(23) C. J. H. asks: Will water always seek its own level? We have in our factory a coil of pipes; and at about fifty feet from the coil, we have a tank which holds about 40 barrels. The bottom of the tank is about 12 feet above the top of the coil. We cannot induce water to flow through this coil from the tank. We can readily attach our pump and force it through, but the water will not flow through of itself. Can you explain the trouble? A. It is probably due to the accumulation of air at the high points.

(24) J. M. S. says: I am running a locomotive, and her slide valves are nearly worn out. They are 15 inches long and 5 inches wide, and flat on top. Will it reduce the friction caused by the steam pressure on the valve if I make the new ones in the shape of a half circle instead of flat on top? A. No.

(25) B. B. says: We have an engine with cylinder 8x6 inches, furnished with steam at 60 lbs. pressure through a 2 inch pipe 550 feet long, the pipe being about 8 feet underground. Can we, at that distance, get the full benefit of the steam? A. The engine is large enough, but it is probable that the steam pressure is greatly reduced in passing from the boiler to the engines. If this is the case, it is due to an improper arrangement of the pipe; and you can easily satisfy yourself in regard to the facts by attaching a gage to the steam pipe, near the engine.

(26) W. H. M. asks: In building a large smoke stack, is it advisable to have it octagon in form? Would not storms have a better chance to blow such a stack down than if it were circular in form? A. One form will answer as well as the other.

(27) C. W. asks: Please decide who is right in the following question: The subject is the drive wheel of a locomotive engine supposed to be standing still on the track. I claim that, when the wheel slips, on the starting of engine or when the steam is let on suddenly, any point on the wheel makes a complete circle; but when it makes a revolution in running, it does not make a complete circle. My friend claims that the point on the wheel forms a complete circle in any case. A. When the wheel advances in revolving, each point in the periphery describes a cycloid, a curve resembling a series of semicircles or semi-ellipses.

(28) C. B. W. asks: 1. Is not the side of the firebox of a locomotive boiler the place where contraction and expansion is the least? A. Generally, yes. 2. What shall I put on my engine to keep the bright work from rusting? A. Keep it well oiled; but you will be obliged to clean it often.

(29) J. H. asks: 1. I have a boat 15 feet long by 4 feet beam, a vertical engine, cylinder 3 inches in diameter, by 2½ inches stroke, and 3 cylinder boilers 8 by 24 inches each, made of $\frac{3}{32}$ inch steel with heads $\frac{3}{16}$ inch thick, connected by a steam dome. I mean to throw the exhaust into the smoke stack. What pressure can I carry with safety? The boilers have stood a hydrostatic test of 175 lbs. per square inch. A. About 150 lbs. 2. Will the boilers be large enough for the engine? The grate surface is very large, being 24x24 inches. A. Yes. 6. Will the engine be large enough for the boat? A. Yes. 4. What size of screw propeller shall I use? A. Diameter, from 15 to 18 inches; pitch, from 2 to 2½ feet.

(30) G. A. S. asks: 1. What is the horse power of the largest engine in the United States, where is it, and what is it used for? A. We are not sure that we can answer this question correctly; but if any of our readers will send us particulars, the matter can soon be decided. 2. How is the power of a locomotive estimated? A. Builders generally rate locomotives by the load that they can draw under given circumstances.

(31) A. W. says: In your issue of May 15 you say: "When you find that the water is below the bottom gage tap, and the steam is rising rapidly, you should haul the fire at once." If you are gaining steam, and then start and haul the fire, you will gain from 10 to 15 lbs. more, as I have experienced in locomotives. I would recommend this: Fill the furnace with coal so as to choke the fire, keeping the engine and pumps on until you get water in gage glass or steam gets low, then haul the fire if required. How would that do? A. In this case it might not be advisable to start the feed; and if you could stop forming steam more quickly by throwing coal on the fire than by hauling it, you would find the quickest way to be the best way. We believe that, in general, hauling the fire will be most efficient. 2. We have a direct acting locomove engine with cylinders 16 inches in diameter by 24 inches stroke. Steam pressure is 150 lbs., and driving wheels 5 feet, four wheels coupled. She weighs, when coaled and ready for running, about 47 tuns. What is her horse power? A. We could not answer this question without having some idea of the mean pressure in her cylinders.

(32) C. E. R. asks: Will a brass spring ½ inch wide, $\frac{1}{16}$ inch thick, and 2 inches long, lose its elasticity under ⅛ inch depression in the middle? A. Not for a long time, and the elasticity can be restored by hammering.

(33) C. R. P. says: We have a brick smoke stack, 70 feet high, and burn wood shavings: when we have not sufficient shavings, we burn anthracite coal; the draft is strong enough to carry out large sparks, and we put a screen of No. 10 galvanized wire over the top, which was used up in 6 months so that we could pick it to pieces; and the copper wire (No. 10), with which it was fastened on, was also eaten up. Is there anything that will do for such a screen? A. Use heavier wire.

(34) C. T. S. asks: What fractional part of the breaking weight of the best steel wire rope, as used for mining cables, is allowed for a permanent load? A. About $\frac{1}{7}$ or $\frac{1}{6}$.

(35) W. F. S. says: I have been using water for a steam boiler from a tank into which the drip from the engine cylinder goes, and the water is consequently quite oily. The tank also takes the drip from the heater. Do you think the water is injurious to the boiler? I have thought that the oil might adhere to the iron of the boiler, and prevent the water coming in contact with it, and so turn the iron. A. You will find it better to use clean feed water; although if the oil is of good quality, and is not excessive in quantity, it will not do any serious harm.

(36) M. A. R. asks: How long would either native or vulcanized rubber endure as a packing for kerosene oil? A. Possibly for a few days.

(37) A. B. says: 1. We have a pump with a steam cylinder 15 inches in diameter, and a water cylinder of 10 inches diameter. The ram is of 10 inches diameter, and discharge opening 8 inches, discharge pipe 6 inches; we pump the water vertically 200 feet. It requires 60 lbs. steam to run the pump. Would it require less power, or more, to pump the water through a 10 inch pipe? A. It would require less power, if the pipe were enlarged, but not much, unless the pump is run very fast. 2. Would the entire weight of the water in the 10 inch pipe rest on the pump ram? A. The pressure on the pump ram, due to the hight of the column of water, is independent of the size of the pipe; but as this pressure is increased by the resistance of the water in the passages and pipe, it is greater for a large pipe than for a small one, if a similar quantity of water is discharged through each.

(38) A. M. P. C. asks: 1. I have a double engine, cylinders 1½ inches bore by 3 inches stroke. Will a plain cylinder boiler, 1 foot in diameter and 4 feet long, set in brickwork, be large enough to run it up to its full capacity? A. The boiler would be rather too small. 2. If the boiler aforesaid be constructed of $\frac{3}{16}$ iron, how great a pressure could be carried with safety? A. If well made, it would be safe to carry a pressure of 150 lbs. to the square inch. 3. How much grate surface should be allowed? A. Make the grate 1 foot square. 4. What should be the dimensions of the smoke stack? A. From 5 to 6 inches in diameter.

(39) L. L. H. asks: Will Babbitt metal do to make a 3 x 1½ inches cylinder for a steam engine? A. A hard Babbitt metal will wear very well.

(40) L. C. & Co. say: Your reply to E. A. (No. 14, January 30, 1875) regarding draft of street car interested us, but we are quite unable to agree upon the meaning of your reply. We admit and believe that, if the end of the axle of a wagon stands equally high with the point of draft on a horse's shoulder, it makes no difference how far the horse is from the wagon; but suppose the axle to be 2 feet high, and the point of draft on the horse's shoulder be 3 feet high, will the horse draw a load as easily 10 feet from the axle as he will 2 feet from the axle? Is it not easier for a horse, under ordinary circumstances, to be harnessed close to his load, so that the act of drawing lifts a certain amount upon the load? A. It is better to harness the horse so that his whole force is expended on traction, and none on lifting.

(41) N. O. P. asks: What is the rule for measuring the inside of a furnace stack? I wish to know the number of bricks it will take to line it. A. Find the solidities of two frusta of cones, each having for its altitude the hight of the chimney, one having for its diameter that of the interior of the lining, the other of the exterior. The difference between these two volumes will be the volume of the lining.

(42) F. S. Jr. says: Bourne, in his "Catechism of the Steam Engine," states that "if we take the tensile strength of cast iron at 15,000 lbs. per square inch, a fly wheel rim of 1 square inch sectional area would sustain 30,000 lbs." Please elucidate the above for me by stating what is meant by a rim of 1 square inch sectional area. A. It means that, if the rim is cut in the direction of a line passing through the center of the wheel, the area of the cut end of the rim will be 1 square inch.

(43) W. asks: 1. Is it possible to drive a vehicle, large enough to carry a man, by spring power? A. Yes. 2. How large or strong a spring would be necessary? A. You can readily calculate the required strength of the spring for any proposed arrangement of a vehicle of given weight, assuming that the tractive force required, on a good road, will be from 80 to 100 lbs. for a vehicle weighing 1 tun.

(44) R. H. A. says: I have an engine with a utilized steam space of 8 cubic inches, more or less. The fly wheel (of 50 lbs.) is mounted on a pillar about 30 inches high, tapering from 3 to 2 inches diameter, with a strong pedestal of 12 inches, spread, bolted to a 3 inch oak platform. There is positively no spring in the standard. When this wheel runs 500 in a minute it is pretty steady; but as the speed increases, agitation begins, until at or about 860 the thing is fearful, and bystanders leave. It seems as if the thing must fly from its fastenings. There are two ways of checking it, one by turning on steam, and the other by turning it off. At about 1,100 revolutions a minute, which is by no means its maximum, it runs so quietly that hardly any vibration happens. Can you give the *rationale* of these movements? A. The trouble seems to be caused by a lack of balance. It may possibly be remedied by making the fly wheel run perfectly true.

(45) J. B. C. says: I have seen statements that decarbonized steel, for gun barrels, would withstand the strains of firing better than plain twist, laminated steel, or Damascus twist. I would like to have your opinion on the relative merits of each of the above barrels, considered in regard to strength and durability. A. The plain twist, we believe, is the best.

(46) A. C. says: We have a mill with an engine 14 inches bore x 30 inches stroke. Our boiler is 24 feet long by 52 inches diameter, with 12 seven inch flues. The engine makes 65 revolutions per minute, and is geared to an upright shaft with bevel wheels. We lack power, and it takes hard firing to make steam. What would be the result if we ran the engine at 100 revolutions per minute, and geared the bevel wheels to run the upright shaft as now? We would gain power, but would the boiler make steam any more easily than now? A. If the engine exhausts into the smoke stack, running it faster may increase the draft. Otherwise we do not see that you will gain much from the change.

(47) W. B. D. says: I am running a 56 inch fivegang saw, direct from waterwheel shaft pulley 6 feet in diameter to pulley on saw mandrel 2 feet in diameter. I wish to get power into a shop standing in a direct line down stream 50 or 60 feet. I do not use the saw all the time. Can I get as much power on the saw if I run my belt to a line shaft, and then up to my saw, as I now have? A. Some power will be taken to drive the belt and shafting.

(48) C. F. says: H. S. S. asks: "What, if any, is the difference in power required to transmit a given amount to the same sized pulley, if the belt be long enough to run loosely without slipping, or be a short belt with a tightener, or be a short belt stretched very tight?" After many years' experience with belts of all kinds, I have learned that it will require the most power with the short, tight belt, especially if the pulley receiving the power be much smaller than the one giving it. With the tightener there is a greater length of belt brought in contact with the pulley, consequently the belt can be much looser, and thereby lessen the friction upon the bearings. The tightener should be only heavy enough to take up the slack of the belt, which should be quite loose when relieved of the weight of the tightener, which should always be close to the pulley receiving the power. If the power is carried horizontally, the long and loose belt will have a similar effect, as the slack of the belt will always be found on the side of the belt going from the giving to the receiving pulley, which will, if it be the top side, sag so as to bring a much greater length of belt in contact with the pulley than in the case of the short tight belt. A. We would have been glad to receive some facts, as the result of experiment, in corroboration of your views. Matters of this kind cannot be finally settled by mere reasoning, because there is a question of fact involved which can only be determined by experiment. Your views, however, strike us very favorably, and we shall be glad to hear from you again if you will send us some particulars of your experience.

(49) C. S. W. asks: Am I right in claiming that light travels faster than galvanic electricity? A. Yes, as a general rule.

(50) T. C. S. asks: What is the amount of heat generated by passing a current of electricity over a long, thin platinum wire, and the amount of zinc required to generate the necessary quantity of electricity? A. The amount of heat generated would be proportional to the amount of zinc consumed.

(51) E. E. M. says: I have a book on electricity which says that, if a current is sent through a hollow coil of wire, and an iron bar brought to the mouth, that it will be drawn in. I have tried this but have failed. How can I construct such a coil? A. Use 100 feet of No. 14 copper wire, covered with cotton and wound into a helix, and charge with Bunsen's cells whose zincs are connected together for one pole and carbons for the other.

(52) I. A. says: I have a Bunsen battery. The porous cup is 2 inches in diameter and as high as the cell, and about ⅜ inch thick. I cannot get a current through. I think the porous cup is too thick. How can I remedy it? A. Soak the porous cup in warm water.

(53) G. H. A. asks: 1. In what respect do a relay and sounder differ? A. A sounder is wound with coarser wire. 2. How can I coat copper wire with gutta percha for use in batteries? A. Melt the gutta percha and press it on. 3. In what respect is silk-covered copper wire better than cotton for making the magnets of a sounder? A. It is a better insulator. 4. Which is the most economical, as far as battery is concerned, to keep the circuit closed or open when not in use? A. Open. 5. For a line of telegraph a mile or less in length, what number and how much insulated wire will I need for the magnets to the sounder? A. Use 270 feet of No. 24 copper wire. 6. In batteries, should the surface of the zinc and copper be similar? A. Approximately. 7. How can I construct a battery using zinc and lead, so that the blue vitriol will cut the lead instead of the zinc, as is generally the case? A. By first turning your lead into zinc. 8. How can I nickel plate with a battery, using nickel 5 cent pieces? A. Rivet the 5 cent pieces on to a nickel plate.

(54) J. H. asks: Will a Leclanché battery answer for electroplating such articles as watches, chains, rings, etc.? A. It can be used, but Smee's or Daniell's is better.

(55) D. L. G. asks: 1. Is a lightning rod of any benefit whatever as a conductor of an electric charge? A. Yes. 2. Which is the best rod in use? A. Copper. 3. How much space will a rod protect? A. A space equal to its projection above the building. 4. What are the merits of a platinum point? A. It does not rust.

(56) A. O. B. asks: 1. Is there danger of lightning striking telegraph wires and entering the buildings to do damage, if we can cut the offices out and leave the circuit closed? A. Not much. 2. How much No. 11 iron wire (in length) will give 1 ohm of resistance? A. 190 feet.

(57) A. E. C. asks: How is shellac prepared so that it can be put on evenly, between the successive layers of the secondary wire in an induction coil? A. Put 1 oz. of shellac into a wide mouthed 8 oz. phial containing 5 ozs. of well rectified naphtha. Close the bottle with a cork, and let it stand in a warm place until perfectly dissolved. Shake the mixture frequently and pass the fluid through a paper filter; add rectified naphtha to the solution from time to time in such quantities as will enable it to percolate freely through the filter. Change the filter when necessary.

(58) I. R. says: I would like to find the cheapest and simplest way of producing the electric light, and how to construct a battery for that purpose. A. You will require 50 cells of Grove's or Bunsen's, or 100 cells of Daniell's battery, to produce an electric light. Attach the two poles of the battery to two carbon pencils. Touch the pencils together and then separate them, and the light will appear.

(59) G. C. B. says: 1. I have an electrica gas lighter which occasionally gives me a great deal of trouble. When I want to light up, it refuses to work altogether. What is the trouble? A. Soak the carbons for a few days in hot water. Thoroughly amalgamate the zincs, and put new solutions in your battery. 2. Is the Tom Thumb or miniature electric battery strong enough to work a wire from Newark to New York? A. Yes. 3. Is it difficult to telegraph? A. It is as easy to learn to telegraph between these two places as anywhere else. There is no difficulty in the matter. It requires practice to become a good operator on any line.

(60) H. P. M. says: I have just built a privy, the vault of which is 5½ feet deep, being 24 feet from my neighbor's well of drinking water. The well is 33 feet deep in a gravelly soil. Will the use of the privy foul the water of the well? A. The probability is that it will, in the kind of soil that you name.

(61) W. F. S. asks: 1 How should one proceed who wishes to study practical chemistry? Is it best to work in some laboratory at first, and attend lectures on chemistry? A. Yes. 2. Can one have a good knowledge of the science without understanding pharmacy? A. The study of pharmacy is never included in a chemical course, except by those working for the degree of M. D., etc., as it pertains wholly to the preparation of medicines.

(62) P. S. asks: 1. What is considered the best and safest way to make gas for the oxyhydrogen light? A. You will find a full description of obtaining these gases, etc., on p. 218, vol. 32, in answer to J. H. L. 2. I see a notice of a self-condensing cylinder. Are they safe for a new hand to use? A. We cannot consider them safe in unpracticed hands. 3. I also want to know which is the most portable kind, for using with the magic lantern? A. In the larger cities gas may be obtained under pressure in small cylinders suitable for transportation. But as obtained in this form it is necessarily somewhat more expensive, and in the end it will be found more economical to manufacture the gases when required, and to use them in the bags manufactured for this purpose.

(63) A. K. says: 1. We have a brick cistern that was cleaned out a few months ago. The water has a very bad smell. When it is hot, there is a scum on it that is hard, like lime. What will remove the smell, and what causes the scum, as the water ought to be perfectly soft, being rain water? A. Try adding a small quantity of alum to the water before using, and allow to settle for a short time.

(64) O. R. asks: How can I calculate the flow of water in a trough 2 feet wide, 1 foot deep, and 20 feet long? The water runs through with great rapidity, and I do not know any certain method of ascertaining the velocity, and consequently the quantity in a given time. A. Your best plan will be to ascertain the velocity by means of floats, on the surface as well as submerged at different depths.

COMMUNICATIONS RECEIVED.

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

On Patent Politics in Ohio. By A. K. S.
On the Iron Horse. By F. G. W.
On Hydrogen. By T. G. B.
On a Universal Language. By J. C.

Also inquiries and answers from the following:

R. L. N.—J. C. Y.—R. J. F.—J. M.—S. C.—J. K.—A. C. J.—N. T. W.

HINTS TO CORRESPONDENTS.

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

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

Hundreds of inquiries analogous to the following are sent: "Who sells the best silk-covered wire for magnets? Whose is the best line wire insulator? Whose is the most economical turbine water wheel? Who builds the fastest steam launches? Why do not makers of drawing instruments advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.