make a jump spark coil of it? If so, kindly give directions and state the way it should be coupled up. A. A simple spark coil may be made with a core of iron wire (No. 16) 10 inches long and one inch in diameter. Fasten heads for the spool on this, and cover the core with a few turns of brown paper. Wind No. 14 single cotton-covered magnet wire on this to a depth of about ⅝ inch, insulating each layer from the next by a layer of paper. It is better to give each layer a coat of shellac also. The coil is used in series with a battery, and the spark is obtained when the circuit is broken. With six or eight strong cells a thick spark will be given.

(10170) F. H. R. writes: I have a stereopticon lantern, and have been experimenting some with it. For a screen I have a blank wall tinted an orange red. Can you tell me what colored glass I can use with my lens in order to throw a white light upon the red surface? A. To obtain the best effect you must find a glass of a tint the exact complementary of the color of the wall. This will be a bluish green. Of course much light is lost both by the absorption of the wall and of the glass. We should suppose that very little would be left.

(10171) G. W. H. asks: How can I connect the wires on the carbon element of an open circuit, home-made battery which I have? I use sal ammoniac. They work fine for about two weeks, when I have to renew connections on the carbon. It seems the fluid rises within the carbon and corrodes the wire. Have tried paraffine and also rubber on the outside, but to no avail. The carbons are arc-light pencils, well up out of the fluid. A. Dip the tops of the clean and dry carbons into melted paraffine till they are saturated with the paraffine as far as the surface of the liquid, so that the sal ammoniac cannot climb through the carbon, nor over the outside of it. In sal ammoniac cells usually there is a thick head of composition on the upper end of the carbon.

(10172) A. K. M. asks: 1. Can you let me know the cheapest and most simple way of producing oxygen? A. Oxygen is generated by heating a mixture of manganese dioxide and potassium chlorate in a metal flask. Care is necessary in doing this not to disengage the gas too rapidly and thus produce an explosion of the apparatus. The materials also should be tested in advance to see that they will give up the oxygen quietly and not too rapidly. 2. Can you explain what caused electric sparking at point of connecting 3-inch suction pipe let in from top of tank car containing a mixture of turpentine and naphtha, the discharge pipe from pump leading to large storage tank of several thousand barrels of the same mixture? Also being connected with large storage tanks of gasoline and carbon oil. The suction pipe being of iron, every attempt made to connect would cause heavy sparking, so that the men dared not connect for fear of fire, the temperature being about 15 deg. Fahr., having had cold weather for some time; whereafter the men got a suction pipe of galvanized iron, let it down into the tank car, and in connecting there was no more sparking. A. The charge of electricity was due probably to the very cold air and friction of the pipe and pump. If the liquid was not set on fire by the sparks which passed while the men held the pipe near the tank, it could not have been after they had brought the ends into connection with each other. The danger would then have been over. These oils are not conductors of electricity.

(10173) J. F. C. asks: 1. What advantages has the double pole receiver over the single pole (as they are called) electrically? Why would not one coil, the same resistance of the two, placed on one pole of a permanent horseshoe magnet (traversed by an alternating current) affect the magnet flux as much as the two coils of half the resistance, one placed on each pole? A. A horseshoe magnet is always stronger than a bar magnet of the same number of turns of wire upon its poles, and so a double pole magnet in a telephone will act more powerfully than a single pole of a straight magnet. 2. Is pure soft iron free from resistance to magnetic flux? What is the resistance of the air to magnetic flux as compared to pure Norway iron? A. The number of lines of force which will pass through iron as compared with air under the same degree of magnetization varies with the degree of magnetization. It may be as much as 5,000 times as many, and it may be only a few times as many when saturation is nearly reached. See the table of permeability in electrical works such as Foster's "Pocket Book," price $5 by mail. 3. Which is correct to say, that a magnet attracts a piece of soft iron because it lowers the resistance of the magnetic flux, or that an opposite magnet is induced in its mass by induction? A. When a piece of iron approaches a magnet it both becomes a magnet and furnishes an easier path for the lines of force than the air. 4. Is the *greatest* force of attraction exerted in a magnet in attracting opposite poles of itself? A. We do not know whether a magnet works most in attracting its own poles or not. 5. What electrical disturbance is made by the action of the wind on telephone wires that a receiver takes it up? A. The noise to which you refer in a telephone is produced by vibrations caused by induction of adjacent wires and not by the friction of the wind. The wind produces no electrical disturbances.

NEW BOOKS, ETC.

THE CHEMISTRY OF PAINTS AND PAINT VEHICLES. By Clare H. Hall, B.S. New York: D. Van Nostrand Company, 1906. 12mo.; pp. 134. Price, $2.

In the great mass of analytical chemistry it is often difficult to discover particular methods applying chiefly to any one subject, or, rather, to find those methods concisely collected between the covers of a single volume. The author has attempted to sift out those methods which apply particularly to the analysis of paints, while at the same time dwelling with a certain degree of completeness upon the most important physical characteristics of the raw material; for it will be understood that no chemist can be proficient in the analysis of paints without a thorough knowledge of all the materials with which he comes in contact. Of course, the limits of the book make it impossible to give more than the general facts regarding these raw materials. While the information has been written from the standpoint of the chemist, the author tries to bridge the space between the laboratory and the factory, and to show that the less this space is in evidence, the better will be the resulting product of the manufacturer.

DWARF FRUIT TREES. By F. A. Waugh. New York: Orange Judd Company, 1906. 16mo.; pp. 125. Price, 50 cents.

American agricultural and horticultural conditions are usually on so large and extended a scale, especially in a commercial sense as well as in a physical one, that these subjects have hardly been introduced as avocations and pastimes, and the growing of trees largely for pleasure has been hitherto extremely limited. The author of this book will doubtless succeed in his undertaking of arousing interest in dwarf fruit trees more as a pastime than as a commercial enterprise, though the latter is by no means precluded.

THE AMERICAN STEEL WORKER. By E. R. Markham. New York: The Derry-Collard Company, 1906. 16mo.; pp. 339. Price, $2.50.

Mr. Markham's book, which has reached its second edition, is based on the experience of nearly a quarter of a century in the selection, annealing, working, hardening, and tempering of the various sorts and grades of steel. The new edition contains an interesting section on high-speed steel, which includes the latest information on the subject, thereby bringing the text to a condition of completeness which was lacking in the earlier edition.

JAHRBUCH DER NATURWISSENSCHAFTEN 1905-1906. By Dr. Max Wildermann. Freiburg im Breisgau: Herderfsche Verlagshandlung, 1906. 8vo.; pp. 501. Price, $2.

The interesting volume edited by Dr. Wildermann, with the collaboration of eminent experts, is a comprehensive survey of the advances that have been made in the natural sciences during 1905-6. The latest developments in physics, chemistry, astronomy, mineralogy, zoology, botany, geology, and many other fields of science are discussed, often in detail, and frequently with excellent illustrations. This book will be found valuable for the general reader, who desires to keep in touch with the general advances of our age in science and natural history.

OUTLINES OF THE EVOLUTION OF WEIGHTS AND MEASURES AND THE METRIC SYSTEM. By William Hallock, Ph.D., and Herbert T. Wade. New York: The Macmillan Company, 1906. 8vo.; pp. 304. Price, $2.25.

The authors declare themselves flatly in favor of the metric system, both on the ground of its intrinsic superiority and because of the manifest advantage of having a universal system of weights and measures for all industries throughout the world. A complete and fair history of the metric system is given in the various chapters of the volume, with its logical development and chief characteristics. An account is given of the experience of the European nations which have tried and adopted the system. The citation of the authorities is voluminous, and the references to the bibliography of the subject are extensive. The tables of equivalents have been carefully worked out, and are put in very convenient form, and therefore as a work of reference on the subject the book will doubtless be found scholarly and useful.

ITALIAN VARNISHES. By George Fry, F.L.S., F.C.S. London: Stevens & Sons, Ltd., 1904. 16mo.; pp. 170.

Little attention has apparently been given to the subject of the varnishes used on the old Italian musical instruments, and the theory has been accepted that these are oil varnishes, or rather an oil varnish colored to suit individual tastes. The author gives an account of the interesting research which forms the subject of the treatise, and he shows, to his own satisfaction at any rate, that the old violin makers used as the constituents of their varnishes the natural products of coniferous trees and the flax growing in their immediate vicinity, both abundant and easily procurable, and that therefore the varnish was a simple one composed of resin and turpentine, or both of these with linseed oil. The work is interesting from the standpoint of the chemist as well as from that of the general reader.

FIELD TO DAIRY. By William Shepperson, F.C.S. London: Simpkin, Marshall & Co., Ltd., 1906. 16mo.; pp. 49. Price, 80 cents.

The object in gathering the material in "Field to Dairy" was to give in as concise a form as possible the essential points pertaining to the management of fields and cattle, and the production of milk, cream, butter, cheese, and various by-products in the dairy. The little volume will be found a handy book of reference where time is lacking for the study of a completer history of any particular subject.

FARM SCIENCE. By Joseph E. Wing, P. G. Holden, Waldo F. Brown, Hon. W. M. Hays, Thomas Shaw, Clinton D. Smith, Cyril G. Hopkins, and Fred R. Crane. Chicago: International Harvester Company of America, 1906. 32mo.; pp. 128.

This excellent little book has been compiled by a number of eminent specialists for the particular purpose of assisting American agriculturists in the work of farm management. With this end in view, the highest authorities in their respective fields of research have been called upon to prepare a number of special articles covering the results of extended experiments involving the most important operations on the farm, and the subjects treated deal substantially with every branch and phase of modern agriculture and cover a wide range of thought. It is generally conceded that the astonishing progress made in agriculture in this country is due mainly to the intelligence of the American farmer, notwithstanding that considerable credit must be given our unlimited agricultural resources, and to the material assistance rendered the farmer by the work of inventors who, recognizing the necessity of improved methods, have supplied both machines and implements to lighten or entirely obviate manual labor. A careful perusal of "Farm Science" will undoubtedly suggest methods of improving the quality or yield of the crops, of making the dairy more profitable, and of securing larger results with less labor.

ROPP'S COMMERCIAL CALCULATOR AND SHORT-CUT ARITHMETIC. By C. Ropp. Chicago: C. Ropp & Sons, 1906. 8vo.; pp. 160. Price, $1.

In this convenient volume the author gives a new, complete, and quite comprehensive system of tables intended to save time and labor in the various phases of commercial calculation. The text includes condensed and simplified explanations, rules, and reviews of the essence of arithmetic and mensuration. It is designed for the use of farmers, mechanics, business and professional men, bankers, and storekeepers. The explanations of the principles of arithmetic, mechanics, and mensuration are well prepared, and the book will doubtless make the study and use of figures easy, if not interesting, for the user. Altogether, the work is convenient, practical, and labor-saving, and will be found useful by business men.

SCHOOL TEACHING AND SCHOOL REFORM. By Sir Oliver Lodge. London: Williams & Norgate, 1905. 16mo.; pp. 171. Price, $1.20.

This book by the well-known English educationalist, Sir Oliver Lodge, should be of interest and value to teachers in Great Britain and this country. The text comprises a series of four lectures on curricula and methods, and they were intended for the information of teachers in general, notwithstanding that they were delivered before the secondary teachers and teachers in training at Birmingham.

GAS ENGINES AND LAUNCHES. By F. K. Grain. New York: Forest and Stream Publishing Company, 1905. 16mo.; pp. 123. Price, $1.25.

This little manual is a collection of a series of papers published in Forest and Stream on internal-combustion engines and launches. The subject is placed before the reader in terms which are easily understood even by the inexpert, and technicalities have been avoided wherever possible. The illustrations are clear and sufficient in number advantageously to supplement the text.

PORTLAND CEMENT. By Richard K. Meade, B.S. Easton, Pa.: The Chemical Publishing Company, 1906. 8vo.; pp. 385. Price, $3.50.

One of the latest contributions to the literature of the cement industry is this book, which is really a second and enlarged edition of a small handbook by the same writer published some years ago. Of course, the advance of the industry necessitated the rewriting of large sections of the earlier work, and the addition of much information and data collected since then. The analytical methods given have been found satisfactory in the writer's laboratory. The section on the analyses of cement is exceptionally good.

THE ELECTRICAL NATURE OF MATTER AND RADIOACTIVITY. By Harry C. Jones. New York: D. Van Nostrand Company, 1906. 8vo.; pp. 212. Price, $2.

Prof. Jones's book is a collection of a series of articles which he wrote for the Electrical Review, and the correlation of the subjects under consideration, as well as the general interest of which they are worthy, thereafter led the discussion to be placed in compact form in a single volume. The text has been carefully revised with the assistance of Dr. H. S. Uhler. The object of the lectures was to place as far as possible, in non-mathematical language, the important facts and conclusions in connection with the work on the subject, and this has been done in the interest of those who, while having a really scientific interest in the developments in physics and physical chemistry, nevertheless are ill equipped technically and mathematically to comprehend a purely scientific treatment of the subject. Thus, while the work has been written in a semi-popular style, the subject has doubtless been covered with scientific accuracy.

THE ANALYSIS AND SOFTENING OF BOILER FEED-WATER. By Edmund Wehrenfennig in collaboration with Fritz Wehrenfennig. Translated by D. W. Paterson, M.E. New York: John Wiley & Sons, 1906. 8vo.; pp. 290. Price, $4.

The present form of this book is the result of a number of changes from the original one, in which it appeared as an essay in "Das Organ fuer die Fortschritte des Eisenbahnwesens" of Austria. The translator first performed that part of the work for his own personal information, but it was found to contain so much excellent data of practical value and general interest, that it was decided to place the book before the public. The chemistry of the subject is treated with great care, and includes simple methods of analyzing water intended for boiler feed. These methods are explained in such a manner that they can readily be understood even by the layman. Certain European railroads have been very successful in softening water intended for steam purposes, and the exposition of their methods should be of use and value to American roads introducing or contemplating the utilization of water-softening plants.

NEW EXTENSIVE A B C TABLES FOR AZIMUTH, POSITION LINES, ERROR IN LONGITUDE DUE TO AN ERROR IN LATITUDE, ETC. By S. Mars. Groningen: P. Noordhoff, 1906. 12mo.; pp. 56.

ILLOGICAL GEOLOGY. The Weakest Point in the Evolution Theory. By George McCready Price. Los Angeles: The Modern Leretic Company, 1906. 8vo.; pp. 93. Price, 25 cents.

UNSOLVED PROBLEMS IN METALLURGY. By Robert Abbott Hadfield, M.Inst.,C.E. London: The Institution of Civil Engineers, 1906. 12mo.; pp. 36.

DIE ABHANGIGKEIT DER BRUCHLAST VOM VERBUNDE. By Dr. Ing. Fritz v. Emperger. Berlin: Wilhelm Ernst & Son, 1906. 8vo.; pp. 47.

AUTOMOBILI STRADALI E FERROVIARIE PER TRASPORTI INDUSTRIALI. By Ing. Ugo Baldini. Milan: Ulrico Hoepli, 1906. 8vo.; pp. 351.

OPERE. Vol. II. By Galileo Ferraris. Milan: Ulrico Hoepli, 1903. 8vo.; pp. 473.

THE QUEST OF THE GERM. With Observations Thereanent. By Eugene H. Wood, A.M., M.D. Milwaukee: Published by the Author, 1906. 12mo.; pp. 229. Price, 75 cents and $1.50.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending September 11, 1906.

AND EACH BEARING THAT DATE

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

Account register, Staples & Potter..... 830,936
Agricultural implements, riding attachment for, L. E. Waterman 830,690
Air and other gases, apparatus for liquefying, R. P. Pictet 830,613
Air compressor, compound, E. Hill 830,503
Air or oxygen, apparatus for producing highly ozonized, A. Dechaux 830,975
Amalgam carrier and plugger, H. W. Arthur 830,872
Amusement apparatus, F. W. Thompson.. 830,853
Amusement device, F. Ingersoll 830,838
Amusement device, E. H. Lanier..... 831,012
Animal trap, L. Westgaard 830,693
Ankle brace and supporter, A. R. Garrod.. 830,894
Anode, J. Nelson 830,918
Anthracene derivative and making same, M. H. Isler 831,002
Atomizer, C. J. Davol 830,889
Axle spindle, T. Babbitt 830,955
Bag holder, J. J. Hatin 830,994
Bale bands, fastening, D. M. Campbell.... 830,966
Ballot, pocket, M. Dunn 830,979
Barrel, knockdown, Milligan & Bee..... 830,670
Bearing for the ends of shafts, roller, W. T. Fleming 830,985
Bed, folding, G. Henkel 830,590
Belt coupling, J. N. Johnson 830,593
Belt fastener, E. Mundschenk 830,913
Belts, machine for attaching slats to conveyer, W. T. Gordon 830,709
Berth, ship's, D. Tagliafico 831,019
Binder, H. E. Dade 830,573
Binder lock, loose leaf, A. D. Hulquist.... 830,835
Binder, loose leaf, G. Labarre 831,011
Binder, temporary, T. R. Eddy..... 830,579
Bisulfite liquor, making, N. Heath..... 830,996
Blast furnace, M. Mannaberg 830,513
Boat, sailing, T. Jensen 830,720
Boiler. See Steam boiler.
Boiler cleaner, H. C. Daley 830,574
Boiler trap, C. Dennis 830,649
Book, sales, H. P. Brown 831,023
Boot and shoe ware and other goods, appliance for inserting beading in, E. Townsend 830,855
Bordering machine, W. R. Phillips 830,612
Bore holes, means for surveying, H. F. Marriott 830,730
Bottle and stopper, milk, C. M. Conley.... 830,886
Bottle closure, H. A. Olsson 830,735