

to problems in statics. The next chapter takes up the principle of d'Alembert, which is made the sole basis of the development. The principles of Gauss and of Hamilton and the principle of least action, are given in the *Traité* but omitted here. Lagrange's equations, the distinction between holonome and non-holonome systems, small movements about a position of equilibrium, and the canonical equations are discussed. These are all illustrated with examples worked out in full and with practical directions as to the use of the theorems. It is also suggested that many of the problems could as well have been solved by methods previously given. The next chapter completes the treatment of an earlier one on impact. A method analogous to the principle of d'Alembert is used.

In Chapter XVI we find Green's theorem, stated in the usual way and also in the vector form: the integral of the flux of the field through a closed surface is equal to the integral of the divergence of the field over the points enclosed by the surface. This theorem is then applied to the theory of attraction and potential.

The last chapters are concerned with the equilibrium of fluids, and with hydrodynamics. Both Lagrange's and Euler's methods are developed, and there is a brief treatment of vortices.

Taken as a whole, it is difficult to see how the text could be better. The book has a finished character, and is so practical as a text that one lays it down well pleased with its form and contents.

JAMES BYRNIE SHAW.

*Systèmes cinématiques.* Par L. CRELIER. Paris, Gauthier-Villars, 1911, 99 pp.

THIS monograph is one of the recent numbers of the well-known French collection *Scientia*. The author confines himself to the solution of a number of problems in generating plane algebraic curves by link motions, so that the general title of kinematic systems for the ground covered, even when limited to the plane, seems not entirely justified.

We should expect an introductory chapter on the general principles of link motions and the transformations realized by them. The theorems of Kempe and Koenigs concerning the realization of all algebraic curves and surfaces by linkages should at least be mentioned. A treatment of general propositions like these would be of far greater importance

than the solution of any number of particular problems without correlation.

Among the list of references we miss the names of Burmester, Somoff, and in view of the subject matter treated, De Ross, who in the *Revue Universelle des Mines* published a series of articles on linkages, their different forms and uses. A translation of these articles appeared 1879 in Van Nostrand's Science Series. As in Crelier's kinematic systems, the tracing of curves is the main object of De Ross's investigations. While De Ross uses Peaucellier's inversor and its modifications as a generator, Crelier does not mention it at all.

The first three chapters deal with the curves which are produced by points and lines in connection with the motion of a right angle subject to certain conditions. In the next chapter conchoidal circular systems and curves are studied. The displacement of the extremities of a straight line of constant length along two rectangular lines, and on a straight line and a circle are the subjects of the concluding two chapters.

A number of new curves are obtained from the various motions. The treatment is throughout clear and simple and does not require more than the elements of plane analytic geometry and calculus. In some parts the typography is poor and a number of figures lack precision and neatness of execution.

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ARNOLD EMCH.

#### NOTES.

At the meeting of the London mathematical society held on January 11 the following papers were read: By W. H. Young, "Successions of integrals and Fourier series"; by G. H. Hardy and J. E. Littlewood, "A new condition for the truth of the converse of Abel's theorem"; by A. Cunningham, "On Mersenne's numbers."

At the meeting of the Edinburgh mathematical society on February 8 the following papers were read: By Professor Goldziher, "On graphical integration"; by Dr. Muirhead, "A mechanism for solving equations of the  $n$ th degree"; by G. Philip, "The geometry of the general pedal curve"; by W. Gentle, "An extension of the remainder theorem."