

the "cycle" is not complete. 4. Must a two-cylinder engine have two cylinders? A. No.

(9697) C. S. J. asks: 1. Do two objects, for example a ball of lead 4 inches in diameter and a cork ball 4 inches in diameter (thus presenting an equal surface for the air to act upon), fall to the earth in the same space of time if dropped from the same height at the same moment, under atmospheric resistance? A. A ball of lead falls faster through the air than a ball of cork of the same size, since it has more momentum for overcoming the resistance of the air. This is easily observed. If you watch motes floating in the air, or a feather, you will see the effect of the resistance of the air to the downward motion of light bodies. They lack weight for pushing the air out of their way. 2. Would the result be changed if the cork ball be, say, 8 inches in diameter and the lead ball 1 inch in diameter? A. The result will be the same if the cork ball is made larger, for the surface presented to the air increases as the square of the radius of the ball, while the weight increases as the cube of the radius. The ability to overcome the air varies as the radius. 3. Or would it make any difference in the time of descent if the cork be, say, only 1 inch in diameter and the lead ball 8 inches in diameter if dropped from the same height at the same time, under normal conditions of the air? A. You cannot make a cork ball fall as fast as a lead ball by any proportions whatever, so long as the densities of the two are so different. Compress the cork and it will fall faster. 4. In pumping water from a well with a common suction pump, does the person pumping by means of the pump-handle raise the water out of the well or does he lift a column of air of the same diameter as the well tube, thus letting the atmosphere outside of the tube press the water up into, and out of the tube? A. The piston of a suction pump removes the pressure of the air from the surface of the water in the barrel of the pump. The pressure of the atmosphere in the well forces the water up into the barrel of the pump. The person pumping lifts the air in the barrel of the pump. If the area of the barrel is 5 square inches he must lift 75 pounds of air. This has no relation to the size of the well.

(9698) F. L. J. asks: 1. Are the polished parts of a bicycle nickel plated, or are they polished with an acid, as I have been told? A. The parts of a bicycle which have a silvery luster are nickel-plated. 2. Why is it that people do not receive shocks from a trolley rail? If you could touch the overhead wire, without touching the ground, would you get a shock? I have seen birds do this last, and think the reason they can do it, is that they are not in contact with the ground. Am I right or wrong? A. If by a trolley rail you mean the rail of the track upon which the car wheels run, there is no reason why a person should receive a shock from it. It is at the same potential as the earth. If one could catch a trolley wire while in the air he would receive little shock because the potential of his body would soon be the same as the wire, which is at a low voltage, only about 550 volts. No current would flow through him since he is not in a complete circuit. 3. When electric cars jump the track, I have seen the motormen place the switch iron from the rail to the trucks to complete the circuit. Is this necessary? The wheels are in good contact with the ground, and I have heard that the current returned to the station through the ground as well as the rails. A. When electric cars jump the track, it is necessary to provide a better contact than that of the dirt for the current to flow from the motor to the rails. Dry earth is not a conductor nor is pulverized earth. When the current returns through the earth to the power house it must find a better path than either of these if any considerable current is to make a swift return. A poor conductor will take a small amount of current by leakage. 4. I have asked several persons why they build roofs over their porches, and have been told it was to keep the rain and dew from coming on the porch. Is there any part of this answer? I have learned that dew does not fall, but is moisture in the air which was condensed by contact with cold objects. How can a roof protect a person from dew? A. Most certainly there is good sense in the "dew part" of the answer to the question why piazzas have roofs. Dew forms on a body exposed to radiation, so that its temperature can fall below that of surrounding objects, that is, below that of the air. Under a roof or under a tree the heat which is radiated upward is arrested by the roof or the tree and prevented from easily escaping to the sky, with the result that the space underneath the roof or tree is warmer than in the open air. You can verify this by moving your chair out from under a roofed piazza on almost any quiet clear evening. You will find it colder than under the roof, and dew forms more quickly. Clouds act in the same manner to screen the earth, and there is rarely dew on a cloudy night.

NEW BOOKS, ETC.

MANUAL OF TERREOHMETRY. By Ethan Scheidler. South Pasadena, Cal.: Ethan Scheidler, 1905. 16mo.; pp. 44. Price, \$2.

This little manual has been written as an aid to mining men, for the purpose of showing

how ores may be located scientifically by electrical tests. The science of terreohmetry, as it is called, has received a large amount of study and original investigation by the author, who has incorporated in his manual the results of many lessons learned from practical experience in making mining surveys throughout this country, Canada, and Mexico. A clear description of all the necessary apparatus is given, and full directions will also be found as to the method of using the same in locating ore.

MODERN IRON FOUNDRY PRACTICE. Part II. By George R. Bale, Assoc. M. Inst. C.E. London: The Technical Publishing Company, Ltd., 1905. 12mo.; pp. 194. Price, \$1.40.

This part of the work on iron foundry practice deals with Machine Molding and Molding Machines; Physical Tests of Cast Iron; Methods of Cleaning Castings; Foundry Accounting, etc. The machines illustrated and described are typical ones, and besides these descriptions the reader will find a very exhaustive account of the physical tests of cast iron which, on account of the exacting demands of the modern engineer, has now generally to be very thoroughly tested before being put into use. The book is completed with an index, and will be found most helpful to all connected with the iron industry.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES. New York: Samuel E. Hendricks Company, 1905. 4to.; pp. 1,279. Price, \$7.

This is the fourteenth annual edition of this valuable reference book, which forms a complete and reliable index, containing over 350,000 names, addresses, and business classifications, of the architectural, mechanical, engineering, contracting, electrical, railroad, iron, steel, mining, mill, quarrying, and kindred industries. The book also contains a full list of the manufacturers of and dealers in everything employed in the manufacture of material, machinery, and apparatus used in these great industries, from the raw material to the manufacturer article, and from the producer to the consumer. The book will be found extremely valuable as a buyers' reference book, for all engaged in any way in the trades above mentioned.

PROBLEMS OF THE PANAMA CANAL. Including Climatology of the Isthmus, Physics and Hydraulics of the River Chagres, Cut at the Continental Divide, and Discussion of Plans for the Waterway. By Brig-Gen. Henry L. Abbot, Consulting Engineer, New Panama Canal Company. New York: The Macmillan Company, 1905. 12mo.; pp. 248. Price, \$1.50.

This work, which is from the pen of one of the most qualified and lucid writers on the problem of the Panama canal, appears at an exceedingly opportune time. The American public, after being treated to successive reports by expert commissions, each giving a series of recommendations differing, more or less, from the others, will welcome this book, which gives a complete but not over-elaborated statement of the various phases of the Panama canal question. Gen. Abbot was at one time a member of the celebrated Comité Technique which, at the request of the new Panama Canal Company, made an exhaustive examination of the vast amount of technical data gathered by the engineers of the company. His pen was one of the most potent influences in leading the United States government, and the American public at large, to see the superior claims of the Panama to the Nicaragua canal route, and the present work embodies much data that have been presented in the various articles written to this end during the past few years by Gen. Abbot. The work opens with a historical resume of the history of the canal, and then takes up the subject of the rival routes and the physical conditions existing on the isthmus. A whole chapter is devoted to the once-formidable and supposedly-insurmountable problem of the Chagres River. Then in logical sequence there follows a chapter on the ultimate disposal of rainfall in the basin above Bohio. The last chapter considers, in considerable detail, the projects for the construction of the canal. To all of those who desire something more than a superficial knowledge of this great national problem, we cordially recommend this work.

THE MECHANICAL HANDLING OF MATERIAL. By George Frederick Zimmer, A.M. Inst. of C. E. New York: D. Van Nostrand Company, 1905. 4to.; pp. 521; 550 illustrations. Price, \$10.


This work forms the first complete and connected treatise on the Mechanical Handling of Material, in any language. Its author has had over twenty years' experience in the designing and installing of machinery designed to handle material in the substitution of or supplemental to hand labor, and all such machinery is described in full in the present volume. The book is divided into three main sections dealing with the Continuous Handling of Material; the Intermittent Handling of Material; Unloading and Loading Appliances; and Miscellaneous Handling Apparatus, such as automatic weighers; apparatus for coaling locomotives; coal-handling plants for gas works; power stations, boiler houses, etc.; floor and silo warehouses for grain and seeds; and high-level or cantilever cranes. Section I. deals largely with all kinds of elevators and



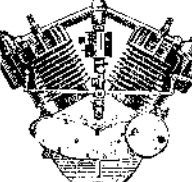
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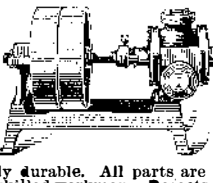
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FARM GRASSES OF THE UNITED STATES. By William Jasper Spillman. New York: Orange Judd Company, 1905. 12mo.; pp. 248. Price, \$1.

This volume presents, in connected form, the main facts concerning grasses grown on American farms. Actual practice in grass growing has been set forth wherever information concerning this is available. The country has been divided into four regions, each of which presents a different set of problems. The problems of growing grass in the South and the semi-arid lands of the West are discussed, and full information given concerning them. The book forms a practical treatise on the grass crop, seeding and management of meadows and pastures, descriptions of the best varieties, the seed and its impurities, grasses for special conditions, etc.

BUILDING MATERIALS. Their Nature, Properties, and Manufacture. By G. A. T. Middleton. New York: William T. Comstock, 1905. 8vo.; pp. 420. Price, \$4.

This book is one of the most recent and complete works on the subject of building materials which has come to our notice. It is prefaced by a geological introduction, describing the formations in which British building materials occur, and by a second introductory chapter dealing with the chemistry and physics of building material. After citing the various stones and their classification, these are all described in detail, a chapter being devoted to each. Other building material, such as lime, plaster, cement, bricks, terra cotta, artificial sand and stone, and their methods of manufacture, are described in detail and illustrated by photographic views. Several chapters are devoted to timber, the various woods and their method of seasoning and preservation being described. The main varieties of iron, their impurities, strength, and test, are also considered in detail. Steel, copper, zinc, and lead are also treated of, and the book even goes into the description of special paints, enamels, and iron and stone preservatives, giving full directions for mixing and using the same. Varnishing, polishing, enameling, and lacquering are also described in the latter portion of the work. Glass and wall and ceiling papers, besides stamped metal linings, etc., are among the sundry materials of lesser importance which will be found described. The work is a complete textbook for students and others engaged in the building trades.

THE POCKET BOOK OF REFRIGERATION AND ICE-MAKING. Edited by A. J. Wallis-Thayer, C.E. New York: The Norman W. Henley Publishing Company, 1905. 16mo.; pp. 184. Price, \$1.50.

This volume contains in a handy form such formulae, data, tables, and memoranda as are constantly required by persons engaged in the refrigeration and cold-storage industries. It is a very reliable handbook, giving full information on all subjects of refrigeration, such as Cold Storage; Ice-Making and the Storage of Ice; Insulation; the Testing and Management of Refrigerating Machinery, etc. The book has a large number of general tables and memoranda, and is completed by an index, which makes all its information readily accessible.

KNOTTING AND SPlicing ROPES AND CORDAGE. By Paul N. Hasluck. Philadelphia: David McKay, 1905. 16mo.; pp. 160. Price, 50 cents.

This small handbook, which is fully illustrated with numerous engravings and diagrams, was compiled by the author for everyday use. It consists of a comprehensive digest of information on this subject, obtained from the columns of Work. Among the different kinds of knots described are eye knots, ring knots, and fancy knots. Rope formation, shortening, and splicing are also described. One chapter is devoted to "Working Cordage," another to "Lashings and Ties for Scaffolding," and a third to "Splicing and Socketing Wire Ropes." Two of the most useful chapters are on "Simple and Useful Knots" and "Hitches and Bends." The book is provided with an index, which makes the information it contains readily available.

CEMENT AND CONCRETE. By Louis Carlton Sabin, B.S., C.E. New York: McGraw Publishing Company, 1905. 8vo.; pp. 507. Price, \$5.

This volume is one of the most complete we have seen on cement and its properties and uses. It is divided into four parts, which deal respectively with the Classification and Manufacture of Cement; the Properties of Cements and Methods of Testing Them; the Preparation and Properties of Mortar and Concrete; and the Use of Mortar and Concrete. The author has produced a work which, although not going into the subject as deeply as some others, still gives all the information essential to the young engineer of to-day, to whom we heartily recommend the work as a most helpful reference book.