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 This is for our information and not for publication.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.

(9242) B. Jonas says: You would oblige me much by answering the following question: I have a galvanic battery giving 15 volts 70 amperes. Is it practically possible to charge with it a 110-volt storage battery? A. A storage cell requires two and a half volts in the charging current and 4 to 6½ amperes per square foot of surface of positive plate, reckoning both sides. The 15 volts which you have in your battery will therefore charge six cells at once. You can divide the storage battery into parts, and charge them successively. It will be a slow job, as there will be nine sections to be charged. It would be far more economical in both time and money to have a connection to a heavy current in your city, and charge the battery in two sections at the same time.

(9243) F. B. P. says: Will you kindly tell me how much water will be discharged per hour through a pipe ⅛ mile long

6 inches dia., fall 1½ inches to 100 feet
9 inches dia., fall 1½ inches to 100 feet
12 inches dia., fall 1½ inches to 100 feet
24 inches dia., fall 1½ inches to 100 feet

through square box 12 x 12 inches, same length and fall. Don't want any laborious calculation, but an approximate estimate. Water at mouth of pipe covers the mouth 2 or 3 inches. Pipe at outlet to have free, unobstructed discharge. It is said that a pipe running full will not discharge so much as one not quite full. If that is so, I take it that a small obstruction at mouth (where mouth is fully covered by water) would regulate the flow, so that the pipe would not run quite full. Or would the unobstructed outlet in that length of pipe (⅛ mile) operate so as to prevent the pipe running full? Can you refer me to some work on farm drainage, modern drainage by tiling, etc.? Can you refer me to back numbers of SCIENTIFIC AMERICAN containing articles on that subject? If so, I will write for them. Can you refer me to work on farm buildings? A. Referring to your inquiry regarding the flow of water through a pipe ⅛ of a mile long, with a fall of 1½ inches to each 100 feet, we would say that a 6-inch pipe will deliver approximately 5,900 gallons per hour. A 9-inch pipe will deliver approximately 15,700 gallons per hour. A 12-inch round pipe will deliver approximately 34,500 gallons per hour. A 12-inch square box will deliver approximately 43,200 gallons per hour. A 24-inch round pipe will deliver approximately 207,500 gallons per hour. Each one of these pipes will deliver the maximum amount when running full. With a given fall, and a given quantity of water flowing, the velocity of flow will be greater if the pipe is large enough, so that it does not flow full, than it will be if a pipe is used so small that the pipe must flow full; but for any given sized pipe the maximum flow will occur when the pipe is full. It is immaterial whether you regulate the flow of water at the entrance or at the outlet, provided both are under water. We would refer you to, and can supply you with, the following books: "Irrigation of Farm, Garden, and Orchard," by H. Stewart, price $1.50; "Drainage of Farms," by French, price $1.50; "Drainage for Profit and Drainage for Health," by G. E. Waring, price $1.50; also "Barn Plans and Outbuildings," price $1.50, and "Stables and Outbuildings," price $2.50.

(9244) G. W. D. says: In your paper of September 19, 1903, Query 9174, F. M. L. asks for information in regard to the "Big Dipper." He states that "at present" (I suppose about September 1) the handle of the "Dipper" points toward the earth in the early evening, which is incorrect unless he was 10,000 miles to the eastward of the United States. At that date (September 1) the "handle" pointed upward about 45 degrees west between 8 and 9 o'clock, and therefore would point toward the earth in 9 hours, or between 5 and 6 o'clock in the morning. However, this is not the object of this communication. Is your answer correct? If so, what I know about astronomy goes for nothing. There is an annual revolution only about the north star. If there was a diurnal revolution from east to west, while the earth's diurnal motion is from west to east, there would be two apparent revolutions of "Dipper." A. There are certainly two motions common to all the stars in the sky—one a motion of rising and setting in the same manner as the sun, due to the rotation of the earth on its axis; the other a motion over from east to west, or if facing the north pole, over from right to left. This is caused by the revolution of the earth around the sun, and is accomplished in a year. Because of this motion, a star sets about four minutes earlier each night than it did the night before. The constellations in the north, which never set, have this motion, and can be seen to occupy all positions around the north pole in a year. The Great Dipper is below the pole at one time, and six months later, at the same hour of the night, is directly above the pole, 180 deg. from its former position. We do not think our answer on this point is wrong.

(9245) M. P. C. says: Please answer the following question: I have a double-acting steam engine, the cylinder of which is 1½ inches x 3 inches, speed 290 revolutions per minute. I wish to make a double-acting steam pump, to be connected directly to the engine piston rod. What should be the diameter of each inlet valve and each outlet valve? What should be the dimensions of the cylinder? What should be the size of the suction pipe and the discharge pipe? What should be the dimensions of the air chamber? What form of valve would be most suitable and simple? A. In reply to your question about a double-acting steam pump which could be connected directly with your engine, making 290 revolutions per minute, with a stroke of three inches, we would say that this speed is too high for any direct-connected pump to work satisfactorily. We doubt if the valves would open and shut smoothly in the length of time that would be available under the conditions you mention.

(9246) A. L. asks: 1. Why is an electric current generated when the two wires are connected together of the Edison-Lalande battery? A. The current flows when the two wires from a cell are connected, because the chemical action is ready to begin at the instant of closing the wires. Most cells have no chemical action in them till the wires are connected; then the chemical action starts, and the current is generated. 2. How can copper be reduced to copper oxide or black oxide of copper? A. Copper is reduced to the oxide by passing oxygen over and through red-hot copper. It is far better to buy the copper oxide if you desire to use it in a cell. 3. If the same chemicals are put in at first in a storage cell, will the cell generate electricity the same as a primary cell? A. If a storage cell is made with the proper materials all ready for action, an electric current will flow from it as soon as it is set up. They are not usually made in this way, but charged for use after they are set up. 4. How much water will a volt-ampere decompose? A. Water cannot be decomposed by a current whose pressure is 1 volt. At least 1.48 volts are required to overcome the counter E.M.F. of the hydrogen and the oxygen and produce any decomposition. The electrochemical equivalent of hydrogen is 0.00001038 gramme, and of oxygen, 0.00008283 gramme. One ampere will therefore decompose the sum of these numbers in one second, or 0.00009321 gramme. This is reduced to ounces by dividing by 28.35.

(9247) W. & Co. say: We are about to build a house for our own residence. It is to be built altogether of concrete, from the cellar floor to the peak of the roof. We have a 6-horsepower (rated) gasoline engine, by means of which we desire to light the building with 50 16-candlepower electric lights through the medium of a storage battery that will carry enough to run all 50 lights for six hours, or a smaller number for a proportionately longer time. We know practically nothing of electrical science save what is picked up in our ordinary contact with it; but we desire to do this job ourselves, partly as a means of self-education on the subject, even if in the end it should cost more than would the employing of an expert to do the job, and then we know nothing about the practical working of it after it is installed. What we want to know is as follows: How and with what kind of wire should the building be wired? Would it be safe to bury permanently the wires in the concrete without pipes? Is concrete an insulator, or would it be necessary to use heavily-insulated wire? What kind or make of dynamo and what kind and amount of battery would you advise? The dynamo will have to be connected to the engine by belt, as when not in use generating electricity, we desire to use the engine for running an air compressor for refrigerating purposes, a pump for pumping water to tanks in the attic, and a lathe and other tools in the shop in the cellar. If necessary we can send you blue prints of the house plans, showing the location of all lights, and engine, as well as the desired location of the electrical machinery and keys or switchboards. If there is any book you advise as covering these specific points, kindly let us know the title and price; but we would prefer that you would give us the information we desire as covering this particular case. A. There are many insulated wires suitable for wiring a house. You can safely buy the wire which any reputable dealer in your city may have in stock or may recommend. The installation of the wires, lamps, switches, cut-outs, fuses, etc., should conform to the rules of the Board of Fire Underwriters; there are usually State laws also. If you do not insure, you may of course put the work in, in any way you please. We are of the opinion that it would be safer and in every way better to employ an intelligent electrical man to plan and put up the plant and teach you all about it. Every man to his own trade is a safe rule. We would not advise the burying of bare wires in concrete. Insulated wires should be used. The underwriters here require the wire to be placed in iron pipes also. You can get a copy of the rules of the underwriters on application to the New York Board of Fire Underwriters, 32 Nassau Street, New York city. The conduits for the wire should be left in the concrete, so that the wires may at any time be accessible. As to the dynamo, we would say get any dynamo which is easily accessible in your city, so that repairs and replacement of parts can be made easily. If you get a machine made at a distance, it may have to lie idle for weeks while you wait for some part to be forwarded to replace a broken or burned-out part. The Westinghouse Electrical Company, Pittsburg, Pa., are near you, and make perfectly reliable apparatus, for every part of your installation, excepting storage batteries. They will probably advise you just what to get from beginning to end. You will then have a homogeneous installation. The chloride accumulator is very largely used for house lighting and central station work. You will not go amiss by selecting it. The amount of battery you will require depends on the voltage of the lamp, half as many cells as the voltage. You will require 150 ampere-hour cells if you only wish to run 50 lights of 16 candle power for six hours on one charge.

(9248) T. C. says: A house is supplied with water from a spring situated 68 feet below the water tank in the attic of the house, and about 200 feet distant in a horizontal direction. The water is raised by a hydraulic ram, and the pipe supplying the tank passes into the *bottom* of the latter. Would it be a good plan to pass a lightning rod through the roof of the house and into the water in the tank, instead of "grounding" the rod outside in damp earth? The water tank is of wood lined with tinned copper. The water pipes are of galvanized iron. A. We would not advise passing a lightning rod through the roof of your house and into the water in your tank, instead of grounding the rods outside the house in damp earth in the regular way. Water is not a good conductor, and we do not consider it good practice to have any part of a lightning rod pass inside of a dwelling.

(9249) S. H. S. says: I have a chimney on my house that causes lots of trouble during extreme cold weather in winter by "sweating" and leaking down into kitchen. The chimney rests on a support in kitchen, runs up through the attic, and extends about 4 feet above roof—total length, 11 feet. The house is built of brick, and the wall forms one side of chimney below roof. The chimney is larger than the ordinary chimneys, with a larger flue. What can I do to remedy this trouble? Must have the chimney rebuilt this summer, notwithstanding it was rebuilt last fall, but it crumbled badly last winter, on account of so much sweating and freezing. Would like to keep chimney same size as now to match others. How would it do to build a double chimney, leaving a small air space between inner and outer walls? There are no masons here that seem to know how to overcome the trouble. The chimney worked all right until it was rebuilt last fall. A. In reply to question concerning your chimney, we would say that it is impossible for us to definitely decide, without thoroughly inspecting the chimney, what is the cause of your trouble and what should be the remedy, but we are inclined to believe that a small air space between the inner and outer walls of the chimney would remedy the difficulty. It would probably be well for you to have this air space arranged so that you could allow a free circulation of air through it or not, as you wished, according to the weather conditions. This could be arranged by means of a small slide or damper.

(9250) P. J. V. V. says: Would you be so kind as to give me information about the way shovels and pickaxes are made in this country, and the machines they use for it? Could you recommend me a book or treatise which gives full explanation on the subject? A. Shovels and pickaxes are made in this country in a great many different ways, different manufacturers using different processes. Shovels are usually stamped from sheet steel, either by hydraulic pressure, steam hammers or drop forges, and pickaxes are usually drop-forged from wrought iron or mild steel. Tooled steel points 3 or 4 inches long are then welded to the picks with a forked or double scarf weld. We know of no treatise on the subject which would give you any detailed information.

(9251) C. W. N. says: Please answer through your query columns as to the meaning in recent advertisements of "brake horse power," mostly applied to motor bicycles and automobiles. A. The meaning of "brake horse power" as applied to motor cycles and automobiles is "power which the engine is able to develop and apply to the driving axle of the machine." The term is used to distinguish the power applied to the axle, or the effective horse power of the engine, from the power developed inside the cylinder. The difference between the two is the friction of the engine.

(9252) H. L. E. says: Will you please let me know where I could obtain an enlarged engraving of the American beam engine, such as appears on a marine engineer's certificate or license? It is as good an engraving of this kind of engine as I have ever seen (but it is a little too small). It also shows the engineer starting the engine. Do you suppose you could obtain one of the blank certificates for me, as I do not want them for any dishonest purpose, only, as I said before, I like the engraving very much, as it shows all the parts of the engine very clearly. A. We know of no engraving like the one on the marine engineers' certificates, and we do not think it will be possible for you to obtain one of these certificate blanks without passing the necessary examinations.

(9253) A. D. W. says: I am informed that there is an alloy on the market for machinery bearings similar to babbitt metal, but possessing the advantage of requiring no oil or lubrication of any kind; my informant, however, did not know the name of this alloy. It occurred to me that you would probably know if there is such a material to be had. I want it for very high speed but light work. A. In reply to your inquiry, we would say that there are a number of so-called antifriction bearing materials on the market, but we know of nothing superior to genuine babbitt metal properly lubricated with oil. In order to reduce friction to the minimum, oil or lubrication of a similar character is necessary.

(9254) J. R. P. says: Girder is 15 inches high and 50 feet long, resting on three piers or columns. Will there be any difference in weight upon the center pier or column, whether cut in the center directly over the center column, or if the girder remains in a whole piece? A. We would say that if the girder is uniformly loaded, and if the piers are absolutely level, the maximum stress in the girder will be less than if two girders of one-half the length were used, by a small amount. The formulas for calculating the stress for such "continuous girders" are very complicated, and the results are inaccurate if there is even a slight settling of any of the piers. For this reason such "continuous girders" are usually not considered good practice in bridge construction; and in building construction are usually figured on the same basis as simple girders extending over but a single span.

(9255) B. M. M. says: Will you please give me the difference in the number of heat units contained in equal weights of the best coke and hard coal? Also, what is the difference in the relative value of 24-hour, 48-hour and 72-hour coke? What would cause coke to clinker and run on the grates, and what is considered the best kind of coke for furnaces and stoves, when used as a substitute for hard coal? A. We would say that there is practically no difference in the number of heat units contained in equal weights of the best coke and the best hard coal. They are both very nearly pure carbon, and each contains about 14,500 British thermal units per pound. We know of no definite data regarding the comparative value of 24-hour, 48-hour, and 72-hour coke. We believe, however, that the difference in heating value is very slight indeed, and that the amount of this difference will vary with the kind of coal from which the coke is made. Impurities, such as silicates and certain iron compounds, in sufficient quantities, would cause the coke to clinker if the fire were hot enough to fuse them. Connellsville coke is one of the best cokes on the market, but the ordinary gas coke will burn satisfactorily; in fact, any coke makes an excellent substitute for coal when the drafts are properly arranged.

NEW BOOKS, ETC.

LA TELEGRAPHIE SANS FIL. L'ŒUVRE DE MARCONI. Traduit du Scientific American de New York. Par Emile Guarini. Brussels. 1903. Pp. 64.

Mr. Guarini's work is a translation of his review of the state of wireless telegraphy published in the columns of the SCIENTIFIC AMERICAN SUPPLEMENT. Mr. Guarini has not only traced the development of wireless telegraphy from the experiments of Hertz to the present time, but he has also shown what Mr. Marconi has accomplished, and what the prospects are of a syntonized transatlantic wireless telegraphic service. The work is to be commended for its conciseness and for its accuracy.

REMINISCENCES OF AN ASTRONOMER. By Simon Newcomb, author of "Astronomy for Everybody," "Popular Astronomy," etc. Boston: Houghton, Mifflin & Co. 1903. With photogravure portrait. 8vo. Price $2.50.

Prof. Newcomb's Reminiscences are certainly a most refreshing combination of scientific autobiography and astronomical anecdote. Prof. Newcomb has known almost every scientist who is worth knowing; and his meetings with the distinguished men of the world have usually been marked by the happening of some striking incident which makes their narration a matter of peculiar interest. Astronomers will read with particular interest that portion