

(8972) C. S. asks: 1. Which is the most desirable current for any electro-magnet—one of great intensity, with less quantity, or one the reverse? A. The current through an electro-magnet should not be strong enough to heat the wire more than 40 deg. above the air, and is usually less than this. If the current is small the number of turns must be large in order to obtain the magnetic flux necessary to saturate the iron. If no other consideration existed, it would be better to have a large number of amperes rather than a high voltage. 2. Is the amperage of a dynamo measured by dividing its voltage by its internal resistance alone, or is there an external resistance included? I refer to the current a dynamo is said to generate, as in the case of one for sale, when no external resistance is mentioned. A. A dynamo machine will give its largest current when the external and internal resistances are equal. This is not desirable except for uses in which the heat produced is desirable. The dynamo is calculated for a definite voltage or for a constant current as the case may be. Incandescent lamps in multiple call for a constant voltage, arc lamps in series call for a constant current. The output of a dynamo is better expressed in watts than in amperes, at a certain speed or turns per minute. 3. Is there more resistance between two separated electrodes in a vacuum than in dry air, being the same distance apart in both cases. A. There is an enormous resistance between two points in a vacuum. A tube can be exhausted so completely that current cannot pass between points a small fraction of an inch apart.

(8973) W. A. S., Jr., asks: Can gas (natural or illuminating) be ignited without a spark? A. A red heat will ignite any of the hydrocarbon gases, when mixed with the proper proportion of air to make them explosive. A spark is not necessary. The hot tube of gas and gasoline engines shows this principle.

(8974) J. L. P. asks: Can you inform me as to whether a bipolar dynamo having its yoke, cores and poles connected by common steel rod running through center will work all right, or should be of iron? A. Steel bolts may be used to fasten the yokes, cores, and pole pieces of a dynamo together. So, too, steel may be used for all these parts of a dynamo. But brass must be used as a bridge across from the positive to the negative pole's piece, if there is need of anything to prevent the vibration of the pole pieces.

(8975) J. H. B. asks: 1. Does a given amount of gas give off, in combustion, the same amount of heat, whether said gas be burnt as an illuminating flame in an ordinary gas jet, as a blue flame, in a Bunsen burner, or for heating purposes, in a stove furnished with asbestos lining. A. The complete combustion of a given quantity of coal gas produces the same number of heat units without reference to the manner in which it is burned; but if burned with a luminous flame, as in an ordinary burner, the combustion is not complete. The Bunsen flame or blast lamp gives the most complete combustion, the most concentrated flame, and hence the highest temperature. The hottest part of a Bunsen flame is 3,137 deg. F. The hottest blast furnace gives 3,272 deg. F. A white gas flame may be between 2,300 degs. and 2,700 degs. F. 2. If so, what is the advantage of the last two methods for heating? A. An asbestos lining or fire brick acts as a non-conductor to retain the heat within the firebox and prevent to an extent its radiation through the walls of the stove. In this way more heat remains to be applied to the articles to be heated.

(8976) H. L. T. says: I have at my disposal one pound of No. 36 double silk-covered wire. With this I wish to construct a jump-spark coil for my motor bicycle. Will you inform me what amount of wire and what size should be used for the primary coil, how thick the core should be, and what the dimensions of the coil should be, whether short and thick or long and narrow? Also whether the vibrator can be omitted or not? A. For a primary winding for your coil use No. 16 wire and wind two layers upon the core. The core should be 8 inches long and 1 inch thick. The condenser requires 100 sheets of tinfoil 5 x 7 inches. A vibrator will not be required if the circuit is broken by the motor in its revolution. A valuable article on the winding of coils may be found in our SUPPLEMENT, No. 1402, price 10 cents.

(8977) S. R. asks how to make a stereopticon lantern large enough to throw an image about 20 x 15 inches, using regular slides. A. The ordinary condenser for a stereopticon is made with two plano-convex lenses placed with their convex surfaces nearly in contact. The combination should have a focal length of about 9 inches. It is not desirable to use lenses smaller than 4 inches in diameter, since the clear opening will then be smaller than a slide. For a projecting lens a Darlot quarter-plate lens of about 9 inches focus is commonly used. The size of the picture upon the screen is determined by the distance of the screen from the lantern. If the hall is long and the lantern must stand far back, it is desirable to have a projecting lens of 12-inch focus. If the lantern must stand near the screen, a lens of 6-inch focus should be had. One who uses a lantern in all sorts of halls should have a set of lenses, so as to adapt himself to the hall and produce his pictures of about the same size in all places.

NEW BOOKS, ETC.
ELECTRICAL PROBLEMS. By William L. Hooper, Professor of Electrical Engineering, Tufts College, Boston, Mass., and Roy T. Wells, Senior Fellow in Physics, Clark University, Worcester, Mass. Boston: Ginn & Co. 1902. 8vo. Pp. 170. Price \$1.35.

The work contains a set of problems typical of those met with in electrical laboratory and engineering practice, with very brief treatment of the methods of solution. The contents comprise: Twelve sets of problems and calculations on combinations of electro-motive forces and resistances in series and multiple grouping; distribution and fall of potential in railway and lighting circuits, inductance of coils, capacity of condensers, thermo-electricity, electro-chemistry; output and efficiency of batteries, generators, motors, etc.; four sets of problems on combinations of alternating electro-motive forces and currents and the impedance of circuits with constant and with varying values of resistance, inductance, capacity, and frequency; five sets of problems on calculating and making winding tables and drawings for direct and alternating current armatures, armature reactions, field windings, etc.; problems on winding and operation of transformers, rotary converters, and induction motors; and on testing of dynamos and transmission of power. Answers are given to all problems, many in the form of curves showing the effect of varying the various constants involved, such as temperature, frequency, capacity, resistance, and inductance. The text contains about forty explanatory diagrams.

A COURSE IN BOTANY AND PHARMACOLOGY. By Henry Kraemer, Ph. B., Ph.D. Philadelphia and New York: G. E. Stechert. 1902. 8vo. Pp. 384. Price \$3.50.

This book was written to meet the individual needs of the author in his work as a teacher, but can also be employed in connection with a laboratory course. Part I. contains a very full account of plant morphology and is divided into chapters on the cell, vegetative, and reproductive parts of the plant. Part II. discusses pharmacognosy and is divided into two chapters, the one on crude vegetable drugs, and the other on powdered vegetable drugs. Part III. treats of reagents; and Part IV. comprises the illustrations and index.

COLOR PROBLEMS. A Practical Manual for the Lay Student of Color. By Emily Noyes Vanderpoel. New York, London, and Bombay: Longmans, Green & Co. 1902. 8vo. Pp. xv, 135; 117 colored plates. Price \$5.

A great deal will be found in these pages that will be of practical service even to the man or the woman who claims to have a naturally good eye for color. Much attention is given to contrast of modified and subdued colors, such colors as would be required constantly in decorative designs covering large spaces, against which more positive colors would be placed. One of the greatest difficulties in arranging a color design is in determining the qualities and quantities of color. Very few works give the useful hints on this subject contained in this book. Under the heading "Historic Color" are some very interesting original diagrams presented in a way easily to be understood and made use of in actual practice. In illustrating the text the author has seen to it that admirable color schemes, beautifully reproduced, have been incorporated.

A TREATISE ON ROADS AND PAVEMENTS. By Ira Osborn Baker, C.E. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1903. 8vo. Pp. viii, 655; 171 figures, 68 tables. Price \$5.

The object of this book is to give a discussion from the point of view of an engineer of the principles involved in the construction of country roads and of city pavements. Considerable space has been given to economics and location of country roads and to the construction and maintenance of earth roads, since such roads constitute more than ninety-five per cent of the mileage of the public highways and are greatly in need of careful consideration. The first four chapters of this book may be regarded as a contribution to the principles of road making and to the improvement and maintenance of our country roads. The remainder of the book, considering roads having permanently hard surfaces, is based chiefly upon American practice. The work is presented in a form for convenient practical use. Numerous cross references are given by section number, and whenever a table or figure is mentioned, the citation is accompanied by the number of the page on which it may be found.

PRECIOUS STONES. A Book of Reference for Jewelers. By W. R. Cattelle. Philadelphia and London: J. B. Lippincott Company. 1903. 8vo. Pp. 224. Price \$5.

This is by far the handsomest technical book which has come to us for a long time. Beautifully bound and beautifully printed, it contrasts strongly with the general run of technical books. The information which it contains is worthy of its handsome dress. The aim has been to avoid unnecessary detail and to present facts useful to a dealer in precious stones. Especial attention has been given to stones unfamiliar to many jewelers, and for which there is a growing demand in this country.

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