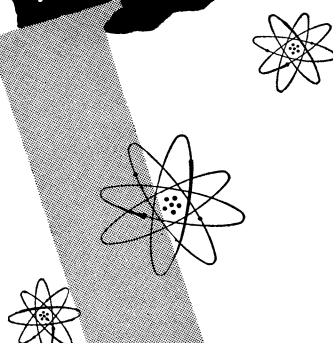


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- EAMON DE VALERA**—M. J. MacManus—*Ziff-Davis*, 281 p., \$3. A biography of the man who was the storm center of Ireland's fight for independence from the British Empire, as well as a dramatic record of that revolution.
- FIRE FIGHTING ON FARMS**—A. T. Holman—*U. S. Department of Agriculture*, Miscellaneous Publication No. 612, 54 p., illus., paper, 15 cents. Instructions to farmers and rural dwellers on types of fires, fire fighting equipment and chemicals, with instructions about how to build or assemble equipment for local use, and general rules about fire fighting.
- FOODS: THEIR VALUE AND MANAGEMENT**—Henry C. Sherman—*Columbia Univ. Press*, 221 p., \$3.25. A companion book to *The Science of Nutrition* by the same author. Addressed to all who are interested in individual and family health and efficiency. Chapters are devoted to each of ten food groups, each group being considered from the standpoint of its nutritional value and its purchase value.
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- PETROLEUM PRODUCTION, The Optimum Rate of Production**—Vol. II—Park J. Jones—*Reinhold*, 293 p., diagr., \$4.50. A technical work on oil production.
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*Science News Letter, December 14, 1946*

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steel cushions for moving parts, place a heavy book on a table and try to push it with a long, thin ruler. Now put two round pencils of about the same size underneath the book and push at right angles to the parallel pencils.

When the book lay directly on the table, there was friction—resistance to motion of two surfaces in contact—at every point of contact. When the pencils were placed beneath the book, a rolling motion was substituted for a sliding motion and the book moved much more easily. Rollers and balls move more freely because only a tiny part of their surface touches the surface on which they move.

The wheel was the first important victory over friction. But wheels were poorly built at first and remained so even to comparatively modern times. The first wheel was probably a cross-section of a tree trunk. A hole in the center, perhaps burned through, held a crude type of axle.

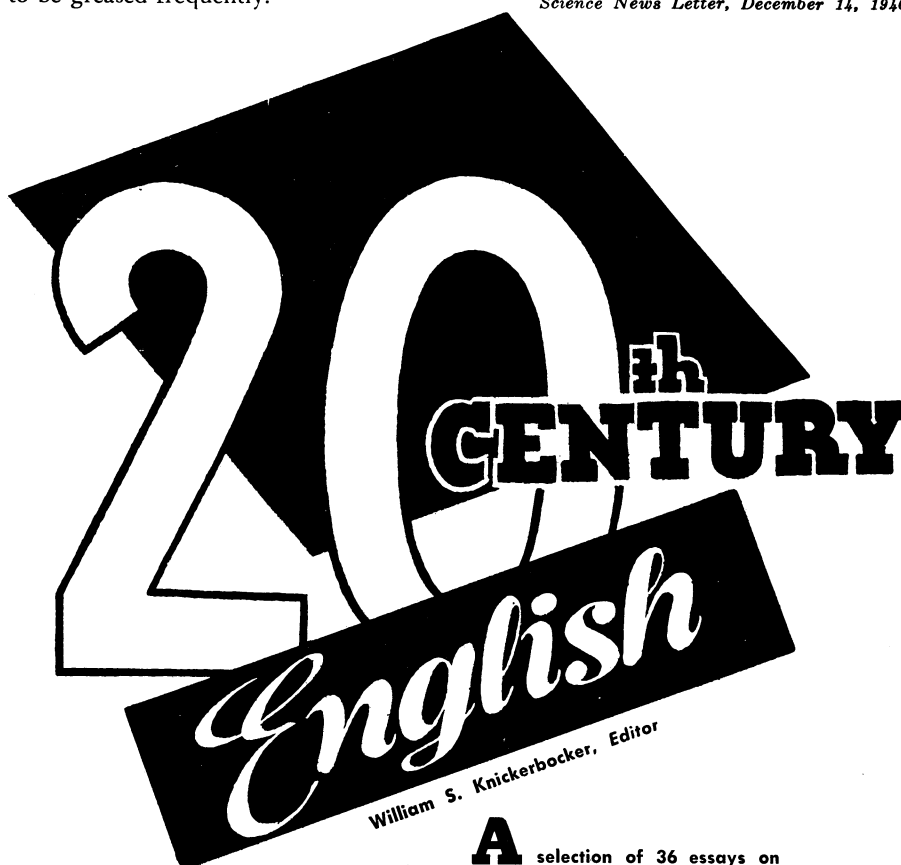
Simple wheels, however, could not turn fast or carry heavy loads, because each rested directly on the axles on which they turned. Sliding friction soon wore away both wheel and shaft. The

wheel wobbled, turned loosely, and finally fell off.

Man fought friction in early days by greasing axles and shafts with animal fat. Such lubrication helped somewhat, but heat built up by turning axles soon burned up the grease. The fat, settling toward the bottom of the shafts when at rest, was soon squeezed out. Hubs had to be greased frequently.

Until the beginning of the twentieth century most wheels worked on the sliding principle. Although the wheels turned, the axle and wheel still slid in relation to each other. Power began to be used efficiently only when wheels were rested on an assembly of balls and rollers—when the bearings between the wheel and the axle were themselves free to roll.

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