

Business and Personal.

**Business and Personal.**  
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**A. G. says:** I have a small sectional steam boiler, made of galvanized sheet iron 1-16 of an inch thick. It is made in the best manner, of good iron, thoroughly soldered and riveted. How much pressure to the square inch will it stand? How large a cylinder can I make for my engine, to run 200 revolutions a minute? How large a safety valve should I have? How large a balance wheel should I have? A. The boiler will safely sustain a pressure of 40 lbs. per square inch, if well built. Calculate the number of square feet of heating surface that it contains, and allow 15 square feet for a horse power in the engine. You can then proportion your engine accordingly, by rules that we have frequently given in former answers.

**J. B. asks:** What is considered a good result as the temperature at which the products of combustion escape into the stack? A. With natural draft, the gases should leave the boiler with about the temperature of the steam. Your other questions can only be properly answered by a manufacturer.

**T. J. M. asks:** 1. Where is the greatest pressure on a boiler? If I take a barrel and fill it with water, and then put in several pounds of gold in the bottom, and attach a pipe to the top of the barrel, and run it up fifteen feet to the bottom of a reservoir full of water, where would the greatest pressure be? A. On the bottom in each case, that is, if we have the correct idea in regard to the second query.

**M. F. K. asks:** Will it take any more pickets to go over a mountain 25,000 feet high than it will to go across the base of the same mountain? The pickets are to be the same width at each end, and to be perpendicular over the mountain. A. No.

**W. A. W. asks:** 1. How, when, and where did the April fool custom originate? A. There are many different opinions on this subject, the most common one being that it originated from a custom of the Hindus. 2. Can you tell who was the first black man, and where he lived? Was it the climate that made him black, or was the color natural? A. We expect that no fellow can find answers to these questions.

**W. J. R. T. asks:** 1. Is it known to be true that the moon has no influence upon the tides of our globe? A. No. 2. Has it any on the vegetable kingdom, or in any other respect? A. Not directly. 3. If the former is correct, what then causes the tide in the Bay of Fundy to rise to such a great height? Is the Gulf Stream the reason of it, by expansion by heat? A. It is on account of the form of the coast. 4. It would shorten the seaway considerably to certain ports of the Pacific Ocean if the Isthmus of Panama were cut through; why has this not yet been done? A. There are many in favor of such action, but, so far, the necessary capital has been wanting.

**W. N. J.—Lava in cooling absorbs water.** The moon has a very attenuated atmosphere. The tension of aqueous vapor varies with the temperature.

**C. B. L. asks:** 1. Are aniline colors poisonous in any way? A. Aniline is poisonous, but its salts are generally considered harmless. 2. I saw in your paper a recipe for keeping glue soft, by mixing a little nitric acid with it; is glue so made in any way poisonous or harmful, when applied to cuts, etc., as described in your paper? A. We think not. As to your other question, we have repeatedly given rules on the subject, which must now be familiar to all our readers.

**D. M. M. asks:** Can you explain to me the principles and workings of the hydraulic jack? Can I construct a small one? A. It works on essentially the same principles as the hydraulic press. By addressing manufacturers you can obtain illustrated circulars, explaining the construction. You can construct one, if you do not employ any of the patented details.

**C. W. W. says:** I am constructing a small flat bottomed sailing boat. If I make the stern quite square, and perpendicular to the surface of the water, that is, like the end of a drydock box, will the helm act, or will it be powerless unless a portion of the under part of the boat's stern is cut away? A. For an ordinary rudder, you must cut away so that the water can get at it. But if you are very desirous of building the square stern, you can steer with a rudder placed like an oar, so as to act at some distance from the stern.

**E. W. R. says:** 1. I am tending three engines. One is an 85 horse power, of which the slide valve is beginning to wear. Is this the fault of the engineer, or is it incident to all engines which are in constant use? A. It is not necessarily the fault of the engineer. It may be due to poor construction. 2. In Bourne's "Catechism of the Steam Engine" he says that one cubic foot of steam at a given pressure would just indicate one half the pressure if the space should be doubled. There are here 6 boilers side by side, three in a set: each has three gages of water. I let the fire go out under 3 of them, and blow off the steam. The other 3 have 60 lbs. pressure. I open the connecting valve, allow the steam to gain the same pressure in each set, and the steam gage indicates 48 lbs. in each. Is Bourne right? If so, please explain. A. Bourne's rule is approximately correct. As we understand your mode of making the experiment, three of the boilers are forming steam all the time, having fire in them, and the other three also make some steam, because the water has a greater temperature than that due to a pressure of 48 lbs. per square inch. 3. Comstock's "Philosophy" says that if you stand a pork barrel on end, insert a 2 inch pipe 50 feet high, and fill it with water, it would break the barrel. He said a 1/2 inch pipe would do it just as quickly as a 12 inch pipe. Is he right? A. Yes.

**H. S. W. says:** In your issue of May 30, G. S. F. asks: Why does the point of the needle of a surveyor's compass at times rise and adhere to the glass, and you reply that it is due to magnetic disturbance, and at times to the influence of local attracting forces. I think you have failed in this instance to point out the true cause of this occasional phenomenon. I have known surveyors to be greatly puzzled by it. It has happened often in my own experience, and is due to frictional electricity, produced by rubbing the hand over the glass. It occurs only in dry, cold weather, when there is little moisture in the air and none on the fingers. At such a time, should the surveyor in the woods find any small leaf, piece of a twig, or bark from a tree, fall upon his glass near the point of the needle, he brushes it away. The friction of his hand develops electricity, and he is surprised to find the needle glued fast to the glass, where it will remain for a long time unless he happens to know the cause and the remedy of the trouble. The glass must at once be moistened; and if there is no water at hand, he should spit upon it and rub it all around with the finger, whereupon the needle will be instantly relieved. I have often intentionally electrified my glass in this way for the amusement of the curious. So far as my experience teaches, this is the only cause of the phenomenon, and G. S. F. or any other surveyor can prove the correctness of the solution on any day when the required conditions exist, by actual experiment.

**R. asks:** What amount of coal is used in 24 hours on board the steamships in the New York and Liverpool trade in ordinary weather? A. It varies from 20 to 60 tons a day according to the size of the vessel and the power and construction of the engines.

**R. L. M. asks:** With what force does a weight weighing 50 lbs. strike on falling a distance of 2 feet? What is the rule for finding the force that different weights strike, falling different distances? A. It is proportional to the moving force or the momentum of the weight, which is found by multiplying the weight in pounds by the velocity in feet per second, and dividing by 32.

**H. W. B. asks:** How are tables of logarithms calculated, with 10 as the base of the system? For instance, log. 2 = 0.301030. By what calculation is the decimal 0.301030 obtained? A. The principle by which such calculations are made is the development into a series, by means of the binomial theorem. It would occupy too much space to give a full explanation in these columns. You will find the matter fully explained in Law's "Treatise on Logarithms," Weale's series.

**D. G. asks:** Is there any means by which gas can be obtained and used for light while the coal is being used for heating purposes? Is it possible to do it? A. Yes. In the manufacture of gas from coal, the coal remaining after the gas has been extracted (called coke) is used to heat the gas retorts; and the remainder is sold in market as fuel. The gas companies here sell large quantities of coke.

**E. W. S. says,** in reference to the "blowing up" question: "If the person lying down does not inhale all he can, and hold his breath, and the lifters do not both inhale and exhale (no matter if they do work together) it is impossible to raise him without straining the fingers while lifting; so it is not imagination that prevents the lifters from feeling the weight. If possible, please tell me why we can raise a person by the above means, and by those means only? A. So far as our experience goes, we see no reason to modify our previous answer, believing that the principal benefit of the inflation is to make all the lifters act together.

**J. F. asks:** 1. Does the outside of a belt run faster than the inside? A. Yes. 2. A friend says that, when an engine is on the up or down center, the piston is not exactly in the middle of the cylinder. I say it must be in the middle of the cylinder when it is on the up or down center. Which is right? A. Your friend. 3. Is the Science Record printed every year? A. Yes. As to your engine and boiler question, you do not send sufficient data.

**B. B. B. asks:** 1. How large a pipe is needed to give a full flow of water through twenty 1/2 inch faucets, from a tank 40 feet above the place supplied, all the faucets to be on the one pipe? A. It should have an area at least as great as the sum of the areas of the separate faucets. 2. What would be the pressure per square inch at bottom of said pipe? Is there a work on this subject that will answer all such questions? A. Divide the height in feet by 2.3, which will give, approximately, the pressure on the base in pounds per square inch. 3. Is there a work that treats on steam piping and heating by steam? A. We do not know of any works that will give you precisely the information you want. We can, however, recommend Trautwein's "Engineer's Pocket Book," and Tredgold's "Treatise on Ventilation and Warming."

**W. H. S. asks:** What is a sill level when you use a correct spirit level on it? A. It is level with the horizon, or the line between sea and sky.

**W. T. asks:** 1. Is the process of zincography used in America? A. Yes. 2. Is this process patented in the United States? A. No.

**J. W. asks:** Can a true cylinder be bored with a boring bar (not having a sliding head) on a slide lathe, said cylinder being bolted to the carriage and fed by it, when the boring bar is not in line with the lathe shears? I contend that it can be done only when the bar and shears are parallel. If bored when the bar is not in line, the cylinder may be straight but cannot be round. A. A cylinder bored by a bar out of true with the lathe shears will be true whether the cylinder feeds to the bar head or not, the only result of the bar being out of true is that the cylinder will be thinner at opposite ends on opposite sides; the bore will not be true with the outside of the cylinder but true of itself, nevertheless.

**H. W. S. says:** We have a boiler carrying 110 lbs. steam. If we put in another boiler of similar size, connected, would 55 lbs. pressure on each boiler do the same amount of work? If so, how would you calculate the horse power of an engine under such circumstances? A. It would not, under ordinary circumstances, with the same engine. We have frequently given rules for calculating the horse power of an engine.

**R. Z. J. asks:** What kinds of lenses are used in a wonder camera, what is their size, and how many are there of them? What are their focal distances, and how must they be set in the tube? A. Any double convex lens will do. Its size, focal distance, etc., depend upon the desired magnitude of the picture to be thrown upon the screen. How it is fixed in the tube can be seen by inspecting any photographer's camera. The wonder camera is now sold by opticians and in many toy stores, and can be purchased at prices ranging from \$5 to \$10.

**A. B. C. says:** I am unable to understand the working of the parallel motion illustrated in your number of June 13, and I beg you to explain further. On making a rough model of about the proportion of the engraving, I find that, as D A is about three times the length of D B, B can never arrive at A, as mentioned in your remarks, and that B can only perform about 1-6 of a circle about J. There is evidently something about it which I do not understand. Will you explain in your answers to correspondents how B can revolve about the center, F, without becoming disconnected from D and E? A. The circles were drawn for the sake of the explanation, and not to indicate that B made a complete revolution. That a circle can be changed into a straight line is manifestly impossible with the device. Its object is simply to do perfectly that which Watt's and other like mechanism does imperfectly, that is, to convert curvilinear motion into rectilinear motion with mathematical exactness.

**S. R. asks:** 1. What is the new parallel motion used for? A. For changing curvilinear into rectilinear motion, or vice versa, in any machine, suitable modifications being made in its form to suit various circumstances. 2. Is the walking beam still used on steamboats? A. Yes. 3. How is the parallel motion of the piston transmitted to the beam? A. There are various plans. See Bourne's "Handbook of the Steam Engine," or any other standard work on the same subject.

**E. W. B. asks:** How shall I make a sand wheel for wood? What kind of sand shall I use, and how shall I fasten it on? A. Make an ordinary wood wheel in sections; fasten leather round its periphery, then coat it with glue (about a foot at a time), and cover it with sifted white sand (sea sand will do) while the glue is hot, pressing the glue on with a piece of board. The leather may be recoated as often as necessary.

**G. C. U. asks:** 1. If the equatorial diameter of the earth is 75 miles more than the polar diameter, why is it that the Mississippi runs toward the equator? A. Because the source is further from the center of the earth's gravity than the mouth. 2. What is used to petrify human bodies? A. See p. 22, vol. 29. 3. Can you give me a recipe for sticking paper together? A. Use a stiff mucilage of gum tragacanth. 4. Who found the order of Free-masonry, and in what year? A. The origin of the order is too ancient to be definitely known.

**L. B.—This cone pendulum** is a heavy ball and rod, suspended from a tripod of brass tubes by four bits of watch spring, of which two are at right angles to the others, so that the ball may swing in a circle. The clock has a brake wheel, which is controlled by an electromagnet, so that the pendulum must rotate once in two seconds.

**W. F. M. says:** 1. I am constructing a small engine with a cylinder 2 inches in diameter x 2 1/2 inches stroke, intending it to run at about 175 revolutions per minute under a pressure of 5 lbs. per square inch. Of what size and weight should the fly wheel be? A. Reports 1/2 x 1/2 inch too large for such an engine? A. It will be sufficient to make it of such a size that it seems to be well proportioned to the rest of the machine. The steam pressure and size of ports will probably answer very well. 2. Is the D valve used in locomotives? A. No. 3. Can a perfect cut-off be obtained at any point of the stroke where the D valve is used in connection with link motion, by having a cut-off lever? A. No. 4. Would you have given a different answer to my previous questions, concerning steam engine eccentrics, had I said "being link motion engines in both cases? A. No.

**W. H. B. asks:** To what depth should I sink an artesian well after coming to water, so that the water will flow out at the top? If I strike water at 40 feet and have 8 feet of water in the well, how deep should the well be? A. No general rule can be given on the subject. It is usually necessary to sink an artesian well to a considerable depth.

**G. J. L. says:** I am building a small steam fire engine. I have the working part done, and it works smoothly and fast until water is turned on to the pump, then it draws the water until the water cylinder is full, and then stops. This trial was with a block tin boiler, 6x14 inches, over a charcoal furnace. The steam and water cylinders are both the same size, being 1 1/2 inches bore and 1 1/2 inches stroke; both have slide valves alike; it is upright, about 9 inches high, turning on a balance wheel 4 inches in diameter. The steam cylinder is at the top. Is it possible for me to get it to run on water at all with both cylinders of the same size? If so, by what means? Could it be run well with a very high head of steam? What pressure of steam would run it? Would a boiler and furnace combined, 14 inches high and 8 inches in diameter, do? The furnace takes up 7 of 14 inches, leaving the boiler 7x8 inches, with 12 one inch flues. The total heating surface of the boiler (not including the top, which would have considerable heat on it, on account of all the heat and smoke collecting there to get to the smoke stack) would be 2 square feet. This is the largest size of boiler I can put to it. A. We suspect that the trouble arises from improper adjustment of the water valve. The present boiler is very small, and so is the one that you propose. Still, you ought to throw some water.

**F. J. says:** I wish to suggest a change of manufacture of low pressure engines. Pass a stream of water from the tender on the cylinder from which the steam is transferred to the condenser. This will diminish resistance, and the steam will be condensed with less water, which has to be pumped against the atmospheric pressure. Horizontal cylinders would not be unequally heated, and the heat of the outside of cylinder would be disposed of. The cylinder would not contract. The heat of the piston would radiate, diminishing a liability to cleave to the cylinder and reducing friction. A. This would be going back to old practice. It is desirable to prevent, as much as possible, all condensation of the steam while in the cylinder.

**M. D. says:** I have a vat of 300 gallons of liquid which I wish to keep below 70° Fah. Having a cistern 6 feet square with 3 feet of water, I propose to build a vat of 150 gallons capacity, running a pipe from the vat into the cistern, using between 200 and 300 feet of 1/2 pipe for cooler, running the water from the 150 gallons vat through the pipe, back in under the 300 gallon vat. I can fix a pump to raise this 150 gallons of water, and run it through the pipes, using 2,000 foot lbs. to furnish a continuous stream. 2. We think that this proposed arrangement will answer very well.

**J. A. S. asks:** What is the best process for bending timber? I have a steam chest which I use, but cannot accomplish a satisfactory job. I often see the most fragile wood which has been bent without the least crack. I have reference to fork handles, shovel handles, wagon tongues, etc. A. It is done by securing the piece to be bent to a template, and bending it little by little, after successive steamings, if necessary.