Business and Personal.

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NEW BOOKS AND PUBLICATIONS.

MATHEMATICAL TABLES. First Series. By Professor James Mills Peirce. Boston: Ginn & Heath.

Contains tables, chiefly to four figures, as follows: Logarithms; logarithms of circular functions; logarithms of sums and differences; inverse circular functions; logarithms of hyperbolic functions; natural sines and cosines, natural tangents and cotangents, natural secants and cosecants, table of proportional parts. In addition are ten sections devoted to instruction with regard to tables in general and the particular uses of the tables given.

KEY TO THE UNIVERSE, OR A NEW THEORY OF ITS MECHANISM, WITH MATHEMATICAL DEMONSTRATIONS AND TABLES. By Orson Pratt, Sen. Published by the author, Historian's Office, Salt Lake City, Utah.

Mr. Pratt's theory rests upon a double hypothesis involving: I. A continuous orbital propulsion, arising from the velocity of gravity and its consequent aberrations; II. A resisting ethereal medium of variable density. The object of the theory is to "extend the universality" of the law of universal gravitation. The author asserts and essays to demonstrate mathematically the existence of an ocean of rotating currents, set in motion by the rotation of the sun, and extending outward millions of millions of miles; so that all bodies entering the sun's dominions must partake not only of his controlling power of gravitation, but also of the great controlling power of rotation, which in connection with ethereal resistance must determine their orbital paths, prescribe their annual periods, and point out their axial rotations.

CATALOGUE OF SCIENTIFIC SERIALS. By Samuel H. Scudder. Cambridge: Library of Harvard University.

This excellent catalogue covers the entire range of scientific serials of all countries, including the transactions of learned societies in the natural, physical, and mathematical sciences, from 1633 to 1876. There are added an index of towns (places of publication); an index of titles; and one of special subjects, such as anatomy, astronomy, botany, chemistry, etc. Thus in the index of towns under New York, the searcher is referred to the pages in the national division, United States, in which the scientific serials of New York are entered. Here, for example, we find the SCIENTIFIC AMERICAN described, mentioning its scope, time of beginning, number of volumes, etc., besides some dozen or more other scientific periodicals which have started and died since this paper began to be published. For students engaged in special investigations or in looking up the history of any science the catalogue must be extremely useful. As the library of Harvard has no funds for the publication of such volumes it is to be hoped that this and similar ventures which it has in hand may somehow be made to pay their cost.

ELEMENTS OF DIFFERENTIAL CALCULUS, WITH EXAMPLES AND APPLICATIONS. By W. E. Byerly, Ph.D. Boston: Ginn & Heath. Price $2.50.

A text book embodying the results of Professor Byerly's experience in teaching the calculus at Cornell and Harvard. It is practical throughout, and apparently well suited for the use intended. Its professed peculiarities are the rigorous use of the doctrine of limits as a foundation of the subject, and as preliminary to the adoption of the infinitesimal notation and nomenclature; the early introduction of simple formulas and methods for integrating, and a rather elaborate treatment of the use of infinitesimals in pure geometry.

INSECT LIVES; OR, BORN IN PRISON. By Julia P. Ballard. Cincinnati: Robert Clarke & Co.

Designed to awaken in children an interest in the lives of our more common moths and butterflies, and to show them how to study such lives scientifically and entertainingly. The work is prettily done and admirably calculated to effect the author's purpose.

FOOT PRINTS OF VANISHED RACES IN THE MISSISSIPPI VALLEY. By A. J. Conant. St. Louis: Chancy R. Barnes.

Gives an account of some of the monuments and relics of prehistoric races scattered over the surface of the Mississippi Valley, with suggestions as to their origin and uses. Mr. Conant is an enthusiastic student of American archæology in the field as well as in the reports of other observers, and writes with unusual fullness of knowledge. His investigations lead him to the belief that the original inhabitants of America were Autochthons. The civilized tribes which the Spaniards found in Mexico were all branches of the great Nahua family, whose origin has not been clearly traced. In the advent of the Toltec domination the first gleams of ancient American history begin to be visible. The original seat of the Nahua race, he is inclined to believe, must be sought for in the Mississippi Valley. The Indians are a later race, evidently of Asiatic origin.

INDUSTRIAL HISTORY OF THE UNITED STATES. By Albert S. Bolles. Norwich, Conn.: Henry Bill Publishing Company. 8vo, pp. 936.

This work occupies, and on the whole commendably, a decided gap in popular literature. Its most obvious fault is the lack of a good index, indeed an index of any sort: a lack which seriously diminishes its usableness and usefulness. Each great department of productive industry is taken up in a special book, separate chapters being given to each important sub-division. Here under agriculture and horticulture, there is a chapter of general history followed by chapters on agricultural implements, cotton, wheat, corn, sugar, tobacco, hay, minor crops, neat cattle, dairy products, the horse, sheep, swine, horticulture, nurseries, and fruit raising. In like manner the historical development of each of the various lines of manufacture is sketched with considerable fullness of detail, considering the vast breadth of the field covered. Shipping and railroads; mines, mining and oil; banking, insurance, and commerce; trades unions and the eight hour movement; and the industries of Canada are severally honored with a separate book. The work is copiously illustrated, the selection of the engravings being determined apparently by their availability oftener than by their superior merit. The author has taken no little pains to bring his history well down to the date of publication, and his work is one that should go into every school and family library. If it could take the place of some of the political and military histories used as text books in our higher schools the change would be a beneficial one to the country.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) H. P. G. asks (1) how to make a cheap and serviceable emery wheel. A. Turn wheels from well seasoned pine, of the form desired; place emery upon an iron plate heated to 200° to 212°; coat the wheels with glue prepared as for uniting wood, and roll the wheels in the warm emery. After the glue dries, the surplus emery is brushed off and another coating of glue is applied and the wheels are again rolled in the warm emery. The wheels should be allowed to become thoroughly dry before use. 2. How can I make emery sticks? A. Prepare sticks of such forms as you may require, and coat them as directed for emery wheels, or attach to them emery paper by means of glue or paste.

(2) F. J. W. asks: 1. Why do we hear sound farthest just before a storm, when the atmosphere is lightest? A. Two reasons are given for this phenomenon: one is, that the air being moist, has more than its normal conducting power; the other is, that the low-lying strata of clouds confine the sounds to the earth. 2. If, as we are taught by philosophy and observation, cold contracts and heat expands the atmosphere, why does rarefied air prove to be so cold as to preserve snow and ice at a few thousand feet above sea level? A. The rarefied air in which the snow and ice exist is not rarefied by heat but by decreased pressure. Rarefaction of air diminishes its heat-absorbing power. Another cause which influences the temperature at great heights is its removal from the ground which heats it by contact. And still another reason is that the air is drier, and therefore very diathermanous.

(3) A. H. asks how to make a cement for sharpening knives. Composed of emery altogether would be too expensive. A. Mix fine sharp furnace sand with hydraulic cement.

(4) A. McC. writes: I notice in the number for December 13, 1879, on page 387 (11), J. S. P. asks about muriatic acid for tinners' use. For a soldering fluid I have in my laboratory work found the following excellent. Dissolve 32 grammes zinc in sufficient muriatic acid, and add 22 grammes sal ammoniac (ammonium chloride), and evaporate to dryness. Dissolve the resulting salt in water, and filter. This will answer for tin, zinc, and brass excellently, the parts to be soldered scarcely needing to be cleaned when this is used.

(5) H. L. S. asks which side of a belt should run in contact with the pulley? A. The grain side next the pulley drives best and wears best.

(6) J. H. asks: Will you tell me the size of the cylinder of engine for boiler described below? Boiler horizontal, 7 feet long, 28 inches diameter, 16 4-inch tubes 4 feet long, height of boiler 3 feet, dome 15 by 15 inch to burn wood. A. It depends in part on the speed of the engine; probably a 5 inch cylinder and 6 to 8 inches stroke would answer.

(7) H. P. T. asks: Can sufficient gas be had through an ordinary dwelling house gas pipe (½ inch), with three Bunsen burners, to evaporate (through the aid of a coil boiler) sufficient water to furnish steam necessary for a 1-6 to ¼ horse power engine? A. Yes.

(8) W. L. writes: A blower being placed in a boat aft of a sail, blows hard against the same; which way will the boat move? A. As action and reaction are equal, we doubt if the boat would move either way from the mere blowing.

(9) J. W. D. asks: Was there an iron vessel or gun boat built or launched from or about the foot of 14th street, North River, by the Delamater Iron Works, at or about the time of the war? A. Yes, the Matanzas.

(10) P. H. D. asks how to find the diameter of a small wheel of a given number of teeth to gear into a larger wheel of given diameter and given number of teeth. For example, what is the diameter of a wheel which has six teeth, to gear into a wheel, two inches in diameter, with sixty teeth? A. The ratio of the diameters of the two wheels is the same as that of the number of their teeth. If one wheel has 6 teeth and the other 60, the diameter of the small wheel is 1-10th the large one.

(11) J. V. asks for the rule for finding the blow struck by a moving body. Is it the weight of the body by the square of its motion, and is the motion the motion in seconds or in minutes, that is, the initial velocity? A. Formula given by Molesworth is F=V W, F=force of blow in tons. V=velocity per second due to fall. W=weight of ram in tons.

(12) R. B. S. asks: What is the difference between levigation and trituration? A. Levigation is the process by which substances are reduced to a state of minute division by rubbing them between two hard surfaces while the substances are formed into a paste with water. Trituration is the comminution of substances without the aid of a liquid.

(13) T. B. asks: 1. Can old Bessemer steel rails be worked over and made into new rails? A. Yes. 2. Which side of a leather belt should be worked to the pulley, the rough or smooth side? A. The grain or smooth side.

(14) A. D. F. asks for a good recipe for waxing floors, and how it is applied. A. Stir 25 parts of shredded yellow wax into a hot solution of 12 parts of pearl ash in soft water. Keep the mixture well stirred until effervescence ceases, then remove it from the fire and stir in 12 parts of finely ground dry yellow ocher. It may now be poured into cans to cool. When wanted for use one part of it is dissolved in five parts of boiling water. Apply warm with a paint brush. It dries in a few hours, when the floor is polished with a floor brush and afterward wiped with a woolen cloth. It is said that this wax coating will last for six months with ordinary use.

(15) H. D. K. asks for a description of a powerful battery about the size of a thimble, to be used in some electric jewelry. A. The essential parts of such a battery are, two plates of carbon, one plate of well amalgamated zinc, and a solution made by dissolving 2 parts of bichromate of potash in 20 parts of hot water, and when cold adding 1 part of sulphuric acid. The zinc plate is placed between the two carbon plates, leaving a space on each side. The carbon plates are connected together and with one of the conducting wires, the zinc plate is connected with the other conducting wire. The zinc and carbon plates may be attached to a rubber stopper fitted to a small jar or bottle containing the bichromate solution at the bottom below the ends of the plates, and the solution may be brought into contact with the plates by turning the bottle down on its side. This battery works powerfully for a short time, but the solution soon becomes exhausted and must be replaced.

(16) F. Y. A. asks: How am I to judge pure lard oil? That which I usually get gums. A. Compare color, smell, taste, specific gravity (=0·9003), and