(9725) S. L. S. asks: Please state whether the current from a step-down transformer is direct or alternating? A. All stationary transformers deliver alternating currents. The step-down transformer receives an alternating current of a certain voltage and changes it to a lower voltage. A step-up transformer delivers the current at a higher voltage than it receives it. Neither of them can transform a direct current. This can only be done by a rotary transformer. 2. How is a wireless signaling receiver made? A. The coherer is the principal instrument for receiving the signals by a wireless telegraph. Its construction is given in our SCIENTIFIC AMERICAN of September 14, 1901, price ten cents. Full details for the whole apparatus are to be found in this paper.

(9726) L. W. asks: In reference to the construction of condensers to be used in connection with induction coils, will you please advise, under Notes and Queries, whether it is absolutely necessary that the foil must be pure tin foil, or whether the ordinary foil used for various purposes, which I understand is a combination of lead and tin, will answer the same purpose equally as well? A. A condenser may be made of any kind of metal. Tin foil is ordinarily used, since it can be rolled into very thin sheets, which also have considerable strength and stiffness. It is also light as compared with the heavy and thick sheets of the so-called tin foil, which contains lead. Only the surface of the plates of the condenser have any part in its action. Hence the lighter the sheet, the better adapted it is for the purpose.

(9727) H. L. B. writes: While experimenting with a small induction coil, I discovered the following, which may be useful to some, i. e., on the interrupter, not having platinum points, if a drop of water be placed on the point of contact with the vibrator, the interrupter will work perfectly, just as if it had platinum contact points. A. Water acts to keep the contact points cool. A break under water would be better, and under oil better still. Alcohol makes a very sudden break, and is used in some interrupters to cover the contact of the vibrator.

(9728) J. L. P. asks: What is the difference in one square foot and one foot square? A. In one sense there is no difference between a square foot and a foot square, that is, 1 square foot and 1 foot square. Both mean a figure with four right angles and four equal sides, containing 144 square inches. In another and better sense there is a difference between the terms. A foot square is a square figure one foot on a side; but a square foot is any area which contains 144 square inches. If one buys a square foot of board, he may wish a piece 1 inch wide and 12 feet long, or a piece 6 inches wide and 2 feet long, or any other shape which will give him 144 square inches in area. You may have a square foot in the form of a circle or an irregular figure of any conceivable shape. In the last sense, a square foot is not the same thing as a foot square. If you had carefully defined the words you were using, you need not have bet about it. But we cannot decide the bet unless we decide that the two expressions are *not the same.*

(9729) F. M. asks: Please tell me how many pounds each of magnet wire are required for the armature and field magnet for the simple electric motor described in SUPPLEMENT No. 641. Will the simple electric motor work if made twice the original size? A. The amount of wire required for the simple electric motor of SCIENTIFIC AMERICAN SUPPLEMENT No. 641 is about as follows: For armature core, 200 feet No. 18 B. & S. iron wire, about 1¼ pounds; for field, 400 feet No. 16 B. & S. wire, 3¼ pounds; for armature, 350 feet No. 18 B. & S. wire, 2½ pounds. As some will wind the wire more closely than others these amounts are only close approximations, and it would be better to allow a slight excess. It is not advisable to build the motor larger, since it is not adapted to heavy work. It is designed for an amateur to build who has little experience with tools. Its wooden parts will not stand strain. It is an excellent machine for its purpose.

In our reply to Query 9681, issue of July 15, by a typographical error 32 thousand millions, English, was made equivalent to 32 millions, or 32,000,000 French. Of course, any one who knows will see that the word *millions* should be *milliards*, the French word for a thousand million.

NEW BOOKS, ETC.

THE STUDY OF CHEMICAL COMPOSITION. By Ida Freund. Cambridge: University Press, 1904. 8vo.; pp. 650. Price, $5.50 net.

This work, which is one of the books in the Cambridge Physical Series, gives an elaborate account of the method of chemical composition and the historical development in the study of the same. In the earlier part of the work the author has sought to demonstrate that the notation by which chemical composition is usually represented can be developed from a purely empirical basis, independent of any hypothesis concerning the ultimate constitution of matter; while in the subsequent treatment of the subject of composition on the basis of the atomic and molecular theory, she has endeavored to keep distinct the boundary line between facts and hypotheses, and to emphasize those special features of the argument which bring out the nature and function of hypotheses, and their place and importance in the science of chemical composition. The author has dealt in detail with a few researches which she could utilize repeatedly from various points of view, rather than tracing separately the entire historical development of the subject. She has not only stated final results, but has reproduced the values obtained in the actual measurements made, so as to indicate the scope of the work involved, and the degree of accuracy obtained in each instance. In stating the various great discoveries, Miss Freund has quoted largely from classical memoirs, and has given as much as possible the actual language used by the experimenters in announcing their own discoveries. The book has also a considerable number of explanatory interpolations and footnotes which will greatly aid those having no previous knowledge of chemistry in following its argument. The chapter on crystallography, which has been introduced into the work, will be found valuable to the average student, because not enough information on this subject is available in current textbooks to allow one to appreciate the results obtained in the study of the relation between crystalline form and chemical composition. All the great discoveries in the science of chemistry will be found set forth in considerable detail within the pages of this work.

THE NEW KNOWLEDGE. By Robert Kennedy Duncan, Professor of Chemistry in Washington and Jefferson College. New York: A. S. Barnes & Co., 1905. 8vo.; pp. 263. Price, $2.

This volume of the New Science Series gives in a popular manner the information to date upon many of the problems in physics and chemistry which are of interest to-day, and which have not been altogether solved. Such conceptions as the three entities; compounds and elements; the periodic law; gaseous ions; the resolution of the atom; and inorganic evolution are described in full. A considerable portion of the work is given up to radio-activity, which is discussed in all its forms. The last part of the work deals with the new knowledge and old problems, and explains, from the modern point of view, such things as the age of the earth, the zodiacal light, aurora borealis, and atmospheric electricity. The reconstruction of the universe is also discussed, and the definitions of science redefined. The book will, no doubt, serve its purpose as a popular science volume, and will be found of real value.

OUTLINES OF INORGANIC CHEMISTRY. By Frank Austin Gooch and Claude Frederick Walker. New York: The Macmillan Company, 1905. 8vo.; pp. 514. Price, $1.75.

In this textbook of chemistry it has been the aim of the authors to introduce the student to the study of the science by the consideration of the simplest and fewest things. The experimental phenomena have been so placed that the inferences drawn from them can hardly be missed. The book is in two parts, of which the first treats of the consecutive experimental development of the principles upon which systematic chemistry rests. With such inductive reasoning the consideration of the identity of substances, chemical change, the chemical elements, and the laws of combination and chemical equivalents naturally come first. In treating of equivalents—electrical, chemical, and thermal—electrical phenomena and ions, and the constitution of acids, bases, and salts from the ionic point of view; conditions of action and equilibrium; and the thermal relation of chemical action, are all discussed in succession. From this discussion the idea of valence is developed, as is also the conception of the molecule.

In the second part of the work the discussion of the properties of elements and their compounds is gone into. With some modifications, Mendeléff's periodic system is followed, as it enables orderly treatment. Graphic symbols are employed, and the ionic terminology has been made use of, the function of ions as parts of compounds and units of reaction being pointed out. The book is one of the latest and best elementary textbooks of chemistry which has so far been published.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending July 25, 1905

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Abdominal supporter and truss, B. F. Lacy, 795,624, 795,625
Absorbent and deodorizer, S. T. Tatti..... 795,562
Accordion, J. Galleazzi 795,795
Acids, making alkyl-barbituric, A. Einhorn 795,495
Adding machine carrying mechanism, C. Wales 795,378