### Business and Lersonal.

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NSWERS SPONCENTS

A. G. says: I have a small sectional steam boller, 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 heatingsurface that it contains, and allow 15square feet for a horse jower in the engine. You can then propor-tion your engine accordingly, by ru'es that we have frequently given informer answers.

J. B. asks: What is considered a good re-sult 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 runit up fifteen feet to the bottom of a reservoir full of water, where would the greatest pressure he? 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 pick-ets to go over a mountain 25,000 feet high than it will to zo across the base of the same mountain? Thenickets are to be thesame 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 com-mon one being that it originated from a custom of the Hindoos. 2. Can you tell who was the first black man, andwhere he lived? Was it the climate that made him black, or was the color natural? A. We expect that no tellow 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 king-dom, orinany other respect? A. Not directly. S. If the former is correct, what then causes the tide in the Bay of Fundy to rise to such a great hight? Is the Guif 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 ten-sion of aqueous vapor varies with the temperature.

C. B.'L. asks: 1. Are aniline colors poison-ousin 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 sameprinciple as the hydraulic press. By addressing manufacturers you can obtain illustrated circulars, exnlaining 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 fast 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 drygoods box, will the helm act, or will it be powerless unless a portion of the under part of the hoat'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 thesquare stern, you can steer with a rudder placed like an oar, so as to act at some distance from the stern.

H. S. W. SEVS: In your issue of May , 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 at-tracting forces. I think you have failed in this instance to point out the true cause of this occasional phenome 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 figures. 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 developes electricity, and he is surprised to find the needle glued fast to the glass, where it will remain for a long time  $u_{1-}$  less 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. F. S. or any othersurveyorcan prove the correctness of the solu ton on any day when the required conditions exist, by actualexperiment.

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 tuns 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 inpounds by the velocity in feet per second, and dividng by 32 2.

R. W. B. asks: How are tables of logar. ittm: calculated, with 10 as the base of the system; For instance, log. 2=0.801080. By what calculation is the decimal 0.301030 obtained? A. The principle by which such calculations are made is the development into \* 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 coa remaining after thegas 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 arge quantities of coke.

E. W. S. says, in reference to the "blowing up" question: "If the person lying down does not in hale 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 f om feeling the weight. If possi ble, 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 fasterthan the inside? A. Yes. 2. A friend says that. whenan 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 yourengine 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 X 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 at great as the sum of the areas of the separate faucets. 2. What would be the pressure per squareinch at bottom of said pipe? Is there a work on this subject that will answer all such questions? A. Divide the hight in feet by 2.3, which will give, approxi-mately, the pressure on the base in pounds per square nch. 3. Is there a work that treats on steam piping and heating by steam? A. We do not know of any works that will giveyou precisely the information you want. We can, however, recommend Trautwein's "Enzincer's Pocket Book," and Iredgold's "Treatise on Ventilation and Warming."

W. H. S. asks: What is a sill level with 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 zinco-graphy 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 athe, 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 barand shears are parallel. If bored when the bar is in line A. A cylinderbored by a bar out of true 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 oppo site ends on opposite sides: the bore will not be true with the outside of the cylinder but true of itself, nevertheless.

# [JULY 11, 1874.

A. B. C. says: I am unable to understand the working of the parallel motion illus trated 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 Als 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 some-thing about it which I do not understand. Willyou 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 same of the explanation, and not to indicate that B made a complete revolution. That a circle  $c_{4n}$  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 otion used for? A. For changing curvilinear into rectilinear motion, or vice versa. in any machine, suitable modifications being made in its form to suit varying 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 sub-ject.

E. W. B. asks: How shall I make a sand whcel 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 coatit with glue (about a foot at a time), and cover it with sifted white sand (sea saud will do) while the glue is hot, pressing the glue on with a piece of hoard. The leather may be recoated as often as necessary.

G. C. U. asks: 1. If the equatorial diameter of the earth is 25 miles more than the polar diameter, why isit that the Mississippi runs toward the equa-tor? 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 muchage of gun tragacanth. 4. Who found ed the order of Free-masonry, and in what year? A. Theorigin of the order is too ancient to be definitely known

L. B.—This coue pendulum is a heavy ball and rod, suspended from a tripod of brass tubes by four bitsof watch spring, of which two are a tright 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 2½ inches stroke, intending it to run at about 1.5 revolutions per minute under a pressure of 5 lbs. per square inch. Of what size and weights hould the dy wheel be? Areports % x % 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 auswer very well. 2. Is the U 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 laver? A. No. 4. Would you have given a different asswer to my previous questions, concerving 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 arteelan well after coming to water, so that the waan artesian well after coming to water, so that the wa-ter will flow out at the top? If [strikewater 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 considerable depth.

G. J. L. says : I am building a small steam freengine. I have the workingpart done, and it works moothly and fast until water is turned on to the pump, then it draws the water until the water cylinder is full, and then stops. Thistrial was with a block tin boller, 6x14 inches, over a charcoal furnace. The steam and water cylinders are both the same size, being 1% inches bore and 1% inchesstroke; both have slide valves alike; it is upright, about 9 inches high, turning a balance wheel 4 inches in diameter. The steam cyl oder is at the top. Is it possible for me to get it  $t_{o,th}$  ow water at all with both cylinders of the same s e. If so, by what means? Could the run well with a very high head of steam? What pressure of steam would runit? Would a boiler and furnace combined, 14 incress high and 8 inches in diameter, do? The furnace takes up 7 of 14 inches, leaving the boller 7x8 inches, with 12 one inch flues. The total beating surfs ct of the boller (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 slack) 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 thewater valve. The present boller 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 nanufacture 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 di-minish resistance, and the steam will be condenser d with less water, which has to be pumped against the atmo-speric pressure. Horizontal cylinders would not be un equally heated, and the heat of the outside of cylinder would be disposed of. The cylinder would not con The beat of the piston would radiate, diminishtract. ing 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 coniensation of the steam while in the cylinder.

St., Philadelphia, Pa. Send for circular.

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E. W. R. says: 1. I am tending three en-gines. One is an 85 horse power, of which the slidevalve is beginning to wear. Is this the fault of the engineer, or is it incident to all engines which are in cons ant ase? 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 cu bic foot of steam at a given pressure would just indi cate 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 a of them, and blow off the steam. The other 8 have 60 lbs. pressure. I open the connecting valve, allow the steam to gain the same pressure in each set, and the teamgageindicates 48 lbs. in each. Is Bourne right? If so, please explain. A. Bourne's rule is approximate v 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 tha pressure of 48 lbs. per square inch. 3. Comstock's "Philosophy" says that if 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 X inch pipe would do it just as quickly as a la inch pipe. Is he right? A. Yes.

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 cal-culate the horse power of an engine under such circumstances? A. It would not, under ordinary circum stances, 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 con-vex lens willdo. 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 wondercamera is now sold by opticians and in many toy stores, and can be purchased at prices ranging from \$3 to \$10.

M. D. says: I have a vat of 300 gallons of iquid 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 3g pipe for cooler, running the water from the 150 gallons wat through the pipe, back in under the 800 gallon vat. I can fix a numn to raise this 150 gallons of wafor the range of the pipes, using 2,000 foot lbs. to furnish a continuous stream. 2. We think that this roposedarrangement 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 bort 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 bendirg it little by little, aftersuccessivesteamings, if necessary.

D. S. H asks: 1. What fraction of a horse power will an average man exert by working a treadle? A. About one seventh. 2. In the description of the new domestic steam engine. p. 386, last volume, it is said: The boller contains water enough to turnish some 42 foot pounds for 4 or 5 hours. Does this mean  $\frac{1}{34000}$  of a horse power? A. Yes. 3. What is the best appliance to prevent Letts slipping on a wooden pu'ley? A. To make the face of the pulley as smooth as possible.

F. M. says: A friend of mine, in speaking of cosmical systems, describes them as machines moving without friction according to the laws of mechanical equilibrium, every part being physically connected with the rest. That, for instance, two bodies would form a couple, each moving with a force in the inverse ratio of mass and distanceround their common center of gravity. Whereas, in our solar system, there are many bodies, the moving force of each is one of a couple, the other being the mass of the primary on the opposite side of the center of gravity; there being, however, a common center for the system as a whole.

J. W. C. asks: How can I stick the bottom of a glass goblet to the bottom of a glass globe so that the goblet will make a standard for the globe, and the joint be waterproof? A. Use some of the cements sold at the drug stores for cementing glass.

J. C: W. asks: Can salt be used more than once in making ice cream, or does contact with the ice chemically change it into a different article from chloride of sodium? A. It is not changed. The salt could be recovered by evaporation and used again.

J. D. I. asks: With Mr. Ericsson's floating ball, if a great mountain could be suddenly placed by the side of it, would it not draw the ball over to that side of the cup next to the mountain? A. We think so.

F. M. F. asks: 1. Can you give me a recipe that will preserve a minnow, so that it will be flexible, to be used for bait? A. Try dipping it into glycerin. 2. Will mineral water keep if carefully sealed? A.Yes.

L. M. ssks: Is there a material, a good nonconductor of heat, that is suitable for covering glass blowers' tools? A. Porcelain is used for purposes similar to that mentioned.

J. E. L. asks: 1. What will be the best method for refines solder? A. Re-melting. 2. What is a recipe for gas fitters' cement, such as is used on iron pipe? A. 4 parts black resin, 2 parts brick dust.

B. W. S. asks: 1. Is the atmosphere heavier or lighter on a cloudy, damp day? A. The latter. 2. Why is it that smoke arises so much more slowly on a damp day? A Because the weight of the column of air which issues from the chimney and contains the smoke is equal to or greater than the weight of an equal bulk of the surrounding atmosphere.

M. E. W. asks: Does the increase of the thickness of ice, when freezing, occur on the upper or lowerside of the ice? A. On the lowerside.

J. A. H. says: An almost insuperable objection to the use, in Southern waters, of steam barges by parties for their private use and pleasure is the requiring, by government officials, of the employment of licensedengi eers and pilots. Is there such a law? If so, whydoesit not apply equally to New York as to Georgia and Florida? A. If the boat is used by the owner alone, it is not necessary to employ a licensed engineer. But if passengers are carried, or the boat is let to other parties, the case comes under the United States law.

F. H. A. asks: How is the gilding put on spetter trimmings for gas fixtures? A. With tin solder, fill all the holes and defects, and scour the piece by passing for a few seconds in a bolling solution of 100 parts water with 5 or 6 caustic soda, and rinse in freeh water. Then atcep for half a minute in a pickle of 1 part sulphuric acid in 10 water, and rinse with bolling water. Then put in scold or warm electro-bath of copper or brass un\*11 it is covered with a metallic coating, which will be the work of a few moments. If the deposit is black and dull, scratch-brush it, and dip again into the bath.

H. J. F. asks: Can you give me a recipe for removing medicine stains from white linen without injuring it? A. When we know the character of the medicine, a recipe can be given for removing the stain which it makes, but no general recipe can be given for removing all medicine stains.

H. A. B. asks: How can I soften finished machine work without discoloring or spolling the polish? A. Piace the finished work in a box made airright with clay, and pack around the work ishavings and turnings of the same metal as the work itself; let the box be kept in a furnace sufficient time to heat the work to a chall red, when the furnace fire may be allowed to go out, and hence the box to cool gradually; or otherwise, take the box from the furnace and cover it with ashes, lime or sand, so as to cool gradually, and your finished work will be softened without losing its finish.

F. C. B. asks: 1. How large should the core of so induction or Raumkorff coil be to produce the best effect? The coll is to be \$incheain diameter. A. See p. 379, vol. 30. 2. What is a commutator? A. A commutator serves to break contact or send the current in either direction. S. How long a spark should a coil \$inches in diameter and 6 inches long give? A. Tbis depends upon the size and quality of wire used, also upon the construction of the coil.

A. asks: Please give me a method of mixing walnut graining color in oil, so as to allow penciling in imitation of the growth. Icannet get the white shade behind the penciling. A. Grounds for graining are made of white lead colored to suit the special purpose.

O. A. Jr. says: Several of my neighbors own aspring of water together. Said spring is some 10 teet higher than my outlet. The main pipe runs up and into the reservoir in my kitchen, and makes a turn out and down ward and goes on to my neighbors below. In the bend in the pipe a small hole is made from which I receive my share of water. In order to have the water run out of the hole, I put in a straight compression cock, in the pipe leading from the tub: and closing said cock would back up the water and make it run as I desired for a few days, then sediments of some kind would collect and partially stop up the hole in the cock; then I would get more than my share of water. The water in the spring is clear, and there is a good copper strain er at the spring. Can I make a filter of some kind to put in at the spring matter in the pipe? A. Probably you can overcome the difficulty by using a valve which will give the full opening of the pipe.

T. M. J. asks: 1. Water is composed of 8 parts oxygen and 1 part hydrogen gas. Can these gases be separated? A. Yes, by the galvanic current. 2. Are gingerdrinks injurious to the health? A. No, if not taken immoderately.

G. B. S. asks: In your answer to L. E. R., for a polish for walnut, you say: "Melt 3 or 4 pieces sandarac of the size of a walnut, and add 1 pint boiled oil and 1 dram Venice turpentine," etc. You must use something else besides sandarac, as it will not melt in oil. You can dissolve it in alcohol or turpentine, but it will all curdle up as soon as it is mixed with the oil. A. Melt your gum separately, and then mix with boilinghot oil.

P. S. asks: 1. Will it do to run lightning rods into a cistern of water outsidea house? Would it injure the walls of the citern? A. The walls of your cistern would probably remainint act until the lightning struck. 2. Will it do to have 4 points of lightning rods all drawn together and down one rod to the cistern? A. There would be nothing gained by multiplying the points in the way you speak of. The safety of these rodeconsists mainly in their stoutness.

P. says: I have a piece of machinery with polished iron shafts. It stands in a damp place. What varnish will effectually prevent rust, without injuring the polished surface? A. It will be your best plan to buy some transparent varnish from a manufacturer.

P. V. J. asks: 1. In working a telegraph the keys and receivers of which are  $\frac{1}{2}$  of a mile apart' do I need an intensity or a quantity battery, and how, is each made with a Bunsen battery? A. Connecty our zunc of one cell with your copper or platinum of the second cell. 2. In what proportion should I mix sulphuric acid and water for a Grove battery? A. About seven of water to one of acid.

D. H. H. asks: 1. Is the black lead known as German lead (not plumbago) found abywhere else than in Germany (Bohemia)? A. Yes, in many places in this country. 2. Is it supposed to exist in sufficient quantity to supply the large demand for it for foundry facing, polish, etc.? A. Yes, in sufficient quantities to last many years.

F. E. W. says: Some time ago I noticed among queries the question: What will remove Indian inkmarks? Your answer was, I think, that you knew of nothing. I have just come across the following: Rub well with a salve of pure accetic acid and lard, then with a solution of potash, and finally with hydrochloric acid. Sometimes these marks may be obliterated by bilstering the skin and keeping the bilster open for a while. When the new skin grows the marks will have disappeared. A. These remedies are a good deal worse than the Indian ink stains. They amount to an absolute removal of the skin.

R. F. L. asks: 1. What preparation can I apply to large wooden friction wheels to prevent alivering up on the face? A. There is no effective method of preventing the slivering of large wooden friction wheels. 2. What kind of paper is used for small friction wheels, and how is it used? Is it clamped between fanges, with or without glue, or is it put on in layers with glue? A. Paper friction wheels are of thick brown paper, put together in layers without glue, under hydraulic pressure.

F. H. L. asks: Will you give me a rule for computing the length of a pendulum rod for any clock in any part of the world, as clocks require longer or shorter rods according to locality? A. We suppose you refer to the length of the seconds pendulum. Its length in feet= $326058-0.008318\times$ the cosine of twice the latitude of the place. Having found the length of the seconds pendulum, that of any other can readily be calculated by observing that the vibrations mase by two pendulums, in a given time, are inversely as the square roots of their lengths.

S. R. L. asks: What sized boiler shall I use for an engine  $3\frac{1}{2} \times 2\frac{1}{2}$  inches? What should be the weight and size of the fly wheel? A. Calculate the probablepower from the proposed speed and pressure, and allow from 15 to 20 square feet of heating surface perhorse power. Make a flywheel from 12 to 15 inches in diameter, weighing from 50 to 60 lbs.

F. H. asks: I am using a powder, for welding steel raths into frogs, which I believe is composed of caustic soda and borax. What does caustic soda add to the welding properties of the powder? It is very bad for the health of those using it; and if you could inform me of some flux that I could use for welding steel ratis at a very highheat, to keep them from cracking, i would be thankful. A. There are several patent compounds in the market, but we know very little in regard to their merita. If you insert a notice in our "Business and Personal" column, you will probably hear from the manufacturers.

G. F. T. & Co. ask: Please give us the best manner of cleaning gilt frames. A. Use a sponge moistened with urine or oil of turpentine.

E. W. says that W. E. M. can bleach tallow without injuing it, as follows: Heat the tallow to 120°, keep it hot at least 50 minutes, then dash water into it, and stew the water and tallow for a few moments. If correctly done, the tallow will be in small lumps like shot, or butter when it first comes in the churn. Skim the tallow and melt it again, remove all the water and stir the tallow while cooling; this makes good tallow for some purposes. I do not know much about an engine cylinder; but for launchioga ship, the tallow must be freshly rendered beef tallow. Five per cent of mutton tallow will spoil launching tallow. Mutton tallow will not slip like beef tallow. Tallow can be heated until it will scorch a feather without apparently injuring it; but it will not slip after that, but will dry like linseedoll. For friction, use beef tallow rendered before decay commences, with but ittle boiling; for belte and the like, mutton tallow is best. For paint or making a hard surface, superheated tallow is best, because it will not slip.

J. H. J. says, on the subject of draining a cellar, p. 379, vol. 30: My cellar is sunk in clay ground, and after heavy rains would be flooded with water comingin below the wall. In such a case the cellar wall should be built on a trench filled with broken stone, with a tile or a broken stone drain to an adjoining low ground. My walls not having been so built, I proceed ed thus: I made a slight trench at the inner foot of the outer wall, so as to catch the drainage, which was all brought to the front and carried under the wall. I then made an outside drain, five feet deep to one foot deep, in which I laid a brick drain (brick on edge covered with cross brick) and refilled the trench. This was 35 years ago. Occasionally I am toid that water is stand-ing in the cellar floor. By way of instruction, I takem y informant to the outfall of the covered drain and, with my cane, removes few leaves which had gathered upon the opening, and forthwith a bright stream of water wouldflow out. At the same time when I made these drains, I dag a well in one of my cellars to the gravel bed below (12 feet) walled it with bricks and covered it securely. Into this well are made drains, 10x12 inches, filled with broken stone and covered with earth, which keep every apartment dry. I have no need of cement and prefer the dry clay. Beds of solid clay have drain-Many years ago I purchased a lot adjoining my own grounds: this lot had on it a small brick house. under which was a cellar so frequently filled with water that the family occupying the house used the cellar as a cistern. Within my own grounds I made a large cave, covered with logs and earth, for storing vegetables in winter. At times the bottom of the cave would be almost filed withinflowing water. To remedy this, I dug and walled a well in one corner of the cave down to the gravel. The remedy was complete, and after that the cellar spoken of, distant sixty leet from the well, was drained and dry

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

W. S. V.-No. 28 does not contain tellurium. It contains silver, copper, arsenic, and antimony, and the green color is due to the second and fourth of these substances. No. 26 is a variety of the rare mineral orthite, having a specific gravity of 3.74. No. 27 is a variety of serpentine of unusual hardness and high specific gravity (274), and is probably to be referred near the variety bowenite; No. 29 is prehnite.-P. S.-No. 11: amphibole. No. 2 is ferruginous sand rock. No. 3 is minute rock crystals on bluish quartz. No. 6 is pe lock coal. No. 7 is magnetite imbedded in quartz. No. 6 is pe lock coal. No. 7 is magnetite of alumina, and lime (very small quapitity). It will not burn to a stone when kept at white heat for 10 minutes. What was done to it to make it burn to a stone?

S. C. H says: I have a drawing in Indian ink on tracing cloth. I wish to mount it by pasting on a paper background, and then varbish the surface. What kind of paste and varnish should be used ?-W. C. says In your last issue E. H. R. asked : In the driving wheel of a locomotive, where does natural philosophy place the fulcrum, the power, and the weight, respectively? I think that the axle bearings are the fullers, the press-nre of steam in the cylinder the power, and the locomotive the weight. [This general idea is correct, but some ers will point them out.-EDS.]-J. A. asks: What is the molus operands of putting on the seed bag on well tub-mg to stop water in rock boring? The bore of the pres ent hole is 5½ inches diameter and 500 feet drep; we are going to bore 500 feet more of 2½ inches diameter.—W. Z. asks; Can you give me a formula for a jet black sten cil ink that will not rub off when handled or exposed to the weather ?-F. W. M. asks: How can I stain bamboo and rattan a black color?—M. J. S. asks: How can luk ribbons for hand stamps be saturated with inks of dif-ferent colors, and how are the inks prepared ?—R. S asks : How can I take the moldiness out of hams? What willpreventaham from molding without injuring its taste ?-W. H. G. asks: What will protect gold jewelry from the stain caused by heat of the blaze while soldering? The trouble with borax is that it runs the solder in the wrong place.-J. S. W. says: We all know that when a freshgreen board or plank is first exposed t theair, it will shrink from its original size. Now if hole be drilled in the middle of it, say of an inch in d ameter, will the hole remain of the same size? Will hrink longitudinally or transverse'y with the shape the plank, or both?-W. F. W. asks: How can I gla earthenware jugs, also the snuff jars used in tobace stores?-O. P. B. asks: Howcan I paint an outside do so as to prevent its blistering, cracking, and peeling?

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.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

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 auch enquiries.

[OFFICIAL.]

## **Index of Inventions**

#### FOR WHICH

Letters Patent of the United States WERE GRANTED IN THE WEEK ENDING

### June 9, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Bagholder, B. B. Downs	151,869
Baggage seal, F W. Brooks	151.749
Bale tie, G. B. Ford	151,770
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Boat, life, F. J. Frackell	151,767
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Boiler, steam, C. H. Haswell	151,777
Boiler, wash, H. Calkins	151,838
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Siamp. Britton & Thayer	151.680
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clothes wringer, Witzil & Hawkins	151,947
coal, etc., unioading, J. Foreman	151,868
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louton statas, putting, J. Sampson	151.800
	191.9.8

T. A. P. asks: How can I bronze tin or any white metal? A. Try the following: Take 1 plnt strong vinegar, 1 oz. sal ammoniac,  $\aleph$  oz. alum,  $\aleph$  oz arsenic; dissolve the three last in the vinegar, and the compound is fit for use.

H. W. D. asks: What is good for a pain in the lower part of the back? I have a friend who has been sflicted with a pain in the lower part of the spine for about eight years. Would not electricity, applied by a good operator, be good? The spinal marrow and nerves appear to be affected. Would not electricity tend to irritate and excite the nerves? A. Electricity under the direction of a physician skilled in these matters, is frequently applied with benefit in such cases.

J. S. asks: How can I bend glass tubing ? A. By beating the tube, slowly revolving it at the same time, in the fiame of an ordinary gas burner. It should be held in the same direction as and not across the fiame. When it softens take it out, and bend very gently. Repeat until the proper curvature is obtained. This method gives a beautiful curve. When cold, wipe off the soot.

A. A. W. says: I am running a pair of 18 inch engines; they both exhaust into one pipe. Would there beany difference in power if each engine had a separate exhaust, and does not the exhaust of one engine throw a back pressure on the other? A.It depends a great deal upon the size and arrangement of pipe. If properly proportioned, one pipe will snswer as well as two. As to your query on water pipes, you do not send sufficient details.

G. A. N. asks: Will a hoiler 10% inches diameter x 26 inches high, with 26 one inch tubes 12 inches long, made of 36 iron with flue sheets x inch thick, be of sufficient cspacity to drive an engine of 2 inches bore x 7 inches stroke? What pressure would such a boiler carry with safety? A. The boiler is rather small.

W. H. S. says: In an argument on cannons, an Englishman asserted that the largest guns in the world weremade in England. This the American would not admit, saying that the 20 inch guns at the Ripraps or Fortress Monroe, were the heaviest. A. We believe that some 20 inchguns, the largest of which we have heard, have been made in Europe.

#### COMMUNICATIONS RECEIVED.

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

On Railway Earthwork. By J. B. On the American Log. By S. B. On Cobalt and Nickel. By G. W. B. On Raiding Ants. By J. S. D.

Also enquiries and answers from the following: C. W.-W. N. W.-H. W. D.-F. W.-F. H. D.-G. T. B. S.-G. S. R.-J. H. W.-R. A.

	Cow fetter, H. J. Sadler	151.9'8
10	Crane, hydraulic hoisting, J. L. Pennock	151.910
a	Cultivator, H. Cargo	151 839
u-	Cultivator, J., D. W., & W. J. McGee	151.789
u.	Cultivator, W. M. Watson	151.733
01	Curry comb. L. Draper	151.764
zę	Cutter, sausige meat, J Knopp	151,789
20	Cutter, vegetable, W, Kimmel	151.884
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	Dovetailing machine, W. F. Moody	151.710
	Drawers, E. Well	151.814
	Drawing and spinning top roll, J. T. Harris	151,697
N	Drill chuck, G. Odholm	151,714
е.	Drilling machine, metal, F. E. Reed	151,912
_	Drum, T. Rawson	151,797
18	Dyeing cotton yarn, R. & J. Garsed	151,694
	Eggbester, W. O. Crocker	151,761
	Egg beater and mixer, J. F. Landis	151,784
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