Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9979) D. C. asks: 1. It seems feasible, and I understand, perhaps erroneously, how nitro-glycerine or other compound of nitrogen, which has such a feeble grip on other elements, could readily by detonation be transformed into gas which would violently compress the atmosphere and cut and tear things to pieces; but how a proportional composition of hydrogen and oxygen, the former the lightest of all gases, could compress the air or cause an explosion at all is a mystery to me, unless there is an outward explosion, from solid matter to gas, such as that by dynamite, gun-cotton, or gunpowder, and an inward explosion, gas exploded by flame partly consumed, thereby causing a vacuum and violent rush of air to fill the place occupied by the gas consumed. Is it the air or gas that does the damage, cuts and tears the material to pieces? Whichever it is, it must become sharp as a razor and hard as steel. Why is there such a deafening report when only in contact with air? A. In the explosion of a solid, such as gun-powder or nitro-glycerine, the substance is transformed into gas at an enormously high temperature, which causes a very great pressure and force of expansion, thus rending the walls of the containing receptacle, and hurling the fragments to a great distance. In the case of the explosion of mixed oxygen and hydrogen the same result is reached. The heat of the resulting steam causes a great expansion and rending of the vessel in which the combustion takes place. 2. Some time ago I read in a magazine that the coal measures or carboniferous beds in Ireland were pushed into the Atlantic Ocean by the ice at the time of the Glacial Period. Is this generally accepted as true by geologists, and if so have they any means of knowing whether the beds were composed of anthracite or bituminous coal? I am aware that the coal fields near Castlecomer, Ireland, are anthracite, and I heard there were small bituminous fields in other parts of the island. Can you inform me if this is the case? A. We have no detailed information regarding the displacement of the coal measures in Ireland. The textbooks of geology state a belief that once coal measures covered the subcarboniferous limestone of the center and southwestern part of the island. You may perhaps obtain help in this matter from the professor of geology in the university of your city. Such men are always willing to give information to inquirers.

(9980) F. W. B. says: My boat is 20 feet long by 4 feet 5 inches wide, with easy lines, and my engine is supposed to be a high-speed double-cylinder opposed-motor, bore 4 inches, stroke 4 inches, weight less than 200 pounds. It is said to give 4 horse-power at 500 R. P. M., and I would like to know what size propeller you would advise me to use, and what should be the proper pitch, and whether it should be two fluke or three. A. The size of a screw depends upon so many things, that it is very difficult to lay down any rules for guidance. However, the following rules are given sometimes for ordinary cases, where the size and power of the boat does not exceed a speed of 20 knots per hour. First: The "pitch" of a propeller is the distance which any point in a blade, describing a helix, will travel in the direction of the axis during one revolution, the point being assumed to move around the axis. The pitch of a propeller with a uniform pitch is equal to the distance a propeller will advance during one revolution, provided there is no slip. In a case of this kind, the term "pitch" is analogous to the term "pitch of the thread" of an ordinary threaded screw. Let P = pitch of propeller in feet. Then

$$P = \frac{10133\,S}{R(100-x)}$$

In which S = speed of boat in knots, R = revolutions per minute of propeller, x = percentage of slip. Assuming a speed of 10 knots per hour for your boat, with engine running at 500 R. P. M., and assuming a 10 per cent slip, we get a pitch of

$$P = \frac{10133 \times 10}{500(100-10)} = 2.25 \text{ feet.}$$

This is probably high, due to the fact that we assumed a low percentage of slip.

Diameter of propeller =

$$K \sqrt{\frac{I.\,H.\,P.}{\left(\frac{R \times P}{100}\right)^3}}$$

K = constant = 17.5. I. H. P. = 4. R = 500 R. P. M. P = 2.25. Therefore, diameter of propeller under these conditions, namely, four blades to the screw, made of cast iron, would be approximately one foot diameter. To allow for any increased slip which may occur, and other contingencies which may arise, we would not advise a screw less than 2 feet in diameter, calculated on a pitch of 2 feet. This will easily allow for any increased speed desired over 10 knots up to 15 knots per hour.

(9981) F. R. S. asks: Some two months ago a friend of mine on a steamer going to Jamaica noticed something which I would like a little information upon. There was an operator on board the steamer for the wireless telegraph. The boat was equipped with its own electric light plant. When a message was being received by the boat from shore the lights in the boat would dim, which would naturally show an overload of current, and there would also be a rumbling sound about the boat at the time of receiving the message. What I cannot understand is why the receiving of the message would affect the lights on the boat, and what would cause the rumbling sound. A. An electric current flowing in a wire is very sensitive to another current in the vicinity, and it is to be expected that wireless signals should impress a current in the vicinity of current for lighting purposes, producing such results as you describe.

(9982) C. J. N. asks how to draw on glass. A. To write or draw on glass, it is necessary to impart to the surface a certain degree of roughness. This may be done by grinding or etching, but much more easily by applying some appropriate varnish. A good matt varnish is made by dissolving in 2 ounces of ether, 90 grammes of sandarac and 20 grammes mastic, and adding benzol ½ ounce to 1½ ounces, according to the fineness of the matt required. The varnish is applied to the cold plate after it has set. The glass may be heated to insure a firm and even grain. To render the glass again transparent, after writing upon it, apply with a brush a solution of sugar or gum acacia. Still better as a surface for writing or drawing is a varnish of sugar. Dissolve equal parts of white and brown sugar in water to a thin syrup, add alcohol, and apply to hot glass plates. The film dries very rapidly, and furnishes a surface on which it is perfectly easy to write with pen or pencil. The best ink to use is India ink, with sugar added. The drawing can be made permanent by varnishing with a lac or mastic varnish.

(9983) J. N. B. asks how to prepare sheepskins for mats. A. Make a strong lather with hot water and let it stand till cold; then wash the skin in it, carefully squeezing out all the dirt from the wool; wash it in cold water till all the soap is taken out. Dissolve 1 pound each of salt and alum in 2 gallons of hot water, and put the skin into a tub sufficient to cover it; let it soak for twelve hours, and hang it over a pole to drain. When well drained stretch it carefully on a board to dry, and stretch several times while drying. Before it is quite dry, sprinkle on the flesh side 1 ounce each of finely pulverized alum and saltpeter, rubbing it in well. Try if the wool be firm on the skin; if not, let it remain a day or two, then rub again with alum; fold the flesh sides together and hang in the shade for two or three days, turning them over each day till quite dry. Scrape the flesh side with a blunt knife and rub it with pumice or rotten stone.

(9984) B. J. N. asks how to remove stoppers in bottles. A. The best way is to take a turn round the neck with a stout string, hold the bottle firmly on the table with one hand, grasp one end of the string with the other, and get a friend to pull the other end. A little sawing will soon heat the neck sufficiently to expand it and loosen the stopper. I have extricated broken stoppers in this way, with nothing to lift them out by but a little bit of sealing wax melted into the broken surface. Try rubbing stopper with paraffin wax.

(9985) W. F. J. asks how to make waxed paper on a small scale. A. Place cartridge or other paper on a hot iron and rub it with beeswax, or brush on a solution of wax in turpentine. On a large scale it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a heavy hot iron, against which is held a piece of wax, which, melting, runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones. Such paper is useful for making waterproof and airproof tubes, and for general wrapping purposes.

(9986) A. J. B. says: 1. What would be the force in pounds exerted at point A in Fig. 1, with the end of the rope fastened at point D and a force of 1,000 pounds pulling at point B, the other end of the rope? The direction of the two parts of the rope is such as to make the angles between A and D, A and B, and B and D 120 degrees each. A. The force exerted at point A is the resultant force of D and B, or 1,000 pounds. 2. Please explain the term "triangle of forces." A. If three forces acting at the same point balance each other, they are proportional to the sides of the triangle formed by any three straight lines parallel to their directions.

Fig. 1.

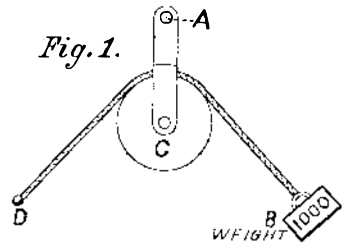
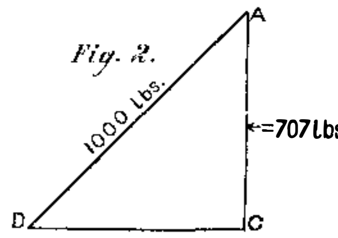


Fig. 2.



Example: In triangle ADC of Fig. 2 we have angle C equal to 90 degrees and angles A and D each equal to 45 degrees. Let side AD or the hypotenuse of the triangle represent a force of 1,000 pounds. Then, by the use of the following rule the other two forces AC and DC can be found. Rule for right-angled triangles: The side opposite an acute angle equals the sine of that acute angle multiplied by the hypotenuse of the triangle.

Therefore AC = sine of $D \times AD$,

and DC = sine of $A \times AD$.

From table sine of A and D or 45 deg = .707. Therefore AC and DC = 707 pounds.

(9987) R. H. M. writes: Query No. 9966 in issue of May 12 asks why water pipes freeze when the surface of the ground is thawing. Although the phenomenon may not have come to your notice it is nevertheless quite common, as any plumber can testify. The explanation that has been made to me is the ice cream theory—the thawing ice above takes heat from what is below. Be this as it may, it seems to be a fact that water pipes freeze when it seems there ought to be no danger, and it is hard to convince the owner that freezing is the cause of the stoppage.

(9988) W. L. W. asks: Kindly advise me in your query column if you believe that any two things in the world are exactly alike. In a recent argument I took the stand that there were lots of things in the world just alike. My opponent took the stand that there were not; that there were no two grains of sand exactly alike, that there were not two nails or tacks or brads exactly alike in the world, and that even no two molecules which compose all the iron and steel in the world are exactly alike. It is probable that it is impossible to prove either assertion, but I will thank you for your opinion. A. We have no opinion whatever upon the question whether there are two things in the world exactly alike. We believe fully that a man can tell the same story twice in exactly the same way, and that the same old questions come up to us with startling similarity. Among these Wandering Jews which are ever young and always bobbing up serenely is the inquiry which you ask. What is the use of discussing such a quibble? Why not start a new and fresh *quid nunc*?

(9989) S. C. H. asks: 1. What is the meaning of "ampere hours"? A. An ampere hour is a current of one ampere flowing for one hour. This phrase is exactly the same in form as "horse-power hour" or one horse-power used for one hour. 2. How is the amperage of any light or coil measured? A. The amperes used by a light or coil are measured by an ammeter put in the circuit so that the current flows through it. 3. What are the necessary steps for a young man to get a position as electrician on board an ocean liner? A. To become an electrician in any position, learn the business thoroughly and then apply for the place you want. Make it appear that you are the man for the place, and you will be likely to get it.

(9990) C. A. C. asks: Will you inform me about the specific gravity of liquid fluorine? A. Hardin in "The Liquefaction of Gases" gives the density of liquid fluorine at 1.14. This must be considered an approximation more or less close, from the manner in which it was obtained. We can send you the book for $1.50.

NEW BOOKS, ETC.

THE DYNAMICS OF LIVING MATTER. By Jacques Loeb. The Columbia University Press, 1906. 8vo.; pp. 233. Price, $3.

Dr. Loeb's book is undoubtedly one of the most important contributions to the literature of biology which has been issued for some time. It is based on a series of eight lectures delivered at Columbia University in the spring of 1902, which were intended to present the author's researches on the dynamics of living matter, and the views and theories to which these had led him. In the preparation of the book the lectures were supplemented to give a somewhat more complete survey of the field of experimental biology, but still without altering their character. Dr. Loeb considers living organisms as mere chemical machines which possess peculiarities of automatically developing, preserving, and reproducing themselves. This opinion, given at the very beginning of the first lecture, strikes the keynote upon which the succeeding ones are constructed. He considers that the fundamental difference between living machines and artificial machines is the fact that the latter, which can be created by man, do not possess the power of automatic development, preservation, and reproduction; but he declares that nothing contradicts the possibility that the artificial production of living matter may one day be accomplished, for living organisms are doubtless nothing more than chemical machines. Dr. Loeb's book is of undoubted interest, and not only the biologist, but the unscientific reader as well, will find in its pages much fascinating information.

A POCKET-BOOK OF MECHANICAL ENGINEERING. Tables, Data, Formulas, Theory, and Examples for Engineers and Students. By Charles M. Sames, B.Sc. 4 x 6⅝ inches; pp. 168; 38 figures. Price, $1.50.

While there are many excellent engineering handbooks before the public, the practical engineer as well as the theorist will find this work a concise, comprehensive, and up-to-date compilation of mechanical engineering information. The book is well indexed, and the contents are so classified that reference to any subject may be made at a minimum of effort; it may be conveniently carried in the pocket under all circumstances. The chapter dealing with reinforced concrete is especially recommended.

AMERICAN SHOEMAKING DIRECTORY FOR 1906. A List of Shoe Manufacturers of the United States and Canada. Giving the classes of goods manufactured, the trade for which they manufacture, names of buyers and superintendents, capacity of factory, number employed in leading factories, alphabetical list of manufacturers, Boston offices, location of towns, population, railroads, express companies, etc. Revised to April 1, 1906. Boston: Issued from the office of American Shoemaking. Paper or flexible leather. Price, $1 or $2.

A NEW AND PHYSIOLOGIC EXPLANATION OF A COMMON PSYCHOLOGIC PHENOMENON. By F. Park Lewis, M.D. Chicago: Press of the American Medical Association, 1906.

BREEDING PLANTS AND ANIMALS. By W. M. Hays. Minneapolis: The University Press, 1906. 12mo.; pp. 189.

During the last few years many novel theories have been evolved relating to the problems of breeding both animals and plants. The work of Luther Burbank has revealed extraordinary possibilities in horticultural development, and the working out of systematic methods of breeding and of disseminating the various field crops at the Minnesota experimental station, has attracted wide attention in scientific circles. In this work Prof. Hays, Assistant Secretary of Agriculture, has put in book form the latest ideas regarding the breeding of animals and plants, including the work of leading authorities as well as the results of his own extensive experiments. The book describes comprehensive plans for the improvement in varieties of field crops, and includes chapters on breeding cattle, horses, and other animals for specific purposes.

THE PRIMORDIAL ENERGY. By Benjamin W. Sands. Springfield, 1906. Pp. 18.

This extremely interesting pamphlet is based upon a lecture delivered by the author in 1905, after nearly ten years spent in study and experiment to determine the truth or falsity of the new discoveries set forth. He has proven, to his own satisfaction at least, that all the various kinds of energy are but different phases of magnetic vibrations, which he declares to be the primordial force of nature. The two illustrations of photographs made by magnetism and by means of ozone interestingly supplement the text, which largely discusses radiant energy in various forms.

PRACTICAL GUIDE FOR FIREMEN. By W. H. Wakeman. New Haven, Conn.: Published by the Author, 1906. 16mo.; pp. 93. Price, 50 cents.

The intention of this little work is shown in its title. It is practical and concise, and describes in word and illustration many points of interest and value to the man in the engine room. The style is well calculated to make the instruction interesting, while the Appendix contains information which will assist in obviating many troublesome situations often encountered by firemen and engineers. The two hundred examination questions included will be found useful in many ways.

THE UNIVERSAL KINSHIP. By J. Howard Moore. Chicago: Charles H. Kerr & Co., 1906. 8vo.; pp. 329. Price, $1.

By this title the author indicates the purpose of the book, which is to prove the kinship of all the inhabitants on the planet Earth, from the lowest protozoa to the highest animal, man,