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 v umes 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 fellowed 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 $\bullet m!tted$ 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 appen dices.

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 temperarily a menepely 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. number of appendices give the various acts that have been passed, both State and Federal, thus far to regulate trusts. is a fair-minded discussion of both sides of this burning question by an able student of pelitical ecenemy.

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 parbions, proliferative forms of diseased protoplasm from which they have sprung by heterogenesis.

SUR LE SYSTÈME GLANDULAIRE DES FOUR-MIS. 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. Sonder-abdruck aus der Electrotechnischen Zeitschrift. Berlin: Verlag von Julius Springer. 1901.

ETUDES SUR LES FOURMIS, LES GUEPES ET LES ABEILLES, Note 18, Aiguillon de la Myrmica rubra, Appareil de fermenture 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 Monthly. 1900. Price, \$1. The Hotel

A most excellent book which will be welby 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 intellimence. It is written by a thereughly practical hotel steward.

The American School of Correspondence of Besten has just published a Reference Library of Engineering Practice, Steam, Elec trical 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.

READ THIS COLUMN CAREFULLY - You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. In every case it is necessary to give the number of the inquiry. MUNN & CO.

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Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

luquiry No. 865.-For manufacturers of small jeweler's rollers.

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Machinery designed and constructed. Gear cutting The Garvin Machine Co., 149 Varick, cor. Spring Sts., N.Y. Inquiry No. S72.—For dealers in cinemategraphs or kinetoscopes.

Kester Electric Mf'g Co's, Self-fluxing solder saves labor, strong non-corresive joints, without acid, Chic-

age, Ill. Inquiry No. \$73.-For catalogues of raint making machinery.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

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The best book for electricians and beginners in elec-By mail, \$4. Munn & Co., publishers, 361 Broadway, N. Y. Inquiry No. 875.—For manufacturers of retary

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, E. 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 entained on application to Messra, 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 neen en 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 the mest talked of pieces of scenery is the Delaware Water Gap, and it would pay any one who has never made the trip to Buffale 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-op, round tin cans for liquids in quart and smaller

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. \$79.—For manufacturers of small malleable iron castings, near Canon City, Col.

Inquiry No. 880, -- For manufacturers of alumnium and brass novelties by contract.

Inquiry No. 881.-For manufacturers of glass. Inquiry No. 882.—For manufacturers of cigarette aking machines.

Inquiry No. 883.—For manufacturers of copper pails.

Inquiry No. 884.—For manufacturers, in Michigan and Ohio, of dress hooks and eyes.

Inquiry No. SS5.—For dealers in dishes, lamps, silver ware, dress suit cases, watches mandoins and guttars, 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 of the manufac-turers 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. S91.—For tools and machinery to make picture frames.

Inquiry No. 892 .- For fertilizer dryers.

Inquiry No. 893 .- For tobacco dryers. Inquiry No. 894.-Fer tebacce grinding mills.

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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.

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Inquiry No. 901.— For opera chairs, hardwood floors, etc.

Inquiry No. 902 .- For a toothpick machine. Inquiry No. 903.-For manufacturers of diving bells, supplies, etc.



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 adver-tised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

addresses of houses manufacturing or carrying the same.

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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 meter, 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 moter 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. Sup-PLEMENT Nos. 783 or 1210, price ten cents each, may contain plans which will meet the 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 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 onetenth 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 (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? 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 and is 1.41. Our table makes it plain that form with the nickel compounds which are peiseneus.

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 me some table that can be worked out in plain was printed in 1876, and contains the error, 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. 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 falling through between the carbons, and if not crack it too soon. 3. Would a blowpipe and even break things.

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 Scien TIFIC AMERICAN of March 23, page 178, I saw the expression, "a current of three thousand volts at the motors." 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 doc. 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 •r enlarging camera, h•w far fr•m 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. 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 $\bullet f$ lens $\bullet r$ lenses $\mathtt{sh} \bullet \mathtt{uld}$ 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 8111, 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 $\bullet \operatorname{ur}$ correspondent has called $\bullet \operatorname{ur}$ attention to the matter, we have been through a large number of authors on this subject with interesting results.

Specific Heats. Constant Constant Authority. Pressure. Volume. Smithsonian Tables 3.4062 0.2419Barker's Physics..... 3.4090 3.4090 Ganet's Physics... 0.2359Pickering, Phys. Manip.... 3.409 K•hlrausch, Phys. Exp.... 0.409 0.2362.402 Hastings and Beach Physics.. .. Ames and Bliss' Manual.... 3.406 2.419 Whiting. Phys. Meas..... 3.40

It is of course known by every student of thermodynamics that the ratio of the specific heat at constant pressure to that at conat some time a typographical error occurred in giving the specific heat at constant volume. (8218) J. L. M. writes: All wiring giving it as 0.24 instead of 2.41, and that this 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 be melted in the time it would occupy in being performed by the author, which was an impossibility. A laboratory book in chemit were it would turn solid in the same time istry recently published by a professor in a after it passed into a colder place below. university directs the student to collect You will find a furnace to be the cheapest chlorine by the displacement of water! He way for melting sand and making the glass. will get some after the water is saturated. 2. If glass were held in an arc would it but meanwhile the back pressure may inter-break the current? A. Yes. if the heat did rupt the complete success of the operation,

(8224) R. A. S. asks: 1. What is th voltage of six cells of the Edison-Laland battery, type "Q," as is used in the Otto ga engines, when connected in series? What the amperage? A. A cell of this type given 2-3 volt in the catalogue of the con pany. Six cells in series would have 4 volt The safe working current is given as 2 amperes. The internal resistance of the cells is very low, 0.07 ohm. In order that the current may be 2.5 amperes the coil should the current may be 2.0 amperes the constant have a resistance of 1.2 ohms, with the battery in series. 2. What difference would there be in the voltage and amperage if the were connected in multiple? A. When the battery is in multiple the voltage is 0.66 and the internal resistance is 0.01 ohm. With the same external resistance the current give would be about one-half an ampere. 3. have a small toy motor which will run on tw cells of the battery, if connected directly with the battery, but will not run on all six cel after it has passed through the resistance coil used for making the sparks for the en gine. Can you tell me why this is? A. Th is because the resistance of the coil is large as compared with that of the battery.

(8225) L. E. Dare asks: Is there a electric light which can be used successful at any depth of water and about at what A. Any incandescent electric ligh will burn under water at any depth if th wires and the lamp are protected from getting

TO INVENTORS.

An experience of over fifty years, and the preparation of more than one hundred thousand applications for patents, at home and abroad, enable us to understand the laws and practice on bot continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and person contemplating the securing of patents, either a home or abroad, are invited to write to this offic for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office Scientific American, 361 Broadway, New York.

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R. A. S. asks: 1. What is the	l Cash register. E. H. Jahnz 676.386 l	WOOD or METAL
e "Q," as is used in the ●tto gas	Cask, H. A. Cohn	VV Workers
en connected in series? What is age? A. A cell of this type is well in the catalogue of the com-	Channel opening machine, L. Goddu. 676,362 Checkrein holder, E. Hagberg. 675,997 Chimney cowl, D. Keller. 675,952	Without Steam Power should use our Foot and Hand Power Machinery. Send for Catalogues
cells in series would have 4 volts. working current is given as 2.5	Cigar package. C. Johann 676.1361	A-Wood-working Machinery, B-Lathes, etc. SENECA FALLS MFG. CO.
The internal resistance of these by low, 0.07 ohm. In order that	Cigar tip cutter and lighter, G. Weiss 676,404 Circuits, regulating device for alternating current, E. Thomson	695 Water St., Seneca Falls, N. Y.
may be 2.5 amperes the coil should sistance of 1.2 ohms, with the	Clock striking mechanism, J. Gutekunst 675,890 Clod crusher and land leveler, G. E. Blaine. 675,924 Clothing, etc., holding device for, C. V. D.	ROTARY ENGINES.—ARTICLES ON IF
series. 2. What difference would the voltage and amperage if they	Blair 675,925	thistype of engine, giving many details and illustrations, are contained in SUPPLEMENT NOS. 1158, 1186, 1193 and 1309. Price 10 cents each. For sale by Munn & Co. and all newsdealers.
in multiple? A. When the in multiple the voltage is 0.667 ernal resistance is 0.01 ohm. With	for, P. E. Berger	ENGINEA FOOT MACHINE SHOP OUTFITS ELATHES SEBASTIAN LATHE CO. 20 CONGRET ST.
aternal resistance the current given about one-half an ampere. 3. I	F. W. Nims. 676,046 Composition of matter, N. B. Mayer 676,046 Concentrator, J. Mellein 676,388 Container, flexible, B. E. D. Stafford 676,012	
ll toy motor which will run on two battery, if connected directly with	Cork extractor, J. Rogginger	FOOT and Power and Turret Lathes, Plan-I SHEPARD LATHE CO., 138 W. 2d St., Cincinnat., O. I.
, but will not run on all six cells as passed through the resistance	Cotton chopper and cultivator, combined, J. E. B. Ogden	this new 14 inch
or making the sparks for the en- you tell me why this is? A. This	Couch, box, G. E. Bedell. 676,215 Curb, cistern, W. B. Dorward. 676,355 Currycomb C. Fockens 676,358	B. F. BARNES Upright Drill is sever al laps ahead of any
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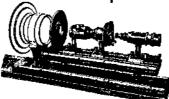


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