

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue. The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

Wanted—Situation as Analytical Chemist or Assayer. Address H. F. Starr, 91 Mt. Pleasant Ave., Newark, N. J. Elevators.—Stokes & Parrish, Phila., Pa. See p. 421.

The Steam Pipes, Boilers, etc., of the Tradesman's National Bank, Broadway National Bank, and First National Bank, are protected with H. W. Johns' Asbestos Boiler Coverings. H. W. Johns Manufacturing Company, No. 87 Maiden Lane, New York, sole manufacturers of genuine Asbestos Liquid Paints, Roofing, etc.

Wanted—A Nut Machine and a Bolt Header. Address, stating particulars and prices, B. & S., Box 773 New York city.

Twelfth Year. Prof. P. H. Vander Weyde, Editor. Send 10 cents for a specimen copy of the Manufacturer and Builder, the best and cheapest mechanical journal published. Address H. N. Black, Publisher, Box 4379, New York city.

A New Health Almanac and Annual of Phrenology for 1880, will be sent to every reader of the SCIENTIFIC AMERICAN who will send three 3c. stamps to the publishers, S. R. Wells & Co., 737 Broadway, New York.

Attention is directed to the new and readable prospectus of the New York Ledger in our advertising columns.

Wanted—Watchman's Time Detector. Penfield Block Works, Lockport, N. Y.

Band Saw, Jig Saw, and other Wood-working Machines. P. Prybil, 467 W. 40th St., New York.

Jewelry Boxes with Safety Locking Device. Security against sneak thieves and dishonest domestics. Just the thing for a Holiday Present. See adv. of Frothingham & Emory, Safe M'f'rs, outside page.

Brick Presses for Fire and Red Brick. 309 S. Fifth St., Phila., Pa. S. P. Miller & Son.

Combined Step Ladder, Ironing Table, Clothes Frame. Good thing sure. See adv. last week.

Crucible Steel Castings that weld and work like bar steel. All articles difficult to forge. Special facilities and skill in plow castings and agricultural work. Also agricultural wrought steels and shapes. Write to Read, McKee & Co., limited, Pittsburg, Pa.

Fire on the Hearth.—Open grate and warm air furnace combined. Circulars by O.S. & V. Co., 78 Beekman St., N. Y.

Telephones repaired; parts of same for sale. Send stamp for circulars. P. O. Box 265, Jersey City, N. J.

Hub Mortisers; latest improved. Witherby, Rugg & Richardson, Worcester, Mass.

Machine Drawing Copies, 10 cents each. Descriptive list and catalogue of scientific books sent free by mail on application. E. & F. N. Spon, 48 Broome St., N. Y.

The Friction Clutch Captain will start calendar rolls for rubber, brass, or paper without shock; stop quick, and will save machinery from breaking. D. Frisbie & Co., New Haven, Conn.

For Sale.—One Horizontal Steam Engine, 20' x 48'; one 18' x 42'; one 16' x 36". Atlantic Steam Engine Works, Brooklyn, N. Y.

The Baker Blower ventilates silver mines 2,000 feet deep. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Park Benjamin's Expert Office, Box 1009, N. Y. Recipes and information on all industrial processes.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburg, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 406. Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Noise-Quelling Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Stave, Barrel, Keg, and Hoghead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Eclipse Portable Engine. See illustrated adv., p. 389.

For best Fixtures to run Sewing Machines where power is used, address Jos. A. Sawyer & Son., Worcester, Mass.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery. Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The New Economizer, the only Agricultural Engine with return fue boiler in use. See adv. page 405.

Special Wood-Working Machinery of every variety Levi Houston, Montgomery, Pa. See ad. page 405.

Latest improved methods for working hard or soft metals, grinding long knives, tools, etc. Portable Chuck Jaws and Diamond Tools. Address American Twist Drill Co., Woonsocket, R. I.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y. Light and Fine Machinery contracted for. Foot Lathe Catalogue for stamp. Chase & Woodman, Newark, N. J. Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y. Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Sawyer's Own Book, Illustrated. Over 100 pages of valuable information. How to straighten saws, etc. Sent free by mail to any part of the world. Send your full address to Emerson Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 9 cents per pound. Fully warranted. Repairs to Corliss Engines a specialty. L. B. Flanders Machine Works, Philadelphia, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus'd adv. p. 30.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Oak Tanned Leather Belting, Rubber Belting, Cotton Belting, Polishing Belts. Greene, Tweed & Co., N. York.

Walrus Leather, Solid Walrus Wheels; Wood Wheels covered with walrus leather for polishing. Greene, Tweed & Co., N. Y.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn. \$400 Vertical Engine, 30 H. P. See page 350.

No gum! No grit! No acid! Anti-Corrosive Cylinder Oil is the best in the world, and the first and only oil that perfectly lubricates a railroad locomotive cylinder, doing it with half the quantity required of best lard or tallow, giving increased power and less wear to machinery, with entire freedom from gum, stain, or corrosion of any sort, and it is equally superior for all steam cylinders or heavy work where body or cooling qualities are indispensable. A fair trial insures its continued use. Address E. H. Kellogg, sole manufacturer, 17 Cedar St., New York.

Emery Wheels for various purposes, and Machines at reduced prices. Lehigh Valley Emery Wheel Company, Weissport, Pa.

Comb'd Punch & Shears; Universal Lathe Chucks, Lambertville Iron Works, Lambertville, N. J. See ad. p. 333. Patent Steam Cranes. See illus. adv., page 353.

National Steam Pump. Simple, reliable, durable. Send for catalogue. W. E. Kelly, New Brunswick, N. J.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 23, Pottsville, Pa. See p. 349.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

Catechism of the Locomotive, 635 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schlichter, Schumm & Co., Philadelphia, Pa. Send for circular.

For Machine Knives and Parallel Vises, see advertisement, p. 349. Taylor, Stiles & Co., Riegelsville, N. J. Steam Engines, Automatic and Slide Valve; also Boilers. Woodbury, Booth & Pryor, Rochester, N. Y. See illustrated advertisement, page 421.

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, and natural tangents and cotangents, natural sines 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 archeology 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 usability and usefulness. Each great department of productive industry is taken up in a special book, separate chapters being given to each important subdivision. 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, meat 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.



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 tinner's 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=VW, 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 ochre. 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