

the detection of forgeries, (4) chemical considerations, including a statement of the constitution of common inks and chemical tests applicable to documents by means of which the nature of an ink may be ascertained. The author describes no less than seven methods of investigation of which he is the originator. The book also has an appendix containing valuable notes on the scientific aspect and legal status of the subject.

ELECTRIC LIGHTING. By Francis B. Crocker, E.M., Ph. D. New York: The D. Van Nostrand Company. 1901. 500 pp., 391 ill. Price \$3.

This book, which is the second of two volumes dealing with the subject, describes the distributing system and lamps, and covers all parts of electric lighting systems excepting the generating plants. In treating each branch of the subject the principles are first stated with considerable fullness and are then followed by practical examples of prominent methods and apparatus employed in actual practice. Both volumes are intended as textbooks for engineering schools and as handbooks for practising engineers, and thus all abstruse and detailed matter has been omitted as far as possible. The National Electrical Code and the Report of the Committee on Standardization of the American Institute of Electrical Engineers are added as appendices.

THE TRUSTS. By William Miller Collier. New York: The Baker & Taylor Company. 1900. 336 pp.

Mr. Collier should receive the thanks of every business man for such a fair-minded and able discussion of this great problem of the new century in America. He approaches the trust question from the economic standpoint and views it in the light of past experience. He shows the causes that have led to the giant corporations of to-day, as well as the dangers that lie in the monopolistic tendencies of these corporations; and also indicates what appears to be the proper legislation to hold such tendencies in check. The conclusion he reaches is that the trust is a natural outcome of modern competition; that it is the most economical form of conducting industries, and that its only danger is in its power to become temporarily a monopoly and raise prices if it so desires. That such a course is in the end self-destructive he very clearly demonstrates. A chapter on trusts and expansion offers some good suggestions as to one unappreciated aid in remedying the evil, while another chapter is devoted to all the various remedies. A number of appendices give the various acts that have been passed, both State and Federal, thus far to regulate trusts. The book is a fair-minded discussion of both sides of this burning question by an able student of political economy.

UNTERSUCHUNGEN UEBER HETEROGENESE. Von Dr. A. P. Fokker in Gronigen. IV. Die Granula der Milch. Three plates. Gronigen: P. Noordhoff. 1901. Octavo. Pp. 102. Price, paper, \$1.

The work before us is an ingenious demonstration of a new hypothesis that bacteria are not individual living creatures, but only partial biens, proliferative forms of diseased protoplasm from which they have sprung by heterogenesis.

SUR LE SYSTEME GLANDULAIRE DES FOURMIS. Par Charles Janet.

SUR LA VESPA CRABRO L. Ponte. Conservation de la chaleur dans le nid. Par Charles Janet.

VORSCHLAG ZU EINER NEUEN EINFACHEN METHODE DER VIELFACHTELEGRAPHIE. Von J. W. Giltay, in Delft. Sonderabdruck aus der Electrotechnischen Zeitschrift. Berlin: Verlag von Julius Springer. 1901.

ETUDES SUR LES FOURMIS, LES GUEPES ET LES ABELLES. Note 18, Aiguillon de la Myrmica rubra, Appareil de fermentation de la glande à venin. Par Charles Janet. Paris: Georges Carré et C. Naud. 1898. Pp. 27.

THE PRACTICAL HOTEL STEWARD. By John Tellman, Chicago, Ill. The Hotel Monthly. 1900. Price, \$1.

A most excellent book which will be welcomed by all hotel and club stewards. It gives precisely the information which stewards need to conduct the affairs of a house with economy. The steward is very much in the position of a general of an army, and in order to make a success it requires unremitting attention to the smallest detail. The book before us gives samples of menus for various grades of hotels, samples of requisition blanks, etc., and takes up the question of wines with rare intelligence. It is written by a thoroughly practical hotel steward.

The American School of Correspondence of Boston has just published a Reference Library of Engineering Practice, Steam, Electrical and Mechanical, which comprises a set of five large and extremely handsome volumes. The editors have been led to prepare this library as a result of success obtained in teaching engineering subjects to mechanics and others who are not deeply versed in mathematical science; and in the preparation of the library the use of clear and simple language has been adhered to throughout. The illustrations, which have been carefully chosen, number some 2,000. The volumes are handsomely bound.

Business and Personal Wants.

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Sheet Metal Stamping: difficult forms a specialty. The Crosby Company, Buffalo, N. Y.
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Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.
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For Sheet Brass Stamping and small Castings, write Badger Brass Mfg. Co., Kenosha, Wis.
Inquiry No. 866.—For parties to manufacture a tinware novelty on royalty or otherwise.
Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.
Inquiry No. 867.—For manufacturers of carpet cleaning machinery.
Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city.
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SAWMILLS.—With variable friction feed. Send for Catalogue B. Geo. S. Comstock, Mechanicsburg, Pa.
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Wanted—Punch and Die Work, Press Work and light Manufg. Daugherty Novelty Works, Kittanning, Pa.
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We are equipped to manufacture all kinds of specialties. Send samples. Chicago Handle Bar Co. Chicago, Ill.
Inquiry No. 871.—For manufacturers of oil machinery.
Machinery designed and constructed. Gear cutting. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.
Inquiry No. 872.—For dealers in cinematographs or kinoscopes.
Kester Electric Mfg Co's. Self-fluxing solder saves labor, strong non-corrosive joints, without acid, Chicago, Ill.
Inquiry No. 873.—For catalogues of paint making machinery.
The celebrated "Hornby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.
Inquiry No. 874.—For manufacturers of kilns for burning lime continuously; kilns from which the lime can be taken out without interfering with the burning.
The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4. Munn & Co., publishers, 361 Broadway, N. Y.
Inquiry No. 875.—For manufacturers of rotary cement furnaces.
Will give a one-half interest in twelve inventions, or any part of number, for money to perfect patent and dispose of same. Address S. O. Stewart, El Las Vegas, New Mexico.
Inquiry No. 876.—For manufacturers of lime burners to burn a substance in a powdered form.
ELECTRICAL ENGINEER (Tramways).—Wanted immediately by the Council of the City of Wellington, New Zealand, a thoroughly qualified Electrical Engineer, who must have had special experience in carrying out and equipping overhead electrical tramways and power stations. Full particulars and conditions may be obtained on application to Messrs. R. W. Forbes & Son, Produce Exchange, New York, and applications must be delivered at the office of Messrs. John Duthie & Co., Ltd., Lime Street, London, E. C., England, not later than noon on the 20th July.
Inquiry No. 877.—For manufacturers of sugar machinery.
EVER MADE THE TRIP?
While it has always been a beautiful trip over the Lackawanna Railroad to Buffalo, yet the fact has not been so generally known as it has of late, and the result is that the increase of traffic is very large. One of the most talked of pieces of scenery is the Delaware Water Gap, and it would pay any one who has never made the trip to Buffalo by way of the Lackawanna to take it and view this beautiful spot. Another great advantage is the shortness of the route. It is a fact that the Lackawanna is the shortest road to Buffalo.—Insurance Times.
Inquiry No. 878.—For manufacturers of screw-top, round tin cans for liquids in quart and smaller sizes.
Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.
Inquiry No. 879.—For manufacturers of small malleable iron castings, near Canon City, Col.
Inquiry No. 880.—For manufacturers of aluminum and brass novelties by contract.
Inquiry No. 881.—For manufacturers of glass.
Inquiry No. 882.—For manufacturers of cigarette making machines.
Inquiry No. 883.—For manufacturers of copper balls.
Inquiry No. 884.—For manufacturers, in Michigan and Ohio, of dress hooks and eyes.
Inquiry No. 885.—For dealers in dishes, lamps, silver ware, dress suit cases, watches, mandolins and guitars, rocking chairs and jewelry; western houses, if possible.

- Inquiry No. 886.—For manufacturers of pipe-making machinery, also machinery for working and cutting amber.
Inquiry No. 887.—For small glass articles.
Inquiry No. 888.—For the address or the manufacturers of the Packard vacuum pump.
Inquiry No. 889.—For manufacturers of well-drilling machinery.
Inquiry No. 890.—For a sand screen and elevator for loading railroad cars.
Inquiry No. 891.—For tools and machinery to make picture frames.
Inquiry No. 892.—For fertilizer dryers.
Inquiry No. 893.—For tobacco dryers.
Inquiry No. 894.—For tobacco grinding mills.
Inquiry No. 895.—For glue machinery.
Inquiry No. 896.—For vacuum pans for glue.
Inquiry No. 897.—For manufacturers of paint machinery.
Inquiry No. 898.—For manufacturers of steam river boats of the stern-wheel pattern.
Inquiry No. 899.—For responsible manufacturers to build apparatus requiring heavy sheet copper and cast bronze in construction.
Inquiry No. 900.—For machinery for making coal slack eggettes.
Inquiry No. 901.—For opera chairs, hardwood floors, etc.
Inquiry No. 902.—For a toothpick machine.
Inquiry No. 903.—For manufacturers of diving belts, supplies, etc.

Notes & 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.

(8215) C. J. K. asks: What horse power electric motor, connected to axle by double reduction gearing, would be necessary to draw a train of cars weighing five to six pounds, track perfectly level? How many cells of acid battery would be required? A. A very small motor should pull a couple of pounds on the drawbar, which is all that is required to draw a weight of 6 pounds on a level track. SUPPLEMENT Nos. 753 or 1210, price ten cents each, may contain plans which will meet the case. Two cells will drive the first, and four to six the second of these motors.

(8216) U. M. writes: 1. I would like to ask a few questions in regard to voltmeters described in SUPPLEMENT No. 1215, page 19480. 1. What necessary changes are required to make the voltmeter register from 0 to 12? That is, divide the full length of scale into 12 divisions in place of 125 divisions. A. To cause the needle to swing the whole length of the scale for a voltage one-tenth as great, or for 12.5 volts, you should use one-tenth as much wire. 2. Would it be advisable to use copper plate of 1/8 inch (which I have) in place of brass, for the back of voltmeter? A. There would seem to be no reason why copper may not be used in place of brass, except that copper is harder to work than brass.

(8217) C. G. asks: Is nickel plate acted upon by photographic chemicals? A. All acids dissolve nickel with more or less rapidity, hence these dishes are not suitable for use in photographic work. Use hard rubber, celluloid, glass or porcelain. The use of nickel-plated dishes is unsafe in the kitchen for the reason that the acids of the foods will form with the nickel compounds which are poisonous.

(8218) J. L. M. writes: All wiring tables are figured mostly in algebra. I am not up in this study, and wish you would give me some table that can be worked out in plain multiplication and division for getting sizes of wire for carrying different amounts of current at different voltages any given distance and with different percentages of loss. A. Cushing's "Standard Wiring," price \$1 by mail, contains the rules expressed in initial letters, with the signs of multiplication and division. These can be easily learned and are the simplest form for expressing the rules.

(8219) C. H. asks: 1. Can glass be made by sand and potash falling between two arcs or is it necessary that it should be held in place before it will form into a liquid, and would it then interfere with the carbons or current? A. We do not think sand could be melted in the time it would occupy in falling through between the carbons, and if it were it would turn solid in the same time after it passed into a colder place below. You will find a furnace to be the cheapest way for melting sand and making the glass. 2. If glass were held in an arc would it break the current? A. Yes, if the heat did not crack it too soon. 3. Would a blowpipe

have any effect on an arc the same as with gas to direct the heat? A. No. The blowpipe does not direct the heat of a gas jet. It produces the heat. The heat of a blowpipe is due to the fiercer combustion of the gas in the greater supply of oxygen furnished by the blast. It is a blast furnace on a small scale. The arc would be cooled by a blast of air, since its heat is not due to combustion, as in the ordinary flame. An arc can be blown out to a point and act as a blowpipe by using an electro-magnet to repel the arc.

(8220) J. J. D. writes: In the SCIENTIFIC AMERICAN of March 23, page 178, I saw the expression, "a current of three thousand volts at the meters." Is the expression correct? A few weeks ago in your inquiry column, in answer to a correspondent, you said, "We get the expression very frequently, 'A current of so many volts.' The statement is entirely wrong. A current is measured in amperes, not in volts." A. The voltage of a current is its pressure. The current is measured in "amperes." The expression so often heard, "A current of 110 volts," is not correct. It should not be used, even if it does occasionally find its way into our columns. We confess that we do not always use entirely correct language; that does not prevent our pointing out incorrect language when it comes in our way to do so.

(8221) C. G. asks: Will you please publish in the SCIENTIFIC AMERICAN a description how to make a Wehnelt interrupter for a direct current of 125 volts? A. THE SUPPLEMENT, pages 19602 and 19811, price ten cents each, contains illustrated articles upon the Wehnelt interrupter. The interrupter is adjusted to the voltage of the current by varying the length of the platinum wire which is in the acid.

(8222) R. H. C. asks: 1. In a copying camera or enlarging camera, how far from the source of light (incandescent gas burner) should the condensing lens (ground glass) be? A. A condensing lens is not found necessary. Place the ground glass one or two inches in front of the negative. It will then diffuse the light of the lamp so as to give an even illumination over the negative. 2. At what distance from the condensing lens should the negative be placed? A. If a lens is used the negative should be quite near it, so that the negative shall be covered by the cone of light from the lens. 3. What size should the condensing lens or ground glass substitute be for a 4 x 5 or 2 1/4 x 3 1/4 negative? A. Anything larger than the negative. 4. What kind of lens or lenses should be used in enlarging to obtain the best results? And what size (diameter) should the lens be? A. The same lens that was used in making the negative will work to enlarge it to any size. If the lens will cover the plate, it will serve to enlarge it.

(8223) W. T. M. writes: In answer \$111, for specific heat of hydrogen and constant volume for 0.2419 read 2.419. The ratio of the specific heats at constant volume and pressure is 1.41 for hydrogen and 3.4062 divided by 1.41 equals 2.419. A. We confess the error. And yet we quoted the best authorities accessible. Our error arose from not verifying the calculation and making sure that the reference was correctly made. Since our correspondent has called our attention to the matter, we have been through a large number of authors on this subject with interesting results.

Table with 4 columns: Authority, Specific Heats, Constant Pressure, Constant Volume. Rows include Smithsonian Tables, Barker's Physics, Ganot's Physics, Pickering's Phys. Manip., Kohlrausch, Phys. Exp., Hastings and Beach Physics, Ames and Bliss' Manual, Whiting, Phys. Meas.

It is of course known by every student of thermodynamics that the ratio of the specific heat at constant pressure to that at constant volume, for a perfect gas, is constant, and is 1.41. Our table makes it plain that at some time a typographical error occurred in giving the specific heat at constant volume, giving it as 0.24 instead of 2.41, and that this error once started has been transmitted from text to text. The oldest book quoted above was printed in 1876, and contains the error, which is thus shown to be venerable. Another more glaring error of the same sort is seen in the number given by Kohlrausch, 0.409, an obvious error, if one is informed on the subject; but a reference book is for the learner and the uninformed. These cannot detect such a misprint unless by a comparison of authorities, which may not be at hand, and for which there may not be time. Very few would think of verifying the statements of so eminent an authority as Kohlrausch. We think we have shown that we were in good company when we committed the error. This is not a solitary instance of errors traveling for a long time in textbooks without detection. Many an experiment has been printed without being performed by the author, which was an impossibility. A laboratory book in chemistry recently published by a professor in a university directs the student to collect chlorine by the displacement of water! He will get some after the water is saturated, but meanwhile the back pressure may interrupt the complete success of the operation, and even break things.

