



HINTS TO CORRESPONDENTS.

Full hints to correspondents were printed at the head of this column in the issue of August 8th, or will be sent by mail on request.

(10850) W. P. says: Will you kindly state if the phenomenon of "ball lightning" described in inclosed article is an established fact, and if so, how scientists explain it? A. The appearance of globe or ball lightning has been recorded too many times by competent observers to deny its occurrence. Prof. Davis, "Elementary Meteorology," page 268, says: "Discharges of atmospheric electricity occasionally take the form of globe lightning, having the appearance of luminous balls, seeming to be a foot or so in diameter, moving at a moderate velocity, and passing about among objects near the ground; remaining visible a number of seconds, and commonly disappearing with an explosion. No satisfactory explanation has been offered for this curious phenomenon." Formerly the possibility of such an occurrence was promptly denied, but now the scientific mind seeks more carefully to find out what is seen than to make what is seen correspond with the accepted notions of people. Whether ball lightning appears is to be determined by careful observation of competent observers. If such people say they have seen it, others will have to accept their testimony, even if no plausible explanation can be found for the appearance.

(10851) M. F. F. asks: 1. How can you lacquer brass, and what is the preparation used to lacquer with? A. Lacquer is prepared from a nice grade of shellac, better from seed lac, by dissolving it in alcohol and adding some other substance to color or harden it. The article must be perfectly clean and should be warmed. The lacquer is applied with a brush. Full and detailed instructions may be found in our "Scientific American Encyclopedia of Receipts," which we send for \$5. 2. A friend works in a telegraph office and he says his relays are wound in the same direction on both magnets and a telegraph sounder is wound differently. I think the relay is wound in different directions. Who is right? A. The direction of winding the magnets of a relay is of no consequence. They must, however, be connected so that the current circulates in one direction on one spool and in the other direction through the other spool, so that one pole is plus at the armature and the other is minus. The same is true of a sounder. 3. I made a wireless telegraph and it works very well except when the tapper should knock the filings apart, and this it will not do. Am I using too much current, or what is the matter? A. Perhaps your coherer needs to be tapped harder to knock the filings apart. Perhaps the ends of the plugs are too near together so that the filings are held too tight. You can easily find if less current will make it work better. 4. How many gallons of water will flow out of a pipe in one day with a pressure of 108 pounds and the hole in the pipe 1-16 inch in diameter? A. The theoretical solution gives about one gallon a minute for the flow from the hole in the water pipe you describe. So much depends upon the thickness of the pipe and the condition of the edges of the hole, etc., that this may be far from the real efflux. This can only be determined with correctness by experiment.

(10852) M. L. W. says: 1. Can you advise me or tell me where I may get information in regard to the tides on the Atlantic coast? A. You can perhaps secure information as to the height of tides at all places along the Atlantic coast through the Nautical Almanac Office, Washington, D. C. At least that is the most likely place to inquire. 2. Is there any tide at the equator, and does it increase as you approach the poles? A. The largest tide is directly under the moon as it passes over the sky day by day. The moon may vary from about 28 deg. north latitude to 28 deg. south latitude, hence the highest tides vary in the same way. Farther north there would be slightly lower tides. 3. Does the character of the coast line affect the height of the tide? A. The character of the coast changes the height of the tide very much. A bay like a funnel makes the tide very much higher. An example of this is the Bay of Fundy, where tides of nearly 60 feet occur. 4. Is there any or much tide in the Gulf of Mexico, and if not, why not? A. Narrow bodies of water such as inland seas, lakes, and gulfs have very little tide. There is not space for the formation of a tide. You will find the discussion of the tides in any physical geography. We can send you our work on the subject for \$1.75 by mail.

(10853) G. H. G. says: 1. Magnetism and amount of wire not considered with direct-current dynamo, does amount of current depend on speed or on number of reversals of polarity? A. The current from a direct-current dynamo is determined by Ohm's law, as is the current in any other case of an electric circuit. Amperes are found by dividing the volts by the ohms. The machine is wound to such a resistance that it will give its rated voltage at its designed speed. At this speed the turns of wire in the armature cut the lines of force in the

field at the proper rate to produce the volts required. Of course, the polarity of the coils of the armature changes with each change in the direction of the lines of force through the coils. In a multipolar armature adjacent poles are of opposite polarity, and hence the direction of current changes each time a coil passes a pole. Now the ohms of the dynamo are fixed by the winding, and the volts are constant at the proper speed. Hence the number of amperes a dynamo can give is chiefly determined by the resistance of the external circuit, since the internal resistance of the dynamo is always a small quantity. The amperes then vary very nearly with the resistance of the external circuit. At ten times the resistance the amperes will be reduced to one-tenth, and at half the resistance the amperes will be double the former value. 2. If the number of poles in the field is increased and the revolution of the armature decreased by the same proportion, will the results be the same as if no change had been made? A. From the answer to the first question it is evident that if the number of poles in the field is increased, the number of turns of the armature per second may be increased in the same proportion, without changing the voltage, and therefore with the same results as if no change had been made. This is the reason for the existence of the multipolar dynamo. It can be run at a lower speed than the bipolar machine. High voltages with a bipolar dynamo are difficult to obtain. 3. Have you SUPPLEMENTS containing information on the best construction for producing direct current with least speed? Also on the construction of commutator for direct current where multipolar field magnets are used? A. Books on dynamo designs discuss the subject of the proportions of parts to be observed in a machine. We can send you Wiener's for \$3; Crocker's new book for \$1; his "Electric Lighting," vol. I, Generators, for \$3; S. P. Thompson's "Dynamo-Electric Machinery," a very large book, for \$15; Hawkins and Wallis's "Dynamo," for \$3.

(10854) C. C. H. says: A friend of mine wishes to charge a small storage battery from the alternating current. Aside from the rather expensive mercury arc, do you know if the aluminium-lead or other valve cell is satisfactory for that purpose? Perhaps you have published directions for making, to which you can refer me. A. We have published three descriptions of different electrolytic rectifiers, using aluminium and lead, to give a direct from an alternating current. You will find them in SUPPLEMENT Nos. 1644, 1679, and in the SCIENTIFIC AMERICAN, vol. 97, No. 8. We send these for ten cents each. These rectifiers furnish about half the initial voltage in direct current. They can be recommended when no more efficient rectifiers are to be had.

(10855) J. D. says: 1. What is the difference between the windings of a battery motor and a direct-current 110-volt motor? A. Two electric motors are supposed to have the same power. Power is in watts. Watts are the product of volts and amperes. A battery current is usually one of low voltage, depending upon the number of cells. The other motor supposed has 110 volts. Now, if the watts are the same, it is obvious that the amperes for the battery motor with a few volts must be more than for the motor with a large number of volts. And this is the case. The battery motor has few volts and many amperes, the motor of a 110-volt circuit has few amperes and many volts. To secure many amperes the motor is wound to a low resistance, either by using a coarse wire or few turns of fine wire. The motor on 110 volts is wound with many turns of wire to a high resistance. A. What is the theory of an induction coil? A. The induction coil is a transformer. It takes a current of low voltage and raises it to a high voltage. 3. What are the advantages of a transformer for electric lighting? A. Transformers are used with alternating currents for lighting or power. They change the voltage to the proper value for the work to be done, and allow the right number of amperes to flow.

(10856) H. A. says: 1. How much energy in foot pounds is expended in the sending of a 1-pound skyrocket? A. The energy of any moving body is calculated from the formula WV^2

— G is 32.16 feet, W is the weight of the body in pounds, and V is the velocity in feet per second. The result is in foot pounds. From the velocity of the rocket in your question, which you do not state, you can find the energy. 2. How does the distance on lever increase the pressure, i. e., in what proportion is the work done by a pressure of 1 pound on a 2-foot lever to that of the same pressure on a 3-foot lever? A. The effect in a lever varies directly as the distance from the fulcrum at which the pressure is applied. It is found by multiplying the pressure by its distance from the fulcrum. 3. What causes oily rags when laid aside for a short time to take fire? A. Rags take fire when laid aside filled with paint oil because the oil absorbs oxygen from the air. Paint does not dry by evaporation as water does, but by combining with oxygen, thus growing hotter. If this heat is not radiated from the rags, they will in time become hot enough to take fire. 4. Ditto of green hay? A. In the sweating of a mass of green hay or other vegetable matter there is a large growth of mold or other fungi, and this is a process of the combination of oxygen with other materials, similar to combustion. Heat is generated till in some instances a conflagration has resulted.

NEW BOOKS, ETC.

THE SANITATION OF RECREATION CAMPS AND PARKS. By Dr. Harvey B. Bashore, Medical Inspector for Pennsylvania Department of Health. First Edition. New York: John Wiley & Sons, 1908. 12mo.; cloth; xiii+109 pages; 19 illustrations. Price, \$1.

The book adds to the list of practical sanitation works written by this author. His experiences in the field in testing potable water and in the proper treatment of refuse, are given in chapters on Location and Construction, Water-supply, Waste-disposal, Camp Surroundings and the Sanitary Care of Parks. These chapters outline the conditions bred by life in the country at or away from the wayside brook or upland creek, and are an aid to sanitary science. The laws for guarding the welfare of the people could be improved from the researches which the author here makes public.

LOCOMOTIVE ENGINE RUNNING AND MANAGEMENT. By Angus Sinclair. New York: John Wiley & Sons. 12mo.; pp. 438; 55 figures. Price, \$2.

It is now over fourteen years since the first edition of this book was published, and the time has arrived when it was necessary to rewrite the whole of it or permit "Locomotive Engine Running" to fall into the condition of an ancient story. There probably was no decade in the world's history when engineering of all kinds made so much progress as it did from 1889 to 1899. The science of locomotive engineering has kept pace with the advance movement, and has made a book on the management of the locomotive revised ten years ago a back number. The author's constant endeavor in rewriting the book has been to keep it up to the times, to make it just as modern as the hundred-ton locomotive. It is an admirable work, well illustrated, with many questions and answers.

EXERCISING IN BED. By Sanford Bennett. Illustrated. San Francisco, Cal.: Published by the author, 1907. Price, \$1.50.

At the age of fifty the author of this book was physically an old man, worn out, rheumatic, a chronic dyspeptic, and partially bald, with other minor ailments characteristic of age. Eighteen years later, or at the age of sixty-eight, these indications of physical decay have disappeared. Believing that the simple methods by which this unprecedented instance of physical rejuvenation in advanced years has been obtained, he presents this story of an old body made young. The photographs which accompany his text verify his claim to physical rejuvenation. His present condition is due to a system of alternate contractions and relaxations of all of the large muscles of the body supplemented by massage and practised *seriatim* while lying in bed in the early morning. The author believes that the same results can be obtained by anyone who will faithfully and persistently practise the simple system of exercises which he has devised. Starting with the premise that the real cause of old age is waste-clogging matter, the debris or ashes resulting from the process of life, Mr. Bennett believes in the mechanical or muscular removal of the debris. He argues that any muscle exercised, that is, alternately contracted and relaxed, throws off dead matter and increases in size, strength, and elasticity, and any adjacent gland or organ shares in the improvement.

LIQUID AND GASEOUS FUELS AND THE PART THEY PLAY IN MODERN POWER PRODUCTION. By Vivian B. Lewes, F.I.C., F.C.S. New York: D. Van Nostrand Company, 1907. 12mo.; pp. 334. Price, \$2.

The author has an international reputation as an authority on gas as an illuminant and fuel. The subject of liquid or gaseous fuels has, during the last decade, assumed such importance that there is ample room for a good book on this subject. The development of the internal-combustion motor, the perfection of the automobile, and the important part played by liquid fuel in the navies of the world make the present time one of the most interesting epochs in the history of power production; and it is thought that by bringing together the history and practical development of the use of various forms of combustible liquids and gases for the generation of energy, this book may do some service in the advancement of the subject. The author has performed a signal service in bringing out this book at the present time. It is well illustrated with new engravings.

HEALTH AND BEAUTY. By John V. Shoemaker, LL.D., M.D. Philadelphia: F. A. Davis Company, 1908. 8vo.; pp. 476. Price, \$3 net.

Health and beauty are closely allied, and nowhere so clearly as in the condition of the skin, pure skin being an important element of beauty as well as of health. It should, therefore, be a subject of much interest to mankind. The author points out to the reader the various methods by which the health may be influenced by climate, diet, ventilation, bathing, and exercising. The diseases to which the hair and nails are also subject receive attention. The legitimate employment of cosmetics is defined, and choice formulae are given for their preparation. This work, although written from a medical standpoint, does not overlook but expressly includes aesthetic conditions which na-

ture itself presents in connection with the subject.

ROAD PRESERVATION AND DUST PREVENTION. By William Pierson Judson. New York: The Engineering News Book Department, 1908. 6x9 in.; pp. 144; 16 illustrations. Price, \$1.50 net.

The preservation of the surface and the prevention of dust on macadamized roads form the problem now to be solved by engineers charged with the maintenance of many thousands of miles of broken-stone roads which have been built throughout the country during the past decade. The advent of the automobile increased the acuteness of this problem, and new roads that are proposed or in progress must be better built than the older ones. They must be better bonded and better surfaced and these results must be reached if possible without unduly increasing the cost. The author has given us a most illuminating treatise on the whole subject.

HYDRO-ELECTRIC PRACTICE. By H. A. E. C. von Schon. Philadelphia: The J. B. Lippincott Company, 1908. 4to.; pp. 382. Price, \$6.

A comprehensive work, in which the utilization of water power as a source of electric energy is presented. The book is in two parts: 1. Analysis of a Hydro-Electric Project. 2. Designing and Constructing the Plant. The author has pursued the practice of hydro-electric engineering for some fifteen years, and he stands probably alone in his profession in this country as a purely hydro-electric engineer. His exceptional opportunities to gather experience have particularly fitted him to discuss a subject that is now receiving considerable attention from engineers, capitalists, and promoters.

INDIA RUBBER AND ITS MANUFACTURE. By Hubert L. Terry, F.I.C. New York: D. Van Nostrand Company, 1907. 12mo.; pp. 294. Price, \$2 net.

The largely extended use in recent years of India-rubber tires on vehicles of all sorts has led to an increased interest being taken by the general public in the natural history and manufacture of rubber. Moreover, the establishment within the last year or two of numerous rubber plantations in Ceylon, the Straits Settlements, and Malaya has led to this almost indispensable commodity becoming a common topic of conversation. The present volume, which is expressly designed for the general reader and for the technologist in other branches of industry, cannot be considered a superfluity—that is, if its scheme of bringing information up to date is considered by the critical reader to have been accomplished. It may be as well to state emphatically that while this small volume does not pose as a working guide or handbook for the India-rubber manufacturer, it is hoped that the latter may find something to interest him in its pages.

MECHANICAL ENGINEERING AND MACHINE SHOP PRACTICE. By Stanley H. Moore. New York: Hill Publishing Company, 1908. 8vo.; pp. 502. Price, \$4 net.

This book deals with modern machine shop practice and its correlative mechanical engineering and is written primarily as a textbook for the student and apprentice. The book is profusely illustrated with half-tone engravings, line cuts, and diagrams. The tables are also numerous. It is one of the best works on the subject which have ever come to our attention. It would prove of great value to those who are taking a course in mechanical engineering in some institution of learning. The book is extremely well made and does the publishers great credit.

THE MANUFACTURE OF LUBRICANTS, SHOE POLISHES, AND LEATHER DRESSINGS. By Richard Brunner. Translated from the Sixth (enlarged) German Edition, by Charles Salter. London: Scott Greenwood & Son. New York: D. Van Nostrand Company, 1906. 12mo.; cloth; 176 pages, 10 illustrations. Price, \$3 net.

Fatty, chemical, and mineral lubricants are technically and chemically treated in this new edition. Such recipes as are a success in practice have been sanctioned, and they are calculated to give the makers of lubricants for their own uses a reliable compound. Part I. is concerned with the manufacture of lubricants and greases, Part II. with shoe polishes and leather-softening preparations. The rules laid down will secure the perfect preservation of machine parts and protect leather from liability of brittleness. There is hardly an industrial business that may not be benefited by the use of the information and formulae in this important issue. A substantial index is provided.

MACHINE DESIGN, CONSTRUCTION, AND DRAWING. A Text-Book for the Use of Young Engineers. By Henry J. Spooner, C.E. London: Longmans, Green & Co. New York, Bombay, and Calcutta, 1908. 8vo.; cloth; 691 pages, 86 tables, and over 1,400 figures. Price, \$3.50.

Young engineers will find this volume essential in helping them to a thorough training in the elements and principles of design. The opening chapters are given to teaching the art of making working drawings of simple pieces, while design and construction more particularly claim the author's attention in the remainder of this highly technical work. At the end of most of the chapters, drawing and sketching exercises are furnished. Useful