

Business and Personal.

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F. M.'s lightning rod query is answered by anticipation on p. 347, vol. 30.—W. H. M. will find directions for making fusible plugs on p. 266, vol. 28.—D. A. will find a description of a filter for rain water on p. 241, vol. 27.—W. H. S. will find directions for placing a noon mark on p. 234, vol. 29.—J. K.'s query as to using a wider belt is incomprehensible.—W. H. S. will find directions for a walnut wood filling on p. 262, vol. 30, and for green and yellow bronze in the same paragraph.—S. J. S. is informed that making billiard balls of hard rubber is a very old idea.—B. F. S. is informed that his device for making a glue joint on thin stuff is not new.—A. Y. and C. R. should consult our advertising columns.

W. C. V. N. asks: 1. How is mesmerism explained? A. By the well known faculty with which ignorant and credulous people can be made the victims of charlatans. 2. Does it have an injurious effect on those who are operated upon? A. Yes, by allowing themselves to be deceived. 3. There has been a fellow around who claims to have a power to control which is not mesmerism, but he calls it animal magnetism and "mesmerism improved." Is it not mesmerism? A. They are both humbug.

J. P. asks: 1. What pressure will a boiler, 8 inches in diameter, 24 inches in length, with 3 flues 1 1/2 inches in diameter, stand, the shell and flues being of galvanized sheet iron 1/32 of an inch in thickness, with 6 hoops of the same iron 2 1/2 inches wide? The hoops and boiler are soldered and locked together strongly. A. The boiler will safely sustain the 10 or 15 lbs. you speak of. 2. Would such a boiler be apt to burn out in 6 or 8 months, using the boiler 15 or 16 hours a week with wood as fuel? A. Whether or not it will burn out will depend greatly upon the manner in which it is set. 3. Will the boiler make steam enough for an engine 2 inches in diameter by 5 inches stroke, making 150 revolutions per minute, the pressure being 10 or 15 lbs. to the square inch? A. Probably. 4. In case it will stand that pressure, will steam ports 3/4 inch long and 1/4 inch wide be large enough for an engine of that size? A. The size of steam ports you mention will answer very well.

A. X. & C. R. ask: What is the best kind of a skin for a banjo head? A. Parchment.

T. C. says, in reply to A. B., who asks in No. 17 for a formula for obtaining the force of the wind at different velocities: Wind blowing one mile per hour exerts a pressure of 0.005 lbs. to the square foot; as this pressure increases as the square of the velocity, the formula is V^2 x 0.005 = P. This may be calculated mentally by multiplying the velocity by half of itself and calling the last two figures decimals. For instance: wind blows 16 miles per hour: 16 x 8 = 128 lbs. pressure per square foot.

W. T. Y. S. asks: Why does a body projected vertically into the air not return to the earth with as great velocity as it had on leaving the earth? A. Because it encounters the resistance of the air in its descent.

S. A. T. asks: 1. What is meant by "parts," that is, in 10 parts, 6 parts, etc.? Does it mean parts by weight? A. Yes, unless otherwise expressed. 2. Can you give me a method by which I can make an attractive light in a store window? A. Use a small carburet and a silvered reflector. 3. Can you give me a recipe for coloring leather black? A. Use the recipe given on p. 357, vol. 30, leaving out the Prussian blue. 4. I have heard that Russia leather was red because the tanning process gave it both its red color and peculiar odor at the same time. Is this so? A. Russia leather can be dyed to any shade. The odor is due to birch tar, used in the tanning.

N. L. T. asks: 1. Would a candle burn in a boiler with a pressure of steam, provided it did not melt? A. No, because steam extinguishes a candle. 2. I made a plaster cast for a stereotype, which I dried 2 or 3 days on a stove; but when the melted type metal was poured on to it, large bubbles rose and spoilt the casting. What caused them? A. The moisture remaining in the plaster.

G. E. F. says: I wish to ascertain the pressure of the waves on a breakwater placed at right angles to the direction of the sea. Can you suggest a self-registering gage that will answer for the purpose, be strong enough to withstand the force brought against it, and not be affected by the water? A. The pressure of the waves is approximately equal to twice the pressure due to their height. It might be practicable to arrange a piston against which the waves would strike, producing compression of some substance in the cylinder, which would be registered on a recording gage.

A. B. D. asks: What is the best manner of applying the blowpipe to the lamp flame and to the work? A. Apply the tip of the blowpipe to the edge of the flame when a reducing flame is wanted, and insert it a short distance in the flame when an oxidizing flame is wanted.

P. C. says: We have a condensing engine for which we use city water; there is a stream 1,000 feet from us and 10 to 12 feet lower than our condenser. Could we draw the water that distance? If so, what rule would govern as to size of pipe, etc.? A. It could be done, but we scarcely think such an arrangement would be advisable. It might be better to construct a reservoir, near the condenser, lower than the source of supply, and conduct the water to that. We can, of course, give but a meager opinion, knowing so little of the details; and we can assure you that it is generally true economy to entrust a matter of this kind to an engineer.

O. M. asks: Would a galvanized sheet iron boiler, 12 inches high and 7 inches in diameter, be strong and large enough for an engine of 1 1/2 inch bore and 3 1/2 inches stroke? A. The boiler would not be large enough.

E. A. C. says: According to Seydlitz, one degree of the equator is equal to 15 geographical miles. A friend of mine pretends it is equal to 60 geographical miles. Is there a difference between a geographical mile in Europe and in America? A. You and your friend are both right, a German geographical mile being equal to four English geographical miles. It is to be observed that the length of a degree of longitude referred to is the mean length at the equator.

J. P. S. says: 1. I am driving light machinery from a countershaft driven by a three inch belt. What sized engineshall I require to do the work? A. You have omitted one very important particular, the speed of the belt. 2. How can I get rid of insects on garden peas? A. We advise you to change your seed.

A. A. A. asks: 1. Why is dried beef called jerked beef? A. It appears to have no connection with the original roots from which the verb "to jerk" is derived, and the etymology throws no light upon it. 2. What property of water is removed when it turns to ice? A. A portion of its heat, which is rendered latent or hidden when water changes from the solid to the liquid condition, and is given out again when it changes from the liquid to the solid state. 3. Why is ice lighter than water? A. Because, in freezing, water expands. 4. Do you know of any way of making vinegar from a material so that the vinegar will cost from 5 to 10 cents per gallon? A. See p. 58, vol. 30.

F. O. G. says: 1. I put a little nitrate of silver in some water, and then I put in some ammonia and some muriatic acid, and there was something in the bottle resembling chalk. Can you tell me what it is and what it is good for? A. It was a precipitate of chloride of silver. It is good for sensitizing photographic paper, when suitably applied. 2. What substances mixed together will make a blue color? A. Perchloride of iron and yellow prussiate of potash, both in solution.

A. S. asks: 1. What would be the effect of lightning striking a boiler under a pressure of steam? A. None, if the lightning is carried off by proper connections with the ground. 2. Is it dangerous to be about machinery during thunderstorms? A. There is thought to be danger in the presence of large quantities of metal. 3. Has a boiler ever been known to be exploded by lightning? A. We know of no instance of this.

J. E. E. says: I have in my possession an autograph letter written by Charles Sumner more than one year ago. By the use of a solvent (spirits of turpentine) I succeeded in making two dim press copies, barely readable. Every trace is perfect on the paper. Is there any process by which the ink colors can be brought out so as to be more prominent and readable? A. Cover the letters with solution of ferrocyanide of potassium, with the addition of diluted mineral acid (muriatic); upon the application of which the letters will change to a deep blue color. To prevent the color from spreading, the ferrocyanide should be put on first, and the dilute acid added upon it.

F. O. B. asks: 1. What is the surest method of preserving eggs for a period of 6 or 8 months? A. Mix together in a tub or vessel one bushel of quicklime, thirty-two ounces of salt, eight ounces cream of tartar, with as much water as will reduce the composition to a sufficient consistence to float an egg. It is said that this treatment will preserve the eggs perfectly sound for two years at least. 2. Is there any work published on the art of preserving meat, fruits, etc.? A. We know of none. 3. Has vegetable charcoal the same properties for purifying and preserving as animal charcoal? A. No.

T. J. P. asks: What chemical, if any, is best calculated to clarify sugar cane sirup during its manufacture? A solution of common lime has been used in South Carolina, but without much improvement in the transparency of the sirup. A. The method mentioned is the one generally recommended. But care should be taken to add the lime in quantity just sufficient to neutralize the free acid, which is known by its no longer reddening litmus paper.

J. H. K. asks: 1. Of what dimensions ought a boat, to carry from four to six persons, to be light, run fast, and be easily managed, to be? Can I make a propeller to be worked by hand and to be easily removed from boat when not in use? A. We could not answer this question without an extended article, and you can doubtless obtain all information from a builder. 2. Will a cistern 10 by 25 feet hold water enough to run a 12 horse power engine for 3 months? A. No. 3. Could a pipe be connected with the escape pipe of the engine so as to condense the steam and lead it back to the cistern? A. No.

K. asks: 1. What is the reason that American lathes are made with a fine-threaded leading screw (of 8 or 10 threads per inch) while the English ones have a screw of 2 or 4 threads per inch? A. It is easier to secure accuracy by making the pitch fine. 2. English change wheels (Whitworth) are 22 in a set, ranging from 20 to 120 teeth by 5. The American lathes appear to have only 14 wheels. What is the reason of this difference? Will the American lathes cut as fine and as great a variety of threads as the English ones? A. If the pitch of the lead screw is finer, it will not require so much intermediate gear for fine work, and for the same number of variations.

T. S. R. asks: Does a column of mercury measure 2 1/2-10 inches to the pound, which, in order to get 200 lbs. pressure, would require a height of 40 feet? A. It is approximately correct to allow 2 1/2-10 inches of mercury for each pound of pressure. For nice operations, corrections for temperature and for the pressure of the atmosphere should be applied.

L. P. O. says: My circular slide valve cuts off the steam at 1/4 stroke. The length of stroke is 24 inches, and the exhaust closes 2 inches before the stroke is completed (that is, at 22 inches) and opens at 23 inches. Is this an economical arrangement, or is there any well settled point at which the exhaust should close and open to give the best results? A. You do not send sufficient data; but if your engine works smoothly, the arrangement probably answers very well.

T. P. says: 1. I am about building a stump machine in which I wish to hitch the horse to a 20 foot lever, so that he will have to go three times around with the sweep while the stump lifts two feet perpendicularly, the change of motion to be got by bevel cogs. How many horse power will a machine so constructed give? How large should the cogs be to stand the strain? How many pounds would the machine lift? Of what size should the shaft that bears the weight be? The latter will not be over 5 feet long. A. You can readily calculate the theoretical lifting force of the machine by the relative distances passed over by the horse and lifter, which are about as 94 to 1. Of course, friction and other prejudicial resistances will prevent the lifting of a weight 94 times as great as the tractive effort of the horse. But you can design your machine on this supposition. 2. Which is best for a person when angry, to keep his rage pent up within him or (to use a common phrase) to "spit it out"? I refer to the effects upon the health or body. A. We believe that Mr. Meagles' advice to Tattycoram, to take time, when she was angry, and count five-and-twenty before acting, is applicable in most cases.

H. C. asks: 1. How can I produce on small articles of malleable iron the coppery appearance or finish like that on curtain fixtures? A. By a bath of sulphate of copper. 2. Where can fluor spar be had? A. See our advertising columns.

R. S. F. asks: What is the rule for calculating centrifugal force? Would 1 lb. on the periphery of a wheel 1 foot in diameter, running 100 revolutions per minute, have the same centrifugal force as the same weight on a wheel twice as large running half the number of revolutions in the same time? If I place 1 lb. on the periphery of a wheel and 2 lbs. on the opposite side, half way between the periphery and center, would the wheel be in running balance? If not, why not? A. Divide the weight by 324, multiply this quotient by the square of the velocity in feet per second, and divide by the radius expressed in feet. Calling r the radius, v the velocity in feet per second, w the weight, the expression for the centrifugal force is $\frac{w \times v^2}{324 \times r}$. By the application of this rule, you can readily answer your other questions.

J. K. W. asks: How can I find, on the surface of a revolving cutting iron, the exact shape for striking any given molding? A. Double a piece of paper, cut out the form of a section of the given molding, then open the remaining paper, which will have the shape of a section of the cutting tool.

H. H. D. asks: 1. Is a carbon battery more effectual with nitric acid in the porous cell than with the usual bichromate solution? A. Yes. 2. Please give me instructions for constructing an induction coil. A. See answer on p. x; page 3. To which current should the condenser be connected, and how many square feet should it contain? What effect does it produce? A. To the induced. Some of the large coils contain as high as seventy-five square yards. It intensifies the effect. 4. Would not eight layers of the primary wire produce greater intensity of the secondary current than a less number? It would certainly develop more magnetism in the core. A. Probably; you can easily try it. 5. Which is most effectual as an insulator, paraffin or shellac? A. Paraffin. 6. Is the insulation of the primary coil with shellac or paraffin as important as the careful insulation of the secondary? A. It should be thoroughly insulated, and is quite as important. 7. Should the fine wire be wound from end to end of the bobbin, or only in the center? A. From end to end. 8. Would it not be a good plan to wind the primary coil only at the ends of the core, thereby enabling the secondary to approach nearer to the magnet? A. It would not answer.

H. A. asks: 1. How can I make lemon sugar? A. To one quarter lb. sugar add about one half oz. tartaric acid. 2. Is Dr. Ure's "Chemical Dictionary" an American or English work? A. English. See our advertising columns for booksellers' addresses. Fowne's "Elementary Chemistry" is published by Blanchard & Lea, Philadelphia, Pa. In answer to your other question: We cannot recommend you to use any drugs which are dangerous in inexperienced hands.

H. H. G. asks: What is the best material or preparation to line or cover the interior surface of a wooden tub for silver plating, to prevent the wood from absorbing the cyanide solution, and leakage? The material must be durable and not affect operation of plating. A. Paraffin varnish will answer.

J. N. P. says: In Auchincloss' treatise on "Link and Valve Motions," on p. 27, he says: "The circle from remote ages has (though not wisely) been divided into 360 equal parts," but he fails to say why it is unwise. Will you be kind enough to do so? A. Because if the divisions were made on a decimal system, so that there were 100 degrees in the circumference, 100 minutes in a degree, 100 seconds in a minute, reduction would be much easier. For instance, to reduce degrees to minutes, it would only be necessary to annex two ciphers, and so on.

J. H. P. asks: What is the best sized pipe for an engine placed a hundred feet away from the boiler, the engine being 10 inches bore and 18 inches stroke? The boiler is 42 inches in diameter and 10 feet long. I contend that we can get the most power through a 2 1/2 inch pipe, but my employer says that we can get more power through a 2 inch one. Which is right? A. It is well to use as small a pipe as can be employed without reducing the pressure, if the pipe is not covered. We would recommend the 2 1/2 inch pipe in your case. 2. What is the difference between a low and a high pressure engine, and why does it take less steam for the low pressure than it does for the high? A. One condenses the exhaust steam, and the other does not. If there be less back pressure, as in the case of the condensing engine, of course less steam will be required to produce the same mean effective pressure.

H. W. S. asks: 1. What is the rule for calculating the revolutions of engines of circular saws? A. There is no rule; but a counter can be attached that will register the revolutions. 2. How can I calculate the revolutions of saws, run from countershafts? A. If you know the speed of the first shaft, multiply it by the diameter of the driving pulley, increased by the thickness of the belt, and divide by the diameter of the driving pulley increased by the same amount. This will give the speed of the countershaft. Then consider the driving shaft, and find the speed of the saw, etc. in a similar manner.