termed an in-curve or an out-curve. A also claims that if any curve does take place it is due to the resistance of the air to the ball traveling in one direction but revolving in the opposite, also that said curve will not exceed 4 inches in 60 feet. B claims that a baseball can be thrown 60 feet and made to "break" or deflect at an acute angle when about 58 feet, also that it is possible to throw a ball 60 feet and cause it to curve 3 and 4 feet from the median line. A. There can be no doubt about the curving of pitched baseballs. It is seen every day. Pitchers are chosen for their ability to pitch "curves." We do not, however, know the limits of the distance to which a ball has been or may be curved, and should look with doubt upon the statement that a ball cannot be curved more than 4 inches in 60 feet. The matter has been analyzed by scientists with the conclusion that the curving is the result of a diminished pressure on one side of the revolving ball. The air is rent by the ball as the ball rushes through the air. This is equivalent to an air current past the ball having the same velocity as the ball. The rotation of the ball causes the rarefaction of the air on one side, that toward which the ball is turning, and a pressure is produced toward that side which pushes the ball away from its straight course, as seen by one watching the ball. Any batter can tell you that the balls curve, and for that reason are hard to hit. We do not know what scientific demonstration would satisfy A, but the fact of curving is capable of optical demonstration, and it is the business of science to find the reason for the obvious visible fact.

(9457) E. E. W. asks how the horse power of an electric motor is reckoned. Is it reckoned on what the motor will draw or what it will lift? How many men would it take to run a machine by foot power that can be run by a 1 horse power motor? A. The horse power of an electric motor is reckoned from the amperes and volts which it takes. Multiply together the amperes and volts as determined by the instruments and divide the product by 746, to obtain the horsepower. Eight or ten men may be taken as about equal to 1 horse power in continuous work, although no definite number can obviously be assigned.

(9458) F. E. W. asks: Has it ever, to your knowledge, been proved by scientific demonstrations, that a ball thrown by the human arm can be curved in the air? Will you kindly inform me in regard to the matter? A. Curved balls are pitched every day on all the baseball grounds in the country. There can be no question about the matter. It has also been made the subject of mathematical investigation. The conclusion is: "The curving of a pitched base ball or a court tennis ball is due to a reduction of air pressure on one side of the rotating ball." You will find a valuable article on the subject of the curved ball in our SUPPLEMENT No. 402, price 10 cents. Other articles are published in the SUPPLEMENT No. 410, 423, 463.

NEW BOOKS, ETC.

HOW TO ILLUSTRATE FOR NEWSPAPERS, MAGAZINES, BOOKS, ETC. By Charles Hope Provost. New York: Brown Publishing Company, 1904. 12mo.; pp. 186. Price, 50 cents.

Mr. Provost's position as a well-known illustrator of the day will give this manual a claim upon popular regard. If criticism may be ventured, it must be to the effect that the writer has tried to cover too much ground, and consequently has been obliged to dispose of such subjects as "perspective," "pictorial composition," and "ornamental design" within the limits of one or two pages. This fact, however, does not detract from the value of the writer's remarks and instructions on other subjects; as in the chapters on "artistic anatomy," for instance, which are remarkably well illustrated by plates showing the articulation of the bony structure, the disposition of the muscles of the body, and the relative proportions of the features of the face and of the members and parts of the body. The list of publishers who buy illustrative work should be of use to beginners ambitious to make money by brush and pen; while an appendix, devoted to the reproductive processes used in book, periodical, and advertising work, contains much that the beginner ought to know.

CHEMICAL ANALYSIS FOR GLASSMAKERS. Containing Methods of Analysis for Clays and Other Silicates which will be found useful for the Pottery Industry. By Edward C. Uhlig, B.S., Chemist for Whitall Tatum Company, Member of the American Society of Chemical Industry. Pittsburg: Kaufmann & Gauding, 1903. 8vo.; pp. 136. Price, $5.

Glassmakers are, as a rule, accustomed to follow certain recipes to produce certain results, without trouding themselves to learn whether the chemical ingredients they use are of the required strength and purity. Mr. Uhlig urges a systematic test of raw materials, and a more careful scrutiny of operations, such as batch-mixing and gas making, promising that the frequent failures now carelessly attributed to "bad luck" will thus be reduced to a minimum. To this end he endeavors to give, in as simple and non-technical language as possible, such necessary instruction in chemical analysis, in its relation to the manufacture of glass, as will enable the workman to discover beforehand any imperfections in the ingredients, and so avoid failure in the melt.

PRINCIPLES AND PRACTICE OF ARTIFICIAL ICE-MAKING AND REFRIGERATION. Comprising Principles and General Consideration; Practice as Shown by Particular Systems and Apparatus; Insulation of Cold Storage and Ice Houses, Refrigerators, etc.; Useful Information and Tables. By Louis M. Schmidt, Ph.B. Philadelphia: Philadelphia Book Company, 1904. 8vo.; pp. 291; 153 engravings. Price, $2.50.

Ice-making and refrigeration are subjects of great and increasing importance in the economics of civilization. In its application to storage and transportation, refrigeration has extended, and almost revolutionized, trade in foodstuffs and perishable products. Starting with a brief *resumé* of the history of ice making, from the ancient practice of water-cooling in India to the present time, Mr. Schmidt proceeds to impart a general knowledge of the principles involved. He then brings out the application of these principles in practice, by descriptions of representative apparatus as made by the leading manufacturers. In conclusion he presents some instructive tables, and a chapter on liquid air. The success of this, the second edition of the work, is presaged from the fact that the first edition is entirely exhausted and the demand still unabated.

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