Thompson *et al*	146,213
Lock, bag, B. J. Riley	146,282
Lock, combination, A. E. Pickle	146,201
Lock for drawers, etc., J. Palmer	146,273
Lock, seal, J. C. Wands	146,296
Lock, permutation, W. Kock	146,191
Locomotive water supply, W. E. Prall	146,277
Loom shed, G. Crompton, (r)	5,718
Loomshed, G. Crompton, (r)	5,719
Mechanical movement, B. Frese	146,204
Mechanical movement, J. Woolf	146,301
Medical compound, P. Hunter	146,133
Medical compound, E. W. Ober	146,199
Medical compound, J. W. Tallmadge	146,149
Milling machine, D. Slate	146,287
Molding crucibles, P. Wilkes	146,220
Music holder, sheet, H. B. & G. S. Ladd	146,192
Music leaf turner, W. H. King	146,188
Nail, picture, J. O. Niles	146,269
Neck tie shield, S. H. Eisenstaedt	146,173
Nut machine, S. H. Wright	146,302
Optical illusions, T. W. Tobin	146,293
Ores, etc., sampling, J. Collom	146,167
Painting broom handles, J. Reif	146,204
Paper bags, making, C. T. Packer	146,271
Paper cutting machine, T. B. Dooley	146,237
Paper lining machine, B. F. Field	146,240
Photographic back ground, P. C. Nason	146,196
Pipes and tubing, W. V. Phillips	146,144
Plane guide, W. H. Shipe	146,208
Planter, cotton and corn, B. F. Hardwick	146,251
Plow, winged, I. A. Benedict	146,225
Pocket book, safety, G. B. Clarke	146,232
Powder keg, N. Tenney	146,150
Press, wine and cider, H. N. Houghton	146,181
Propulsion, marine, J. S. Morton	146,266
Regulator, draft, J. M. Adolphus	146,221
Roadways, etc., snow from, C. G. Waterbury	146,219
Roofing, metallic, A. Gateau	146,130
Roofing tile, B. Momenthy	146,140
Rubber and cloth roller, R. B. Hugunin	146,255
Saddle attachment, gig, A. Gilliam	146,131
Safe, fur, R. H. Miller	146,139
Sash balance, J. J. Cowell, (r)	5,717
Sash fastener, J. G. Spathelf	146,211
Sash pulley, M. Nelson	146,197
Saw mill, feed wheel for, J. Kerr	146,186
Scraper, foot, N. C. Burnap	146,228
Screw cutting machine, L. W. Stockwell	146,290
Separator, ore, J. Collom	146,168
Sewing machine, T. K. Reed	146,280
Sewing machine caster, J. A. Stansbury	146,289
Sewing machine cover, W. C. Wendell	146,298
Sewing machine water motor, O. J. Backus	146,120
Shaft tug, J. V. Ragon	146,203
Shirt, under, O. P. Flynt	146,175
Shovel, fire, Dodge & Ellis	146,172
Sign, alterable, L. Niclander	146,268
Soda water apparatus, J. W. Tufts	146,294
Sower, guano, C. Smallwood	146,288
Sower, seed, J. B. Nixon	146,198
Spindle step, B. H. Jenks	146,184
Spinning machine bolster, Follett & Potter	146,241
Spooling machine, S. K. Smith	146,210
Spring, suspender, G. K. Wingfield	146,155
Stereoscope, revolving, J. W. Cadwell	146,164
Stereotype block holder, J. Bryson	146,163
Stone, dressing, G. W. Weatherhogg	146,297
Stove, portable, F. A. Schroeder	146,283
Suspender spring, G. K. Wingfield	146,155
Swing bar, adjustable, Cameron & Talbert	146,229
Tablet, drawing, M. Willson	146,300
Thill coupling, E. P. Conrick	146,124
Tool handle, W. H. McCoy	146,263
Toy, G. B. Adams	146,157
Tracefastener, Rombaugh & Mears	146,206
Transplanter, F. B. Abbott	146,156
Trap, animal, C. Schweizer	146,284
Trap, fly, McCreary & Crist	146,194
Twine holder, Huntley & Esty	146,256
Valve, steam regulating, J. E. Watts	146,153
Vehicles, wheel for, F. H. Brinkkotter	146,162
Vehicles, wheel for, W. Corris	146,234
Vehicles, wheel for, C. H. Guard	146,250
Vehicles, wheel for, C. B. Wainwright	146,295
Velocipede, G. Avery	146,159
Washer, ore, E. Paul	146,275
Washer or buddle, ore, J. Collom	146,166
Washing machine, D. W. Linn	146,135
Washing machine, F. E. Smith	146,209
Water wheel, turbine, M. W. Obenchain *et al*., (r)	5,724
Windlass and crank brake, H. M. Howard	146,182
Wind wheel, A. T. Page	146,200
Wrench, H. P. Hood	146,254
Zinc from fumes, recovering, H. Sieger	146,286