Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

Notes & Queries

H. B., Jr., will find a good recipe for aquarium cement on p. 202, vol. 28.—C. R. is informed that the apparent spontaneous cracking of glass tumblers is by no means an uncommon occurrence.—P. B. B. will find directions for brazing band saws on p. 194, vol. 31.—C. H. B. will find directions for removing inkstains from clothing on p. 410, vol. 32. For polishing castings, see p. 57, vol. 34.—F. B. S. does not send data enough as to his engine. He will find a formula for ascertaining the horse power on p. 33, vol. 33. For a rule for calculating the dimensions of a flywheel, see p. 251, vol. 32.—J. P. N. will find a recipe for prepared glue on p. 43, vol. 32. For a recipe for mucilage, see p. 27, vol. 34.—R. P. C. is informed that the only non-conductor of magnetism is a sufficient interval of space.—E. G. will find an explanation of horse power on p. 33, vol. 33.—A. J. will find something on tempering chisels, etc., on p. 220, vol. 31.—H. L. H. should address a pump manufacturer.—H. H. will find directions for making shoe polish on p. 107, vol. 36. To season timber of all kinds, follow the directions on p. 58, vol. 32.—F. C. will find a formula for the lifting power of coal gas on p. 65, vol. 32.—C. H. B. will find directions for removing inkstains on p. 410, vol. 32. Brass castings can be polished by following the directions on p. 57, vol. 34. Steel can be etched by the process described on p. 250, vol. 27.—F. J. S. should send us a sample of the efflorescence on the ash heap.—D. W. will find a description of making gas with a hydrocarbon fluid on p. 65, vol. 32.—R. W. K. will find answers to his queries as to ice boats in No. 63 SCIENTIFIC AMERICAN SUPPLEMENT.—U. D. M. is informed that oxychloride of zinc may be used to cement silica together; but we do not think he will succeed very well with the material of which he sent us a sample.—J. C. B. can solder brass by the process described on p. 251, vol. 28. To mend rubber boots, follow the instructions given on p. 203, vol 30.—A. L. F. will find on p. 119, vol. 28, a recipe for a cement for mending leather shoes.—C. A. D. will find a recipe for red fire on p. 171, vol. 36.—J. D. will find directions for fireproofing clothing on p. 282, vol. 32.—A. D. A. will find directions for mounting chromos on p. 91, vol. 31. This also answers T. S. R.—G. K., who asks as to the U. S. Coast Survey, should sign his letters with his name and address.—E. C. S. will find on p. 319, vol. 35, a recipe for a cement wash for woodwork.—A. B. C. will find formulæ for the passage of water through pipes on p. 48, vol. 29.—W. L. B., A. J. W., W. G. L., E. K., C. F. W., J. G., N. T., W. P. B., and others, who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) T. A. D. asks: 1. What kind, diameter, and focus should a lens be for a photographic camera to take photographs 4½ inches by 3½ inches, principally landscape views? A. An achromatic of about ½ inch diameter and 5 or 6 inches focus. 2. At about what distance should the lens be placed from the photographic plate? A. Where the image will be sharpest on a ground glass, placed where the photographic plate is to be. 3. If stops or diaphragms are used, what kind is necessary and where should they be placed? A. If the instrument is a double combination, the diaphragm should be placed midway between the lenses. If a single lens, place it in front. A piece of cardboard with a round hole in the center is all that is wanted. The smaller the diaphragm, the sharper the picture will be, and the longer the necessary exposure.

(2) F. I. E. says: I have several photographic lenses; and wishing to form some kind of instrument on the principle of the "Wonder" camera, so that objects and pictures may be projected on a screen without much trouble or expense, I would like to know how the glasses are arranged, and what kind of light is best? A. Your ¼ portrait lens is just what is wanted for the objective. Then, in addition to this, you need two condensing lenses, and (if gas or oil is used) a reflector behind the light, the same as in a magic lantern with the "Wonder" attachment.

(3) A. B. C. asks: Can stereoscope lenses, or the lenses of a small spyglass, be used in constructing the home-made magic lantern? A. The usual stereoscopic lenses cannot be used, because they are ground thicker on one side than the other. The lens of a small spyglass would do if not of too long focus. It will make the picture small unless the lantern is placed at some distance from the screen. A lens of about 6 inches focus is the best; and in small rooms, even shorter focus is preferable.

(4) E. J. B. asks: Will a photographic camera, with three lenses and four inches focus, do as an objective for a magic lantern? Will the "Wonder" camera as described in *Science Record* for 1875 do? Could the object glass of an opera glass be used for the purpose? A. If the photographic combination was made for a portrait camera to be used without a diaphragm, then it will answer the purpose very well. Also the opera glass objectives may be used, either singly or in combination. If one will make the picture on the screen as large as you wish, it will give you more light than the two together.

(5) J. L. K. says: I would like to make a 1 inch hole in a window pane, and have tried several ways, but broke the glass every time. How can it be done? A. Bore a hole in the center by means of a hard steel drill moistened with turpentine. Cut the circle with a good glazier's diamond guided by a small piece of copper wire centered in the hole just bored, and by means of cuts radiating from the center to the circumference divide the circle into numerous small sectors. Then, with a small piece of metal, tap the glass on the posterior side gently, following each cut throughout its extent. When this has been properly done, fasten a piece of putty over the area of the circle on the cut side of the glass; and, while holding the putty, tap the glass on the other side firmly in the center of the circle. Too much pressure on the diamond will cause it to scratch without cutting the glass.

(6) E. B. asks: 1. How shall I treat hickory to prevent its becoming powder-post, as we term it? A. The trouble is due to a diseased state of the timber, which reduces its substance to a mass of dry dust, by the decomposition of its fibers. It is caused by the growth of a species of fungus in those parts of the timber which have not been properly dried or seasoned. One of the best preventives of this disease is a solution of corrosive sublimate forced into the pores of the wood by means of an air pump. 2. When shall I cut it? A. It is best to cut the timber in the late fall or early winter.

(7) E. T. says: In speaking of leaky roofs, you say that the best job would be to put on a new tin roof in small sheets. Which kind of tin is most durable, the leaded or dark lead-colored tin or the bright light-colored tin? A. Use the best charcoal tin, which is bright-colored, and solder the joints securely.

(8) J. H. W. says: We have had an explosion in our foundry that we are not able to explain. The shop is a frame building 50 feet square. We had not made a heat for 24 days; and when we made one and proceeded to drop the bottom as usual, the instant the doors dropped we had a tremendous explosion, breaking some 250 panes of glass. It tore a door that was standing open off its hinges, and made a report that was heard at a distance, shaking the windows in houses squares away. Our shop is quite open, and two doors were standing open at the time. The prop that the cupola man used in dropping the bottom was some 10 feet long and 4 inches square. It was shivered up just as though it had been struck by lightning. There was some ice under the cupola at the time; but we threw, as we thought, sufficient sand on it to prevent the iron coming in contact with it. Are such explosions of common occurrence in foundries? A. We imagine that explosions of such violence are not usual, although those of similar kind are not uncommon, when heated iron comes in contact with moisture. Possibly some of our readers may have knowledge of explosions quite as violent as the one described above, and will favor us with descriptions.

(9) J. M. L. says: I wish to build an air stack with sufficient draught for two furnaces. Can you give me the proportion existing between area of stack at bottom and top and height, and the areas of the flues from furnaces? A. It will be sufficient to make the cross section of the stack equal to the combined cross sections of the flues. You can decrease the cross section towards the top if desirable, but there will probably be no advantage in doing so. Build the chimney at least 40 or 50 feet in height, and as much higher, up to 100 feet, as is convenient.

(10) J. J. says: 1. I wish to make a pair of sleigh runners. I have been told that the rim of a wagon wheel steamed and straightened out is very good to make them out of. But I do not know how to straighten them. Could not I get two pieces of oak, of the same thickness and width of a rim of a wheel, and bend them? A. When the wood is softened, secure it by clamps to a former. Perhaps it cannot be bent into shape all at once, but must be heated several times. 2. For a small 1 horse cutter, how far apart should the runners be at the bottom, and how far at the top? A. Distance between runners, 30 to 36 inches at top, and from 2 to 4 inches more at bottom.

(11) W. S. says: 1. I am building a ditcher for drain tile. It is to be drawn by a rope passing a sufficient number of times around a capstan to prevent its slipping, the free end being wound on a reel. The capstan is to be 18 inches in diameter, and the levers 12 feet from center of capstan to where the horses are hitched. What kind and size of rope will be best if two horses are used, and also if our horses are used? A. You can use hemp rope 1¼ inches in diameter for 2 horses, and 2 inches in diameter for 4 horses. 2. If wire rope should break, how can I mend it? A. By splicing.

(12) E. L. L. asks: Do the rubber covers upon telegraph instruments increase the sound perceptibly? A. No.

(13) C. F. A. asks: 1. What size of boiler should I use for an engine of ½ inch bore and 4 inches stroke? A. Make one 12 inches in diameter and 20 inches high. 2. Can you recommend to me a book on the construction of the marine engine? A. We do not know any work that covers the construction of the modern marine engine. You will find much that is useful in Bourne's and Burgh's treatises.

(14) G. F. asks: 1. What I wish to know is how much power could I expect from an engine 2 x 5 inches, 60 lbs. pressure, 150 revolutions? A. From ⅓ to ¾ of a horse power. 2. What size of boiler would I require if it were a plain cylinder, set in brickwork? A. Make a cylinder boiler with about 11 square feet of heating surface.

(15) W. H. K. asks: Which will bear the greater weight, applied laterally, a round or a square rod of metal or wood, of the same circumference? A. The round one.

(16) J. N. A. asks: What has been the highest result in foot lbs., by any steam engine, per 1 lb. of best coal? A. A horse power for 1·5 lbs. of coal per hour is among the best results; this corresponds to foot lbs. per pound of coal.

(17) C. P. P. says: What size of boiler would run to best advantage an engine 3 x 1½ inches? Of what should it be made? A. You can use a vertical boiler, made of wrought iron, 10 inches in diameter and 18 inches high.

(18) C. R. W. asks: Please tell me how to calculate the number of yards of excavation in digging a pond or lake 100 feet by 80, in form an ellipse, 9 feet deep with banks sloped 1½ feet to 1 foot of depth? A. Add together the top area, the bottom area, and the area of their mean proportional, and multiply the sum by ⅓ the depth.

(19) W. L. F. says: I am making an electro-magnetic machine for medical purposes. I made a spool of wood about 5 inches long, the core of which is a hollow cylinder ¾ of an inch in diameter, containing a bundle of iron wire. For the first coil, I wound about 50 feet copper wire (insulated No. 16) around this, and separate from it. I wound about 500 feet silk insulated wire, No. 22. I connected the ends of the primary coil with 1 cell of carbon battery, but could not get a secondary current. Please tell me where the difficulty lies? A. Your arrangement will give you a secondary current by breaking and making the primary. If you require more power, increase the length of your secondary wire and use more battery.

(20) A. S. asks: I have a battery with two copper cylinders 8 inches and 3 inches in diameter, and a zinc cylinder 16 inches in diameter. What must I put in it to make it work? A. Blue vitriol and water.

(21) L. G. W. says: In making a Camacho electro-magnetic engine, can I construct the tubular magnets, and what should be the size of and length of wire used in making magnets? A. It is not worth while to make the magnets less than an inch in length. Wind each tube separately and then place one over the other. No. 23 silk covered wire will do. The turns on each tube should be in the same direction.

(22) J. S. W. asks: 1. Which will give the longest spark, an induction coil made with 2,000 feet of No. 32 wire or with 2,000 feet of No. 36? A. One with the 2,000 feet No. 36. 2. Will 4,000 feet No. 32 give a longer spark than 3,000 feet No. 36? A. No, not with same primary. 3. Which is best for the primary coil, No. 16 or No. 18 wire? A. That depends upon the size of the core and battery used. Make the resistance of primary about the same as that of the battery. 4. How long a spark ought 2,000 feet of No. 32 wire to give? A. Up to a certain limit, about 1 inch spark per mile of secondary can be obtained.

(23) A. R. asks: 1. Does the Atlantic telegraph work upon the same principle as do telegraph lines in general? It has been stated that the electricity is drawn from the cables. A. The batteries are not connected directly to the cable, but to one side of a condenser and to earth; the opposite side of condenser is connected to the cable. 2. What is the strength of the current used? A. Ten or twelve cells is about the number used to charge the condenser. 3. What is the strength at the receiving station as compared with that at the sending station? A. About 99·5 per cent after 3 seconds contact with battery.

(24) H. S. C. says: In your answer to F. H., you say that an engine generally works more economically when running at its full capacity. This is undoubtedly true of single valve engines, as a single valve cannot cut off at less than ¾ stroke without choking the exhaust and impairing its efficiency in a greater or less degree, according to the point of cut-off. But with an automatic cut-off, or even with a fixed one, I think it can be demonstrated theoretically, as it has been demonstrated practically, that there is great economy in having considerable surplus power in your engine. A. You have misunderstood our reply to F. H. The idea we intended to convey was, that under given conditions there is a point at which an engine will work most economically. This is the point at which it should be run, a point probably far within its full capacity.

(25) I. H. D. asks: 1. Why is a chamber used in a condenser for the exhaust steam to flow in? A. With a view to economy of space and efficiency of action. 2. Could not the steam be condensed in an exhaust pipe, and this pipe be connected with the air pump? A. Yes. 3. How much pressure must be given to a jet of water in the combining tube of an injector, so that it will gain velocity enough to enter a boiler, without flowing back into the overflow? A. It depends upon the proportions of the parts. As usually made, the injector will readily force water into the boiler from which it draws its supply of steam, and could be arranged so as to force against much higher pressure than that under which it was working.

(26) G. F. asks: 1. How large an engine could I supply steam to from a plain cylinder boiler, 9 feet long and 14 inches in diameter, of ¼ inch iron? A. You can use an engine of from 2 to 3 horse power. 2. Is a plain boiler safer than one with flues? A. Not necessarily.

(27) G. L. K. asks: 1. Can steam from a boiler with 60 lbs. force water into a cold boiler? A. Yes. 2. Is it possible to get a pressure in the cold boiler above the steam pressure in the steam boiler? I have seen an injector that is said to have forced water into a boiler having 80 lbs. pressure, the injector being operated from a boiler with 20 lbs. pressure. A. Yes. The philosophy of the matter is that a great deal of steam is used, and comparatively little water is forced into the boiler. It is something like a steam pump in which the water cylinder is only ¼ as large as the steam cylinder, so that the water pressure can be 5 times the steam pressure.

(28) H. C. asks: 1. What pressure will a locomotive boiler of copper plates of $\frac{1}{10}$ of an inch thick, 6 inches in diameter, double riveted, stand? A. 40 lbs. 2. How large an engine will it run with firebox 8 x 8 inches and 8 inches high, and 22 half inch tubes 12 inches long. A. Make one 2 x 3 inches. 3. Which of these two engines, 5 x 6 or 4½ x 8 inches, is best for a boat 25 feet long and of 6 feet beam, drawing 6 inches at bow and 24 inches at stern? A. If you wish to compare them when running at the same power, we think the first is preferable on some accounts.

(29) O. A., Jr., says: 1. I have a steam engine with a plain slide valve. The cylinder is 7 inches bore by 9 inches stroke. Steam ports are ⅛ by 5⅛ inches, exhaust port is 1 inch by 5⅛ inches. Valve travels 1¼ inch; lead of valve is about $\frac{1}{16}$ inch, lap about $\frac{7}{16}$ inch, cutting off at about ¾ stroke. Engine runs about 240 revolutions per minute with 70 lbs. steam. Can I get more power out of the engine by changing those proportions? A. We do not think, from your account, that there is any need of a change. 2. Which kind of a return flue boiler is the most economical in fuel and water: the boiler that will hold 1½ barrel of water or the boiler that will hold 4½ barrels, the heating surface being the same in both boilers, and each being of 10 horse power? A. We imagine the difference, if any, would be unimportant.

(30) G. W. A. says: We use 60 lbs. steam on a 12 x 20 inches engine, running three burrs. If we keep just 60 lbs., it is pretty hard work; and it seems easier to let the engine stand and generate 80 lbs. What is the cause of this? A. Generally, an increase of pressure decreases the steam used per horse power, so that although it takes a little more fuel to make 1 lb. of steam at the higher pressure, there are fewer lbs. used to do the same work, and the high pressure is the most economical.

(31) J. R. B. says: I propose running a boat by a screw. She is to be 16 feet long and of sharp bow; of how large a diameter should the screw be? A. Make one 18 to 22 inches in diameter and of 2½ to 3 feet pitch, with a length of blade of 5 or 6 inches. Run it at 300 or 400 revolutions per minute.

(32) C. W. H. says: A boat is 100 rods from a stationary stump. A man in the boat is pulling 50 lbs. on a rope attached to the stump to pull the boat to the stump; and two men are in two separate boats 100 rods apart. Each man is pulling 50 lbs. on opposite ends of a rope between the boats to pull the boats together. The two boats are of equal weight, and all other conditions are equal. Will the one boat arrive at the stump sooner, later, or at the same time as the two boats come together? If not at the same time, how much sooner or later? A. As you have stated the proposition, the two boats would approach each other twice as fast as the single boat approaches the stump—for the reason that the rope is hauled in twice as fast in the first instance, as there are two men hauling it in, one at each end; and in the second instance only one man is hauling in rope, at one end, at the same rate as is employed by each of the two others.

(33) J. J. T. says: I wish to build a locomotive engine with vertical boiler 2 feet high. The cylinders are to be 2½ inches bore by 5 inches stroke. What diameter will the boiler be, and how many 1 inch tubes should I use to get the most power? How much will such a boiler, with all attachments and full of water, weigh? How much power will it develop, if well