must be movable, since a thick slide may require an adjustment of the objective to make it sharp after it has been thrown upon the screen.

(9946) H. H. H. asks: 1. In central station telephone exchange work, where they have party lines with as many as four 'phones connected with the switchboard with only two wires, how is the operator enabled to ring any one of the 'phones she wishes without disturbing the others? I understand they use an alternating current for ringing, and that the 'phones are all alike in construction, that any one of them could be used in place of any other one, that is, they are interchangeable, provided that the connections in the instrument are properly changed. Is this right? Of about what potential is the current that is ordinarily used to actuate the ringer movements? A. The methods for selective calling upon party lines of telephones are divided by Miller into three classes: 1. Those employing step-by-step movements for completing the calling circuit. 2. Those employing currents of different directions or polarity. 3. Those employing currents of different frequencies for actuating the different signals, a harmonic system. These several methods are fully discussed and described for 37 pages in Miller's "American Telephone Practice," which we send for $4, to which we would refer you for further information. 2. In winding the armature of a D. C. shunt motor, to carry a current of say ten amperes, is it necessary to select a size of wire that will carry ten amperes without heating, or is one of a five-ampere capacity large enough? Does not the current, on entering the armature, separate, and flow half around one way, and half the other? And how does the rule apply in the case of a dynamo? A. In a direct-current motor armature as ordinarily wound and connected, the current divides at one brush and goes in opposite directions, uniting at the opposite side at the other brush. Each side carries but half the current, and thus need be wound with wire of a size suitable for half the current. 3. Can you give directions for recharging a battery of dry cells with a dynamo? About how many amperes would you force through, and for how long? Is the voltage of the charging current an essential factor? A. We have had no experience in recharging dry cells with a dynamo or otherwise, and do not think the game is worth the candle. The voltage of the charging current should be about 2 volts per cell in series.

(9947) S. G. B. asks: (1) What strength approximately is required to break an egg held end to end between the palms of the hands, and why the resistance? (2) Can any living man perform this feat, i. e., is any man strong enough? I enclose stamp for reply, although probably you answer no inquiries except through the columns of your paper. A. We have never seen any test of the pressure necessary to crush an egg shell in the direction of its longer axis. It is not probably very great. Any one trying this with his hands is a little uncertain of the result and does not really press so very hard. Doubtless many men can press hard enough to crush the simple arch of the shell. The force required can easily enough be determined by making a plaster cast to fit the two ends of the egg, and then applying pressure till the shell gives way. We answer many more questions by mail than through our columns. Only those thought to be of general interest are printed.

(9948) S. G. B. asks: In your reply March 1 to a question of mine relative to the strength of an egg in the direction of its longer axis you say that probably the resistance is not very great and that many men can doubtless crush an egg held end to end between the hands. With a plaster cast fitting the ends of an egg I applied pressure until the shell gave way. It bore a resistance of 74 pounds. When 7 or 8 pounds more were added the shell gave way. It is very difficult to balance the pressure satisfactorily, consequently I think that an egg offers a resistance of more than 74 to 80 pounds. My theory is that a resistance of 15 pounds per square inch (atmospheric pressure) must be overcome before there is any strain whatever on the eggshell. An egg probably has from 7 to 10 square inches of surface. Multiplied by 15 this would give a resistance of 100 to 150 pounds. Few men have such strength. Many strong men, local champions, have tried this experiment of breaking an egg between the palms of the hands and failed. A. Your observation of the breaking strength of an eggshell under direct and equally distributed pressure is very interesting. The figure you give does not seem very large, and is probably quite near correct. We cannot agree with you that the pressure of the air resists the breaking of the shell, since that pressure is upon the outside of the shell all the time, and is balanced by a pressure from within just as it is upon our own bodies. It has no influence either way upon the power required to break the shell.

(9949) A. G. H. asks how to mend tortoise shell. A. Small pieces of good tortoise shell may be joined so as to form one large apparently seamless piece in the following manner: Slope off the margins of the shells for a distance of about ¼ of an inch from the edge. Then place them so that the margins overlap one another; and thus arranged put them in an iron press and immerse in boiling water for some time. The pieces by this means become so perfectly united that the joint cannot be seen. The filings and very small scraps may be softened in hot water and consolidated by hydraulic pressure in metal molds. Protracted heating of tortoise shell darkens it, and greatly lessens its beauty.

(9950) T. K. asks: 1. Will you kindly explain, in your notes and queries, the mechanism and working of a wattmeter? A. Wattmeters are instruments which have two coils, one a fixed coil of coarse wire in which the current is proportional to the amperes, and the other a movable coil of fine wire in which the flow is proportional to the volts. The instrument is an electro dynamometer; the flow in the coarse coil produces a magnetic field varying with the current in amperes, and the swing or rotation of the movable coils is made to act upon the index or motion of the indexes upon the dials according to the product of the intensities, of volts and amperes, or watts. 2. How does the feeding and regulating mechanism of an arc light act? A. Most of the arc lamps regulate the feed of the upper carbon by means of a clutch. When the arc becomes too long the current through the arc is reduced, and the current through the shunt circuit which controls the clutch becomes greater, and the clutch releases the upper carbon, which drops a little. Its sliding is stopped by the increase of the current in the arc and the decrease of current in the shunt.

(9951) A. L. R. asks how to make fire-proof roofing. A. After the paper is put on take coal tar and lime (burnt, but not slaked), and boil them together in the proportion of 15 pounds lime to 100 pounds tar. Put it on hot. To pulverize the lime, sprinkle it with a little water and sift it. To avoid the tar boiling over, stir the lime in the boiling tar very slowly. The mixture must always be heated before putting on. The lime and tar form a chemical connection, which is fire proof, cannot be melted by sun heat or dissolved by steam or hot water, and makes a smooth, glazed roof.

(9952) M. C. writes: Referring to inquiry 9916, p. 238, my observation is: On inland lakes, where the ice often melts without wind to disturb it, the surface of the lake will appear to have a quite solid covering of ice, and often will sustain a man's weight after a frosty night, and all disappear in a few hours, which gives the impression that it sinks. In reality, ice in thawing becomes very porous, and if disturbed will fall into "nails," as often described. This may be seen in a block of ice lying in the sunshine a short time. Ice in this condition may be a foot or more in thickness, but a slight disturbance will cause it to fall into the small pieces and dissolve in a few minutes. Persons not noticing carefully think it sinks, which of course is impossible. A. The reason given above for the disappearance of ice on a pond in the spring is doubtless the true one, but the question put to us was as to the origin of the belief that the ice sinks when it disappears. This we cannot give. We should have accounted for the disappearance of the ice as our correspondent does, but this does not explain the belief of some intelligent people that the ice sinks when it disappears. That is evidently another matter. We answered the question which was put to us by our correspondent.

(9953) V. R. K. asks: I would be pleased to have you inform me if there is anything that could be put in water to stop it from freezing. I have used salt, but find that it freezes after it gets a certain amount of cold. It must not contain spirits, so as when heated to cause an explosive gas; it must also flow freely. What action has salt on water against cold? A. Calcium chloride brine, such as is used in cold storage houses for refrigeration, will be what you require. Put 3 to 5 pounds of calcium chloride to the gallon of water, and its freezing point will be reduced to 39 deg. below zero Fahr. Salt and water will freeze at a little below zero. The melting point of a mixture of salt and ice is 7.6 deg. below zero Fahr. Below this temperature the salt and ice are solid; above that point the mixture is liquid. That temperature is its melting point, just as ice has a melting point of 32 deg. Fahr.

(9954) R. G. H. asks: In answer No. 9915, page 238, you say the months "beginning with January," etc. I have read that the old year began March 1. I understand that September (7th), October (8th), etc., were so called when the year began March 1, and when the change was made the names were left. If that is correct, should you not have said, "beginning with March"? A. Our use of the phrase "beginning with January" had no reference to the beginning of the year now or at any other time. It happens that the year as ordered by Julius Cæsar began January 1, in order to bring the vernal equinox on the 25th of March as it had been in the time of Numa. This was the 46th year before the birth of Christ. We were asked to explain the number of days in the months, and kept strictly to the question asked. The beginning of the year on January 1 was instituted by England in 1752. Before this time the year had begun on March 25. Scotland had made the change in 1600, and France in 1563. It is not correct so far as the Julian calendar goes to say that March is the first month. The changes in the length of months dates from the Cæsars—Julius and Augustus.

NEW BOOKS, ETC.

BEER BOTTLERS' HANDY BOOK. By Philip Dreesbach. Wahl-Henius Institute, 1906. 12mo.; pp. 765. Price, $5.

This elaborate book is partially based upon the lectures delivered at the Wahl-Henius Institute of Fermentology, and it is intended to serve as a practical volume to meet the many problems apt to confront practical beer bottlers. The author goes very thoroughly not only into the immediate subject embraced in the title, but in a general way as well into the science of brewing with its many subdivisions. Besides this the business phase of the industry is discussed in separate chapters by competent writers. Even many details of work bearing on the brewing industry, which are usually performed by outside contractors, have been included in the book, and in general we may say that it is probably the most comprehensive work of its kind that has so far been placed before the public.

GRAINING, ANCIENT AND MODERN. By William E. Wall. Somerville, Mass.: Published by the Author, 1905. 12mo.; pp. 137; 50 illustrations. Price, $3.

The subject under discussion is unquestionably one of the most important phases of modern house painting and decorating, and the author has handled this in as comprehensive a manner as the importance warrants. The book is splendidly illustrated by full page cuts, showing the various grainings of woods in color, and it will prove of the greatest value to members of the trade. The author's experience in work of this character has fitted him to choose the most necessary matters for discussion, and to eliminate such as have no practical value for the practical man. Not only is the actual work of the graining fully explained and elaborated, but the mechanical side of the trade, the necessary paints, tools, brushes, etc., is also discussed.

MODERN DYNAMOS AND BATTERIES FOR AMATEURS AND STUDENTS. By S. R. Bottone. London: Guilbert Pitman, 1906. 12mo.; pp. 172. Price, $1.

This is the second volume of Electrical Engineering for Students, and in it the author has treated, in a simple and accurate manner, of the construction of many useful appliances required in practical work with current or dynamic electricity. Nearly all the apparatus and machines described can be made by any one possessed of a little perseverance, with the tools usually found at home. The book contains full constructional details and working drawings for making dynamos, motors, battery cells, measuring instruments, and other accessories. A carefully selected list of questions will enable the student to test his knowledge at any time.

THE UNITED-OTTO SYSTEM OF BY-PRODUCT COKE OVENS. New York: The United Coke and Gas Company, 1906. Quarto; cloth; pp. 146; 65 illustrations.

It not infrequently transpires that among the best contributions to scientific literature are the publications of certain of the great manufacturing, engineering, or industrial companies, publications which, while often produced for advertising purposes rather than for the propagation of knowledge, are nevertheless capable of use as reference or text books of the greatest value, and this work unquestionably must be included in the latter category. The book affords general information concerning the by-products coke oven and its operation; and as it is intended primarily for those not familiar with the subject, it avoids to a large extent all unnecessary details of a purely theoretical and technical character. The subject is handled in a most thorough manner, while the language is clear and concise. Among other subdivisions are included chapters on coal, types of ovens, retorts, products, by-products and their use and general arrangement of plants. The book is splendidly illustrated with many engravings, charts, and tables, and is a beautiful example of the printer's art.

PRACTICAL PATTERN MAKING. Edited by Paul N. Hasluck. Philadelphia: David McKay, 1905. 12mo.; pp. 160; 300 diagrams. Price, $1.

This book contains in a convenient form for every-day use a comprehensive digest of information given by experienced craftsmen and which has previously been published in the journal Work. The book goes thoroughly into the construction of foundry patterns, core boxes, and patterns and molds for iron columns. Other patterns which are discussed are those for steam engine cylinders, worm wheels, lathe beds, headstocks, poppets, and slide rests. Miscellaneous patterns and core boxes are also described, and the book has three chapters on the jointing and finishing of patterns, and the making of those of circular form. The construction of core boxes and the coring of holes in castings is also discussed.

FOOD AND DIET IN HEALTH AND DISEASE. By Robert F. Williams, M.A., M.D. Philadelphia: Lea Brothers & Co., 1906. 12mo.; pp. 392. Price, $2.

The section of the book devoted to "Food in Health" is interesting as being based upon the work of the Experiment Stations of the United States Department of Agriculture. Digestive processes, physiology, cooking, etc., are admirably treated. The portion devoted to "Food in Disease" takes up the subject of diet in a thorough manner. The book will prove of use to the doctor, the nurse, and the layman.

VALVE GEARS FOR STEAM ENGINES. By Cecil H. Peabody. New York: John Wiley & Sons, 1906. 8vo.; pp. 142; 33 folding plates. Price, $2.50.

There can be little question that there is no feature of steam-engine design of greater importance than the valve and the valve gearing. There are many valuable works on this phase of mechanical engineering, which treat the subject thoroughly from a scientific as well as a practical standpoint. Among the latest publications is the second edition of this book by Prof. Peabody, and it undoubtedly is one of the best contributions to steam engine design. The work is intended to give engineering students instruction in the theory as well as the practice of designing valve gears. As the vast number of valves and gears proposed and in use at the present time would make an exhaustive treatment in a textbook rather difficult, the author's aim appears to be rather to give the learner a firm grasp of the principles and some facility in their application. Graphical methods are used throughout, both for demonstration of principles and for design of gear. In an appendix analytical demonstrations are given of certain principles that cannot be treated in a complete and satisfactory manner by instruction alone. Common and well-known methods and processes have been used in most cases, though certain features are doubtless original. The changes that have been made from the earlier edition have tended to make the book more simple and more easily understood, and the transfer of all analytical work to an appendix has tended to avoid discontinuity in the graphical presentation of the subject.

DAS VERZINNEN, VERZINKEN. By Friedrich Hartmann. Vienna: A. Hartleben's Verlag, 1906. 12mo.; 5 illustrations; pp. 228. Price, 75 cents.

The covering of one metal with a thin layer of another is of such importance to-day, not only for the usual industrial purposes, but for scientific, chemical, and electrical uses as well, that a practical and thorough handbook on this subject is doubtless of value. Recent years have produced in metallurgy countless improvements and innovations, and this also holds true in that phase of the subject discussed by the author. In this, the fifth edition of his work, he has brought it as nearly as possible up to date, and includes therein the best European practice and methods. Considerable space is given to the discussion of the alloy known as magnalium, a mixture of aluminium and magnesium, and which possesses many remarkable characteristics as yet little known among technical men. Electrometallurgical methods are also thoroughly discussed and developed.

AMERICAN MEN OF SCIENCE. A Biographical Directory. Edited by J. McKeen Cattell. New York: The Science Press, 1906. Large 8vo.; pp. 364.

This book is doubtless a valuable contribution to the organization of science in America. It includes, probably for the first time, a fairly complete survey of the scientific activity of a country at a given period. As a reference book for the field it covers, it may be even more useful in academic circles than "Who's Who in America." Unfortunately, there scarcely exists among scientific men the recognition of common interests and the spirit of co-operation which would help to give science the place it should have in the community, and it is hoped that this work will be of service in making scientific men better acquainted with one another and with one another's work. As far as possible each name is followed by a short historical account, which includes the usual biographical data of birth, residence, etc., as well as the best-known work and the chief field of endeavor.

GLUE, GELATINE, AND THEIR ALLIED PRODUCTS. By Thomas Lambert. London: Charles Griffin & Co.; Philadelphia, 1905. 12mo.; pp. 151. Price, $1.75.

The glue and gelatine industry has made an immense advance during the last few years. Old methods of working have given way to new, and this changed condition of things, due to a better scientific knowledge of the raw materials and their treatment, necessitates a revision of the literature. The work before us is a good one and deals with the subject from a most practical standpoint.

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Antiseptic and germicide preparations, Gold Spirit Chemical Co.	51,555
Antiseptic for local and internal use, H. K. Mulford Co.	51,646
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Banjos, Lyon & Healy	51,373
Bath tubs and lavatories, Kellogg-Mackay-Cameron Co.	51,616
Beer, Storz Brewing Co.	51,429
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Belt couplings, Green Tweed & Co.	51,556
Belts, ladies', A. E. Tomlinson	51,670
Belting, machine, Main Belting Co.	51,471
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Bitters, stomach, Munyons Homoeopathic Home Remedy Co.	51,618
Blue, washing, Sawyer Crystal Blue Co.	51,455
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Butter, J. Menendez	51,375
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Candy, cough, Donlphan & Co.	51,520
Canned fish, Schwabacher Bros. & Co., 51,389,	51,504
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Canned Salmon, Fidalgo Island Packing Co.	51,463
Cards, playing, United States Playing Card Co. 51,378 to	51,580
Cards, playing, New York Consolidated Card Co. 51,449, 51,450,	51,475
Carpets, tapestry Brussels and tapestry velvet, Roxbury Carpet Co.	51,621
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Cigars, A. Straus	51,457
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Colors and colored paints, pigment, John T. Lewis & Bros. Co. 51,399, 51,400
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Combs, Dr. Heinrich Traun & Sohne. 51,671, 51,672
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Concrete Number of The Scientific American

Published May 12, 1906. Price 10 cents

This number will contain articles on reinforced concrete and its applications; concrete block machinery; concrete mixing machinery; applications of concrete in general.

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