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 This is for our information and not for publication.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.

(9420) I. H. C. asks: 1. What power would be required to operate a fan 7 feet diameter of the best design to carry air into a cylinder the same diameter at the speed of 6,000 feet per minute? A. A 7-feet fan cannot be practically driven to a greater speed than 500 revolutions per minute, at which speed it should deliver 160,000 cubic feet of air per minute with a velocity through a 7-foot tube, without back pressure, of 4,210 feet per minute. To run the above fan at 500 revolutions per minute will require 36 horse-power. 2. What pressure would be exerted upon a circular surface 7 feet in diameter by a wind blowing 70 miles per hour? A. The pressure of wind on a flat surface at 70 miles per hour is 26 pounds per square foot, or 1,000 pounds on a circular surface 7 feet in diameter.

(9421) F. G. B. writes: About a year or two ago, in your column of answers to correspondents, there was given a solution of the problem of obtaining the number of feet, board measure, in a telegraph pole. Please give me the date of paper. A. To obtain the contents of a telegraph pole in board measure, add together the squares of the diameters of each end in feet or decimals of a foot and the product of the diameter of each end. Multiply this sum by 0.7854 and the product by the length of the pole in feet and divide the last product by 3 for the cubic feet. For the board measure multiply the cubic feet by 10 to allow for scarfs and waste.

(9422) J. M. S. writes: There is some device on the market for cooling water, etc., without the ice coming in contact with the water. There is a container that you put the freezing matter in and set it right into the pitcher or vessel or whatever you wish to cool. We saw an item concerning this in the SCIENTIFIC AMERICAN about a year ago, but we were not interested then very much. Will you be kind enough to advise us what you know about it, and greatly oblige? A. The material used for cooling is nitrate of ammonia dissolved in its bulk of water, in which the temperature falls from 50 deg. to 4 deg. F. Thus, by setting a vessel of water into an ordinary water cooler with water and dropping in the nitrate in small portions, the water in the inner vessel will soon be cool enough for drinking and may be frozen with a full charge of the nitrate. The method you describe is also a practical way of cooling a pitcher of water by filling a tin cylinder with equal parts of nitrate of ammonia and water and setting it in the pitcher for a few minutes. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 32 and 605, for illustrated examples of this class of domestic refrigeration, ten cents each mailed.

(9423) A. T. L. asks: 1. Suppose a jar which is a perfect vacuum to be instantly opened, will there be a time when the air that fills the jar would be at a greater density than the air on the outside of the jar? A. If a small opening were made into a jar in which was a perfect vacuum, the air rushing in would fill the jar slowly. In this case the inrushing current of air would be diminished in quantity gradually until the jar was full, when it would cease. 2. If there is a time when the air in the jar is at a greater density than that on the exterior would this density be increased by holding a funnel over the mouth of the jar while the air is rushing in to fill said jar? A. If the opening into the jar were very large as compared with the size of the jar, so that the time of filling the jar would be very short, it is probable that the air would rush in with a concussion, and would oscillate somewhat to and fro before it settled to rest. This is because the air is an elastic body, and would rebound upon itself. In this latter case it might be that the air within the jar would be momentarily at a greater density than the air on the outside of the jar. If now the air were passed into the jar through a funnel, the action would be no different from that in the first case supposed, since the funnel would simply constitute a small opening into a larger place, and there would probably be no time when the air within the jar was denser than the external air. 3. Suppose the ground connection of a lightning arrester for a telephone or dynamo to be connected to a steam boiler, would the lightning passing through that ground affect the steam boiler? A. The question you propose concerning a lightning arrester connected to a steam boiler as a ground, may be answered by saying that the lightning would pass through the steam boiler to the earth. We do not see that the metal of the steam boiler could have any electrical effect upon the lightning. The case is perfectly parallel to that of iron ships at sea. They are frequently struck and the lightning passes off from the hull into the water without damaging the hull.

(9424) J. K. asks: Will you please tell me if a lightning rod placed on a pole a few feet from a barn will insure the safety of the barn. In other words, if lightning is in a straight course for a building will a pole and rod placed in said position attract the lightning from its course? A. A lightning rod standing above a building but attached to a pole several feet from the building will make it less likely that the building will be struck by lightning. It does not act in the manner you describe, by *drawing* a discharge which is aimed at the building and is coming through the air from its source and away from the building. A flash of lightning takes place in some such way as this: A cloud comes over a place. The cloud is charged with electricity. This attracts electricity of the opposite kind from the earth and into the highest objects of the earth under the cloud. These charges of electricity in the cloud and the earth react upon each other until they pull strongly enough upon each other to rupture the air between them and then the flash which signals their coming together is seen. If the most intense part of the charge on the earth is in the building, the flash will go to the building; if it is in the lightning rod the flash goes to the rod. Now the chance is that the highest objects will be most highly charged by the action of the cloud, and thus be the points to be struck. No power can divert the discharge when once it starts for its destination, which is the most intense place charged by the opposite kind of electricity to that of the cloud. It goes to that point and to no other. Nor are we to think that the flash always starts from the cloud and falls to the earth. It as likely starts from the earth as from the cloud, and starts from both at the same instant. It sometimes flies back and forth many times from cloud to earth and from earth to cloud before the surging action dies out. Rods protect by furnishing an easier path for the discharge since they are metal. Much may be learned upon this topic from Thompson's "Electricity and Magnetism," price $1.50 by mail.

(9425) J. J. A. asks: Please answer the following: Is it possible to recharge a dry cell? If so, let me know the proper way. A. A dry cell can be recharged in the same way as a storage cell is recharged, by sending a current through it in the opposite direction to that in which the current comes from the cell when it is furnishing current. Connect the positive pole of the charging current to the carbon of the dry cell and the negative pole of the current to the zinc of the dry cell. We have published a good mode of doing this in our SCIENTIFIC AMERICAN SUPPLEMENT No. 1451, price ten cents.

(9426) A. F. asks: 1. What are the advantages of using unsaturated (superheated) steam in running an engine? The superheated steam arrives at the cylinder having a high temperature, consequently there seems to be a small loss in condensation in the pipe conducting the steam from the boiler to the engine. The pressure, however, of this steam is not higher than that of the saturated steam in the boiler. What I would like to know is this: Is the small condensation in the steam-conducting pipe the only advantage of using superheated steam, or has it any special qualities or advantages when working in the cylinder? It seems the latter is not the case, because the pressure is the same as that of the saturated steam in the boiler—say 90 to 95 pounds—and hence for doing an equal amount of work, the engine would apparently consume an equal amount of saturated or unsaturated (superheated) steam. A. The advantages claimed for the use of superheated steam in engines are the saving from loss by condensation in the steam pipe, steam chest, and cylinder, and the gain from expansion of its volume by its increase in temperature; against which are the loss of lubrication of the cylinder walls by the condensing of wet steam and the cost of superheating, unless it is done by waste products of combustion after they leave the boiler. 2. Can superheated steam be used in any engine or is a compound or expansion engine necessary to utilize it? A. Superheated steam may be applied to any engine, but is most effective in compound engines. 3. Please to explain the expression, "the engine consumed 7.2 kg. steam per K. W. hour." (This expression was used in a German article.) A. The expression means 15.84 pounds of steam per 1.34 horse-power or 11.84 pounds of steam per horse-power hour. 4. Are steam turbines of about 60 horse-power manufactured in this country? Which seems to be more economical, especially regarding the steam question, engine or turbine, for electric lighting? A. Steam turbines are favorably considered for electric lighting on account of their high speed. 5. If electricity is always on the surface of a conductor why are larger wires not made hollow or also in thin strips whose surface would be equal to that of the respective size of wire? Is the above common rule only correct for static electricity and not for currents? Why? A. Electric tube wires are more expensive than solid wire. Ribbon wire is not suitable or easily manageable in the wiring of electric plants. This form of wire is the same for static and electric currents.

(9427) B. J. B. says: Please inform me through the columns of your valuable paper concerning "The White Horse of the Chalk Cliffs of England" and oblige a diligent but unsuccessful searcher. A. The "White Horse of the Chalk Cliffs of England" is an image of a horse which may be seen near Ashdown in Berkshire, on the cliff which rises above the valley. The legend ascribes it to Alfred the Great, who overcame the Danes in the valley below, and had the horse cut in memory of his victory. The white horse was the common emblem of the Saxons. This image is frequently alluded to in the opening pages of "Tom Brown at Rugby."

(9428) J. N. H. says: 1. Of what is sewer gas composed? A. Sewer gas is composed of the gases of fermentation and foul odors which are conveyed in the moisture-saturated air, all holding the germs of disease that are constantly poured into the sewers. See SCIENTIFIC AMERICAN SUPPLEMENT No. 1037 on "Analysis of Sewage Water," and No. 418 on the "Dangers of Sewer Gas," ten cents each, mailed. 2. Why will plumber's wiping solder remain in a molten state longer than pure pig lead? The former is composed of forty parts tin to sixty parts lead and therefore melts at considerably lower temperature. A. Plumber's solder is fluid at a greatly less temperature than lead and the heat lost is in proportion to the fluid temperatures. Hot bodies cool faster than cooler ones.

(9429) J. W. V. asks: A very long and narrow strip of country near here has lately been swept almost bare by a "cyclone" or tornado. Not only were the few houses in its path demolished, but large trees in comparatively deep and narrow valleys were uprooted, parts of barb wire fences taken out of the ground and the wire inextricably tangled, and, it is said, even rocks weighing several hundred pounds and lying flat on the ground were moved considerable distances. Can you give me a brief explanation, in your paper, of how such results are accomplished? Is there any foundation for the current belief that a "vacuum" exists in the center of the whirlwind, which assists in doing so much destruction? I cannot see how a vacuum anything like complete or sudden enough to cause the air contained in houses to burst the walls outward by its expansion, as is said to be the case, could be formed. A. The tornado is a violent, whirling storm, usually moving with considerable velocity over the country. It may be but a few rods wide. It is believed that the uprush of air in the center of the storm sometimes reduces the pressure of the air by as much as a fourth of the normal pressure. This reduction would be 533 pounds per square foot. This amount of pressure is sufficient to move stones and almost any other objects with great violence. Such a diminution of pressure will burst a house outward, as is often done, and scatter the debris far and wide. The upward motion of the air in the center of these storms has carried objects up into the air and dropped them at great distances from the point from which they started. Thus a piece of tin roofing has been carried 17 miles, and a letter has been found 45 miles from the place where it was when the tornado struck it. It is pretty certain that the wind in a tornado attains a velocity much more than 100 miles per hour, some say 300 to 500 miles per hour.

(9430) R. M. C. asks: Will you please inform me through your "Notes and Queries" how to make a simple device for varying the speed of a small battery motor, one that runs on three or four cells of battery (or advise me where I can find this information)? A. The simplest method of regulating the current from a primary battery is to raise or lower the plates of the battry by some mechanical device so that less or more of them may come into action according as you desire less or more current. You can in this way secure the amount of current necessary for running a motor at various speeds. A form of battery for this purpose is described in our SUPPLEMENT No. 792, which we will send for ten cents. Should you desire, however, to construct a rheostat or current regulator with wire in the usual form, you will find descriptions which will aid you, accompanied by diagrams, in our SUPPLEMENT Nos. 865 and 985, price 10 cents each. Of course you will require only a small apparatus for three or four cells of battery, and would better use rather a large wire, perhaps No. 16 iron wire. We think, however, the first method which we suggest would be the more satisfactory.

(9431) F. H. asks: 1. What are the chemicals used for the purification of air after it has been breathed? I have seen the statement several times that there are such chemicals, and I would like to know what they are. A. To secure pure air, pass the air through clean cotton to remove dust; then through sulphuric acid to remove ammonia and moisture; then through calcium hydrate and potassium hydrate to remove carbon dioxide; then through a solution of lead acetate to remove sulphur compounds, and lastly, through calcium chloride and soda lime, to remove the last traces of moisture and other impurities. There will be nothing remaining but pure oxygen, nitrogen, and argon. 2. What is the difference between static and dynamic electricity? A says that they are the same, and B says that they are different. A claims that if the secondary of an induction coil gives static electricity, that they are the same. He asks the question: "Can a Wimshurst machine be used to light lamps, or drive motors?" "If it can," he says, "static and dynamic electricity are the same, but if it cannot, then an induction coil does not give static electricity, as a transformer is nothing but an induction coil." A. Static electricity is electricity in the condition of a charge upon a body. The word static means without motion. The charge is at rest, but under tension, ready to move. Dynamic electricity is electricity in motion in the condition of an electric current. The distinction is radical and not dependent upon the apparatus by which the condition is produced. A Wimshurst machine when in operation but not producing a spark is in a static condition; when a spark is passing the discharge is a current and is dynamic. It is of enormously high potential and low amperage, and is momentary in duration. It will not light a lamp, because of these conditions. An incandescent lamp, 16 candle power, requires considerable current at a low voltage and continuing for a time to bring it to the temperature of incandescence. Nor will an induction coil light such a lamp, and for the same reasons. An induction coil arranged to transform a current at the proper voltage and amperage will light a lamp, but is not then in a static condition. It is sending current, which is dynamic. When a dynamo is running but no current is being drawn from it, the potential is there as a static charge, and the machine would charge a condenser. The circuit is then in a static condition. Turn on lamps or a motor and current flows. The machine has become dynamic. It is a dynamo now, as its name implies; it is sending current through its circuit. A's arguments are sometimes right and sometimes wrong. He does not seem to keep in mind the meaning of the terms he is using. 3. We have an alternating current here for lighting, of 220 volts. I can short-circuit this through an ordinary quart fruit jar, filled with water, and with two lead plates, about one inch wide by five long, in it. Can I get a spark with an induction coil as long, using this current without a condenser, as I can using batteries with a condenser? A. When you put the poles of the alternating current into a jar of water as described you have a water rheostat, which can be used to control the amount of current which shall flow for any purpose. It is quite commonly in use for this purpose. You can in this way run an induction coil for any desired length of spark. Such coil does not require a condenser. 4. How many amperes can No. 20 B. & S. magnet wire carry without becoming perceptibly heated? A. At an allowance of 400 circular mils per ampere, No. 20 B. & S. wire of copper can safely carry 2½ amperes. This will raise its temperature of course above that of the air. Any current will raise the temperature of a wire. No carrying capacity is given for wires under No. 18, since the Fire Underwriters do not allow them to be used in lighting and power circuits, and carrying capacity has no significance except in relation to lights and dynamos and motors.

NEW BOOKS, ETC.

ROOF FRAMING MADE EASY. By Owen B. Maginnis, Architect. New York: Industrial Publication Company, 1903. 8vo.; pp. 150. Price, $1.

The fact that this small handbook has reached its second edition is sufficient evidence that it has been found most valuable by architects and builders. The author treats very explicitly of the construction of all sorts of roofs, such as roofs for studios, towers, etc. The book is thoroughly practical in character, and is well illustrated by nearly one hundred cuts.

PRACTICAL LAWS AND DATA ON THE CONDENSATION OF STEAM IN COVERED AND BARE PIPES. To Which is Added a Translation of Péclet's "Theory and Experiments on the Transmission of Heat Through Insulating Materials." By Charles P. Paulding, M.E. New York: D. Van Nostrand Company, 1904. 8vo.; pp. 102. Price, $2.

The object of this monograph is to give to engineers a rational method of estimating the loss of heat from steam pipes and boilers covered with any of the standard non-conducting materials. Far from being new, the method to which attention is here called was worked out by the French physicist Péclet in 1850, but, in the absence of translations of Péclet's pamphlet, his deductions seem to have been generally overlooked in this country. The principles involved are so general that the loss of heat from covered pipes is only one of their many practical applications. To those who have to deal in any way with the problems of cold storage and refrigeration, the information and the formulas given in this volume will be especially useful.

THE LOCOMOTIVE SIMPLY EXPLAINED. By Charles S. Lake. London: Percival Marshall & Co., 1903. 16mo.; pp. 72. Price, 25 cents.

This handbook forms No. 17 of the "Model Engineer" series, and it was written to describe