curve considerably because of the mountain ranges, plains, and rivers. In the storm the wind blows inward toward the center, and the storm as a whole rotates from east to north, west and south, as we say, opposite to the hands of a clock in the northern hemisphere. This causes the northeast winds in the northern front quarter of such a storm. The ocean has little influence on these storms as far west as Ohio. The storm does not come from an easterly direction, but from the west, and the wind in its whirling in the storm blows from an easterly quarter in the front, and from a westerly quarter in the rear of the storm as it goes away. It clears off with a westerly wind, as you have observed.

(10996) A. W. asks: 1. What is meant by "polyphase" as applied to electric machines; and by "cycle" as applied to gas engines? A. A cycle is a series of changes through which a varying quantity passes, including all its values, and it fluctuates through these changes periodically. Thus a cycle of an alternating current of electricity is the successive values of the E. M. F. through one series of changes from zero to its highest value, and down through zero to the lowest and back again to zero. This succession of values the current will have as many times per second as there are cycles, ordinarily 30, 60, or 120. Polyphase currents are those whose E. M. F.'s differ from each other by a fraction of a phase. Thus three currents a third of a cycle apart will furnish a three-phase current in the lines with which it is connected. See Sloane's "Electrician's Handy Book," price $3.50. A cycle is like a complete succession of the heights of one tide in about twelve hours at the seashore. A phase is any single value or height of the water. If two or three tides come together by different channels in the same place or bay we have a two-phase or three-phase current of the tide. 2. What is meant by jibing a sail-boat? A. A sailing vessel is tacked when in changing from one course on the wind to another it presents its bow to the wind; it is jibed when it is turned in the opposite direction so that it presents its stern to the wind. In a high wind the latter is always a difficult and sometimes a dangerous operation. 3. Is a catboat so called because the mast stands straight up at one end of the boat like a cat's tail from its body? A. We are certain that a catboat is not so called because its mast stands straight up like a cat's tail. The mast is at the front end of the boat, and so far as we have observed cats have their tails set at the stern end. We do not know the derivation of the name catboat, but think it far more likely that it was given because of the quickness with which these boats will come about. 4. Does an electric motor differ in structure from a dynamo? Can they be interchanged? A. There is no theoretical difference between a dynamo and a motor. In general, each may be used for either service. There are, however, many structural differences between the two classes of machines, so that it can be easily told to which class any particular machine belongs. 5. How can a steady, effective current proceed from a dynamo giving an alternating current? The current changes polarity each instant, as understood. A. A steady current is not produced by an alternator. An alternating current can, however, be changed to a steady direct current by means of a rotary converter. 6. What light form of motor would you recommend for driving a dirigible balloon? A. Probably some form of gasoline motor is best adapted for use in a dirigible balloon.

(10997) O. E. G. asks: 1. Is the speed of radiant heat (whose medium is the same as light) the same as light and electricity? A. The latest science does not make any such distinction as between radiant heat light, electricity, etc. They are all the same radiation. If the waves are of a length to affect the proper nerves we feel them as heat; if they can affect the eye we see light. 2. Is the difference between light, electricity, and radiant heat due to the difference in wave-length? A. The sole difference between the several effects is due to wave-lengths. See the "New Knowledge," by Prof. Duncan, price $2. 3. If light moves in transversal waves, how can it move forward? A. In all vibratory motions it is the wave form simply which travels. A wind moving over a field of grain is the very best illustration of this one can have remote from the ocean. Water waves on the ocean are good illustrations of a transverse wave with an onward motion of the wave form. It is not light which moves, but a wave form. The matter which vibrates moves to and fro, the wave advances. 4. Please explain wave-length. A. Wave-length is the distance from a particle moving in a certain direction to the next particle in exactly the same condition of motion. In a water wave, the wave-length is from a drop on the crest, for example, to the next drop exactly on the crest, also. 5. What is the wave-length of electricity, and does it vary with the amperage? A. There are all sorts of wave-lengths of electricity down to very short waves, but not so short as those which produce light. Those used in wireless telegraphy with a single wire as an aerial are very closely four times as long as the height of aerial wire from which they are radiated into space. When a capacity is in the circuit this affects the wave-length. The wave-length varies with the rapidity of the oscillations of the discharge. 6. Does a heated conductor of electricity retard the current? A. A hot metal has more resistance than it has at a lower temperature, and so reduces the current which flows through it. Carbon, however, has a much greater electrical resistance when cold than when hot.

(10998) E. G. asks: Kindly give me a clear definition of adiabatic heating, explaining fully the difference between a gas adiabatically heated and one heated by mechanical compression. A. The word "adiabatic" is derived from the Greek and has three parts. *A* means without; *dia* means through; *batio* means going. This word as a whole means "without going through." Applied to heat, the sense is that no heat passes through to affect the temperature of the gas under test, be it steam in a boiler or any other gas in any receptacle or in the air in the atmosphere. A gas which is compressed without any heat leaving it becomes hotter, and a gas which is expanded without any heat coming into it grows colder. Both of these are adiabatic changes. The gas which is heated by mechanical compression is heated adiabatically. Adiabatic changes are of great importance in the atmosphere. 2. In reducing a barometer reading of a given latitude to sea level, the average temperature of the air must be known. Is this average obtained by taking the average of the dry thermometer readings at the A. M. and P. M. observations, or by taking the average of the maximum and minimum temperatures for the day? A. The average temperature of the air in the problem of the reduction to the sea level is the average of the temperature of the air at the various altitudes from the sea level to the altitude of the observation. This can be found only with considerable probable error, since the change of air temperature with altitude varies greatly in different regions, and any error in this causes an error in the weight of the air column to be calculated. The actual temperature at the place at the time of observation is the only temperature to be employed in the reduction of that observation. 3. Is water vapor properly classed as one of the constituents of the atmosphere? A. Water vapor is one of the constituents of the atmosphere. No percentage value can be given for it, since it varies very much, from a mere trace to as much as five per cent of the amount of dry air. The chemical composition of air as ordinarily given is usually that of dry air.

NEW BOOKS, ETC.

CANADIAN TYPES OF THE OLD REGIME. 1608-1698. By Charles W. Colby. New York: Henry Holt & Co., 1908. 8vo.; pp. 366. Price, $2.75.

This handsomely made book is illustrated by well chosen engravings. Some idea of the contents may be gained from the chapter headings, which are as follows: "The Historical Background of New France," "The Explorer, Champlain," "The Missionary, Brébeuf," "The Colonist, Hébert," "The Soldier, D'Iberville," "The Coureur du Bois, De Lhut," "The Intendant, Talon," "The Bishop, Laval," "The Governor, Frontenac," and "The Woman." The chapters of this book represent lectures which were recently delivered in Ottawa. It is extremely well written, and conveys an immense amount of material which is not easily available except in special libraries.

SCIENTIFIC IDEAS OF TO-DAY. By Charles R. Gibson. Philadelphia: J. B. Lippincott Company, 1908. 12mo.; pp. 344. Price, $1.50.

This book is so fascinating that the reader almost feels like neglecting the author's warning that the chapters should not be read at random, no matter how interesting they are. This warning is fully justified, in any work of this kind, for it would be quite impossible to make each chapter complete in itself without a wearying repetition of facts. In the present volume, the author has endeavored to explain the scientific ideas of to-day without using language beyond the reach of any reader. His explanations demand no previous knowledge of science whatever and no acquaintance with mathematics. It is the most admirable book on amateur experiments that we have seen in years. Among the chapter headings are: "What Things Are Made Of," "The Stuff That Atoms Are Made Of," "The Construction of the Atom," "What is Electricity?" "What is the Æther?" "What is Magnetism?" "More About Electrons in Motion," "What is Energy?" "Waves in the Æther," "What is Light?" "The Explanation of Color," "Ideas Obtained from the Spectrum," "The Birth of a Star," "The Age of the Earth," "Whence Came Life?" "What Are the X-Rays?" "How Radium was Discovered," "What Are the Rays from Radium?" "Is the World Going to Pieces?" "The Cause of Radio-activity," "What is Gravitation?" This is a book that it will pay anyone to read from cover to cover. It would make an admirable Christmas gift.

ST. BOTOLPH'S TOWN. An Account of Old Boston in Colonial Days. By Mary Caroline Crawford. Boston: L. C. Page & Co., 1908. 12mo. Price, $2.

The author has produced a most delightful book on old Boston. We have not read a more interesting book of this nature in a very long time, making one understand a little better the part New England, in the person of its chief town, has played in the mighty drama of nations made up of thinking, feeling men and women. Up to the time of the Revolution, of course Boston was the biggest place in all the colonies, as well as the chief settlement in Massachusetts. This numerical prominence needs to be borne in mind if we would understand many acts on both sides of the ocean. To understand the America of to-day, too, we must needs know the Boston of the forefathers. The book is beautifully illustrated, printed, and bound.

LATHE DESIGN FOR HIGH AND LOW SPEED STEELS. John T. Nicholson, D.Sc., and Demster Smith. London and New York: Longmans, Green & Co., 1908. 8vo.; Pp. 402. Price, $6.

Until the advent of high-speed steel the necessity for a theoretical treatise was unfelt; but the new conditions imposed by the general adoption of the high-heat steel were found to have rendered obsolete the long-treasured experience and accumulated data of the tool maker. A recent statement of the problems involved in lathe design, and an attempt to solve them on a basis of experimentally ascertained fact, had consequently become imperative. The substance of the book has already appeared in large part in the columns of The Engineer, and has already awakened widespread interest. The tool designers will be glad to have such valuable matter in book form. The work is excellently illustrated by a large number of engravings, which are executed on a good-sized scale.

FLÜSSIGE KRISTALLE, MYELINFORMEN UND MUSKELKRAFT. Von O. Lehmann. Braunschweig: Druck von Friedrich Vieweg und Sohn, 1908. Pp. 321-330.

FLÜSSIGE UND SCHEINBAR LEBENDE KRISTALLE. Von. O. Lehmann. Leipzig: Verlag von F. C. W. Vogel, 1906. Pp. 10.

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