Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

1.—Our correspondent, T. W. Bakewell, who addresses us on the subject of calculating strength of boilers, refers to a letter of Professor Henry upon the subject. We also have been informed that Sir William Fairbairn has furnished a letter on the same subject. We should like to be able to publish these letters, as the opinions of those gentlemen, when correctly presented, are entitled to unusual consideration, and the fact of the existence of skepticism in relation to the proposition of our correspondent, on the part of nearly all well known engineers, will secure for them unusual attention.

2.—S. asks how to get sulphate of nickel and how to convert it into a nickel solution?

1.—H. J. H. asks: How can I give a brilliant black finish to a quantity of wire goods, such as hair pins?

3.—F. C. would like to know how to temper a steel screw driver, that has been put in the fire by mistake.

4.—A. T. Y. asks: Is there any preparation with which I can blow a bubble (similar to a soap bubble) strong enough to bear being knocked about the room?

5.—D. R. W. says: Can any one tell me of a process by which common pitch may be purified for optical purposes, such as polishing lenses and specula?

6.—W. N. asks for a detailed description of the cupola furnace designed by Henry Kriger, of Berlin, Germany, mentioned in the SCIENTIFIC AMERICAN a few months ago.

7.—D. asks: How can I color extract of lemona light yellow in manufacturing it? By manufacturing it from oil of lemon and alcohol, and exposing it to the light, it will fade nearly to white.

8.—T. N. says: When a bevel wheel is being geared with wooden cogs, what method is adopted, when turning off the outer ends, to find when the pitch circle is of the proper diameter?

9.—S. D. P. Jr., says: How can I make a cheap coloring material to apply to paper or board, a sort of sizing; also a cheap varnish for the same? For varnish I have used alcohol and shellac, but it is too costly.

10.—H. asks if there is any way to make a fountain something on the principle of Hero's, as explained in the school books on philosophy. "I wish one to set on a table for decoration, and Hero's will not throw a stream high enough."

11.—S. asks: Which is the most probably true and best established theory in regard to the polar attraction, its causes, etc.? Is the idea that the atmosphere, acting as a prism, condenses all the violet light of the spectrum at the poles and thereby magnetizes them, at all reasonable?

12.—C. A. S. says: Given a cylinder of the internal capacity of 1,000 cubic feet: If I force ordinary illuminating gas into it to a pressure of forty pounds to the square inch, how many cubic feet of gas will it contain? In other words, if I had taken the gas through an ordinary meter, how many feet would the meter have registered? Can you give a rule for finding the number of feet at any pressure?

13.—J. E. G. says: In your issue of February you answer to G. W. D.'s question "will a wagon be as easily drawn by a long as by a short rope" that there is no difference. Now suppose I receive a dray load of each, rope and sugar, which must be drayed up a long hill. The drayman loads the sugar on the wagon, then attaches the team to one end of the rope and the wagon to the other; can he haul my two loads of goods at one time? Will I get the rope and sugar hauled for the price of hauling the sugar, according to your answer?

14.—D. H. S., Jr., says: Most of the wheat produced here is generally of good quality, but contains considerable smut. In many cases this infection has been avoided by steeping the seed grain for 24 hours in a solution of blue vitriol. For eight bushels of seed about one pound of the copper salt is used with enough water to cover the grain. As a preventive, this seldom fails. Can any of your readers tell us how to remove the smell and taste of smut, by a method practicable with considerable quantities of wheat? We have heard that quicklime is used. Is that the best deodorizer, and if so, in what proportions and how ought it to be applied? We have machinery which removes all visible smut.

Answers to Correspondents

H. M. says: In view of the fact that light will preserve the original color of white paint inside a house, while its exclusion will turn it a deep yellow, we asks you for a solution. Answer: The action of light is to bleach all colors which are not of fixed mineral origin. White lead being already white remains unaffected in the light, but in the dark it gradually absorbs sulphur from coal gas or other sources in a room and turns black. Zinc white is not so readily changed in color.

D. B. asks: Would the sulphuric acid in plaster applied in any quantity liberate phosphorus where it is combined with iron in the soil? Whereand at what price can Fresenius' "Chemical Analysis" be had? Answer: Sulphuric acid in combination with lime in plaster cannot liberate phosphorus. Free sulphuric acid decomposes phosphates and is employed for that purpose. Wiley and Son, New York, are the publishers of Johnson's translation of Fresenius' "Chemical Analysis."

C. J. K. asks: What chemicals will keep water as near as possible to freezing point without going much below it? What work on chemistry would give me the most instructions on freezing and thawing? Answer: Ice floating in water is the only "chemical" that will keep the water as near as possible to freezing. When that melts, the water will assume the temperature of the room in which it is placed. Good books on chemistry have been written by Towne, Barker, and Eliot and Storer.

J. W. B. asks: How long will human bones, the skull for instance, preserve their form in the open air, or buried in moist earth? Answer: The precise time cannot be stated. Human skulls have been found in caves associated with the bones of extinct animals, in such a way as would indicate an antiquity of many thousand years. The skulls in the catacombs of Rome are known to be very ancient.

C. T. S. says: I have a fine scale, enclosed in a glass case. What shall I place in the case to absorb the moisture, to prevent the steel parts from rusting? Can you tell me the cheapest way of making sulphurous gas in large quantities, and what would be the best manner of keeping it, and how long does it remain in fit condition to use as pure gas? Would a bladder or india rubber bag answer for a gage, attached to the vessel in which the gas is stored, to indicate what quantity was always on hand? Answer: To prevent chemical balances from rusting, put a lump of quick lime in the box containing the instrument, in a saucer. It will absorb the moisture and finally swell up and become air slaked; it must then be renewed. We give elsewhere a process for the manufacture of sulphurous acid on a large scale. It is difficult to store it in anything but glass vessels.

P. M. asks: What is the rule for finding the sag of a belt, passing over two pulleys, with their centers say 100 feet apart? The belt is to stand on the rake, the center of the upper pulley being 10 feet out of plumb with the center of the lower one. The lower pulley is 2 feet and the upper one, 4 feet diameter. The belt is of four ply rubber, and 22 inches wide and tightened in working order. In some cases it is important that this should be known. The late lamented, long-winded Rankine, gives the rule, but the hieroglyphics in which it is given are all Greek tome. Now I have a pretty fair knowledge of theoretical and practical geometry and arithmetic, and Irish, English and French, but I am puzzled with nearly everything in Rankine's works. Answer: The rule referred to may be translated thus: Divide the square of the distance between centers by eight times that length of belt which would give, by its weight, a strain equal to the tension on the belt, and the quotient will be the deflection below the straight line joining the centers of the two surfaces carrying the belt. If our readers desire to accomplish much in mechanics, and to avoid the troubles of our correspondent, they will find it well worth their while to devote a good share of leisure time to mathematics and the principles of natural philosophy. They would also be better prepared then to appreciate the labors of Professor Rankine, who has earned a splendid fame by pursuing just such a course.

W. H. G. is making a toy engine and boiler and says: The size of boiler is 3x5 inches; it is made of tin; now would I gain anything by fixing 3 or 4 half inch tin tubes or flues in the bottom of boiler four inches long, or is a common flat bottom better? The tubes are to be closed at one end. How would air work, pumped into a boiler at bottom or top (in steam space) or will it not work at all? How much does air expand? Answer: The proposed tubes will be likely to increase the power of the boiler as they increase the heating surface. Tubes closed at one end are sometimes used, and where the fire is not forced, do well. If the fire is forced, they are defective in not allowing free circulation of water. Introducing air in so small an apparatus would probably not pay for the trouble involved. Look in a recent number of the SCIENTIFIC AMERICAN for answer to last question. We hope to be able to help thousands of others among our young readers as we have aided W. H. G.

J. McC. says: How can I measure a coal barge according to the government measurement? The barge is 124 feet long, 24 feet wide and 5 feet deep. Answer: The tunnage of a barge is legally measured by multiplying the length, breadth and depth together, to obtain the cubic feet of contents, and dividing by one hundred to obtain the burden in tuns (tunnage law of U. S. 1865; "open vessels.") for registry. Thus, a barge 124 feet long, 24 feet wide and 5 feet deep would register 148·80 tuns. Such a barge would carry, of "dead weight," about 400 tons, if loaded down to the water's edge. It would have storage capacity for about 300 tuns of Cannelton coal, or for, say, 8,400 bushels.

A. B. S. says: I wish to use exhaust steam for heating or for boiling water. Can I immerse the end of exhaust pipe in water without any very great detriment to power of engine? The length of the exhaust pipe is 60 feet. Answer: For each two feet of depth of water, above the opening of the exhaust pipe, the engine will be subjected to an increase of one pound back pressure.

A. G. K. says: I have a boiler with 3 inch flues, which does not make steam as fast as I would like. Do you know of any objection to putting in 1½ or 2 inch flues between those that are in? Answer: The most serious defect of the tubular boiler, as frequently constructed, arises from the endeavor of the builder to increase its power by crowding too many tubes into it, and thus checking the circulation of water. It often happens that removing tubes is found to increase the steaming capacity of a boiler. We should doubt if the introduction of additional 1½ inch or 2 inch tubes into a boiler fitted with 3 inch tubes would afford advantages commensurate with the risk, which it might produce, of burning some of the tubes, even if it were to slightly increase the steaming capacity.

J. H. P. says: Will you let us know if there is any patent method of turning an engine off from the center without the use of a tackle? Please write what would be the cost of such a patent. Answer: Many devices are in use, but we know of no purchasable patent which covers one generally adopted.

NOVELTY GLASS CUTTER.—Letters of enquiry for this article come to us from all directions. We know nothing of it, or who sells it.

E. M. B. says: I want to know the simplest and surest manner of putting up long lines of shafting correctly; also, commencing at the engine, how to calculate the speed of pulleys of various sizes. Machines come from the maker with a driver pulley of a certain size, marked to run so many revolutions per minute. I want to know how to calculate the size of pulley on main shaft by which the machines shall be run. I suppose the speed of main shaft must be known. How can I find out that? Answer: Dub off the under sides of the beams to which the hangers are to be attached, or pack them up, until a stretched cord, or sighting along their line, shows them to be accurately in line. Put up the hangers in their places, and again try whether the center line of bearings is a straight and level line, adjusting any that are found out of place. Finally put up the shafting and set up the couplings. The best makers use swivel bearings that will adjust themselves to any slight deviation from line, and the couplings are made with an eye to the same contingency. The speed of shafting is, to some extent, determined by the character of the work driven. For heavy work a speed of 180 revolutions a minute is common, and for light work the speed rises often to 300, or even higher. The tendency is continually to higher speeds, in consequence of the fact that it allows the use of lighter belts and pulleys. The size of driver pulley is determined by multiplying the diameter of the driven pulley by the fraction obtained by dividing the speed of the driving line of shafting by that of the driven shaft.

W. S. B. The use of the common sewing machine treadle is not productive of special illness or discomfort if intelligently used. But there several forms of improved treadles that are claimed to have advantages, and they are on sale in your city of Boston. You will there also find, doubtless, sewing machines operated by springs, without treadle. In this city you may procure sewing machines which are operated by electricity. If you wish for devices not advertised in our columns, you might insert a few lines under "Business and Personal."

J. H. asks how much space there should be between piston and cylinder head of an engine with an 8 inch piston and 16 inch stroke. Answer: The space between piston and cylinder head, when the former is at either end of stroke, should be as little as possible where economy is aimed at. In a direct acting engine of the size given, a clearance of one eighth inch at the back end and three eighths at the forward head is a fair allowance with those whose workmanship is first class. Ports are made of from one tenth to one twentieth the piston area, being given the greater proportional area for high speeds of piston. Clearance, including space in steam passages of cylinder has, in rare cases, been reduced to 2 per cent of the cylinder capacity. In good engines, 5 per cent is a usual figure.

W. H. M. says: Is there any rule for estimating the thickness of material required to be used in constructing cylinders of certain diameters to withstand certain pressures? Of what kind of material and how heavy should a cylinder 18 inches diameter by 3 feet in length be to withstand internal pressures of 18 and 24 pounds per square inch respectively? Does the length effect the strength of the cylinder? How do copper and brass compare with iron for this purpose? Would the same cylinder withstand the same pressure externally? Answer: Any work on the strength of materials will give the desired information. We gave a list of such works at page 106 of our current volume. A cylinder of sheet iron, with single riveted joints, 18 inches in diameter and 3 feet long, would he made of about No. 22 or 24 iron, measured by wire gage, if intended to bear safely a pressure of 16 pounds, and of No. 20 or 21 for a pressure of 24 pounds. The length does not affect the power of resisting internal pressure, but it does influence greatly the power of resisting collapse. Copper and brass cylinders, with joints perfectly made with hard solder, have a strength about equal to single riveted iron cylinders, but the joints are rather more inelastic. Copper and brass are weaker than good iron. Expending a small amount of money in standard books will often save, in cases like this, considerable outlay in experiments which may have been already made with far greater accuracy and completeness by others. The first step to be taken, before commencing experimental research, is always to ascertain what has already been done by others.

B. says: A friend thinks the small steamers plying on the Thames (England) submit to the useless cost and complexity of having the wheels constructed for vertical position of the paddles. Answer: Some, not all, of the steamers alluded to have feathering paddles, and gain in speed by the adoption of that system.

T. N. asks: Will the reports of the Patent Office, which are to be printed every month, be for sale in the book stores? If not, where can they be got, and what is the price? Answer: The publication referred to by our correspondent is the *Official Gazette* of the Patent Office, issued weekly. It can only be obtained at the Patent Office, Washington, D. C. Subscription, $6 per annum.

F. A. S. asks: Will you tell me how to make "Coumarin"? It is prepared from "sweet vernal" grass (*anthoxanthum odoratum*) and is used for giving stronger aroma to other flower essences. Answer: Cut up the herb, and macerate in hot alcohol; strain through cloth, and distil off the greater part of the spirit. The syrupy residue deposits, on standing, crystals of coumarin, which must be purified from fat oil by pressure, and then crystallized from hot water.

A. C. says: Enclosed please find specimen of ore, of which I would like to have the name and value. Answer: It is not an ore, but a variety of hornblende.

G. S. Y. sends a mineral specimen and asks our opinion of its quality. Answer: If the article is as homogeneous as the fragment sent, it will undoubtedly prove an excellent fire-clay. But "trying," on a large scale, "is the naked truth."

L. C. M. has read our article on pickles, published on page 145 of Volume XXVII., and would like to know how to make bright green pickles, free from suspicion of copper and sulphuric acid. He asks for a description of the method produced in manufactories. Answer: In a pickling establishment of wide renown the boiling is done in copper vessels, thickly coated internally with silver, and a very strong *malt* vinegar, prepared for the purpose, is used. The pickles are perfectly wholesome and pure, but they have not the bright green color, for which many foolish people sacrifice the quality and genuineness of what they eat.