

governing the pressure and deformation of a confined material element, and on the movements of fluids in general, there are three sections dealing with phenomena in which the influence of friction is negligible or sensible, and covering the motion of waves and the flow of water in pipes and channels.

The second volume is occupied with the elucidation of problems which appeal more particularly to the practical engineer, who, apart from his interest in the purely scientific aspect of an investigation, demands for his use some definite, even if empirical, quantitative solution. To arrive at such results, postulates of a more or less contestable character have oftentimes to be assumed, and the processes cannot be as rigorous as a mere theorist would desire. The questions treated in this way include the flow of water through orifices and over weirs, and in pipes possessing abrupt changes of direction and sudden restrictions of area. The influence of friction on undular movement is also expounded, and a final chapter deals with water-hammer.

The work is based on mathematical processes of a very advanced nature, and from considerations of space the calculations, many of them intricate enough, have been set forth as succinctly as possible. For further information on particular points the reader is referred to various sections of M. Boussinesq's writings which deal specially with them. There is a serviceable bibliographical index at the end of each volume.

The author manifests his keen appreciation of the *travaux pénétrants* of M. Boussinesq, and concludes his preface by stating:—"Qu'il n'est pas de question d'hydrodynamique appliquée qui ne doive à ce Maître des progrès considérables." The tribute is just, and will be heartily endorsed by British men of science.

*The Chadwick Lectures, University of London, Session 1907-8.* By W. D. Scott-Moncrieff. Pp. 79. (London: St. Bride's Press, Ltd., 1909.) Price 2s. net.

THE Chadwick lectures in the University of London were established in 1907 for a period of five years, the endowment being derived from the funds of the trust created by the will of a great sanitarian, Sir Edwin Chadwick, K.C.B. The trustees have provided that two short courses of lectures shall be delivered each year, at the University, upon subjects relating to sanitary science, with special reference to recent advances in hygiene and municipal engineering. In the lectures under review, Mr. W. D. Scott-Moncrieff deals with the subject of sewerage and sewage disposal in four lectures. At the outset he deals with facts which are mainly historical, tracing the evolution of our present methods, and summarising the Acts of Parliament and the reports of Royal and other Commissions relating to sewage disposal. He then proceeds to a critical survey of the various provisions which have been made, from time to time and in different places, for purifying sewage.

The lectures will serve exceedingly well to indicate the lines upon which we are now advancing towards the solution of the sewage problem, and the lecturer is to be congratulated upon having made an interesting, instructive, and suggestive contribution to the subject of sewage disposal. He strongly emphasises the waste of manurial values involved in modern methods and the economy of ascertaining by direct experiment the conditions necessary to success, in every specific instance, before spending money in ignorance of what these conditions really are. As one of the pioneers among British workers upon the biological purification of sewage, he remains a strong advocate of that method.

NO. 2066, VOL. 80]

After reviewing the enormous amount of study and experiment which chemists, biologists, and engineers have for many years devoted to the subject of sewage purification, the reader will find food for contemplation in the circumstance that the trend of modern scientific opinion is in favour of the methods of "mother earth." Biological agencies, "the scavengers of nature," are now generally considered to afford at once the most economical and effectual means of sewage purification. The natural disposal of fæces upon earth had always proved satisfactory so long as the soil was suitable in nature and amount, but with the growth of our towns and the introduction of the water-carriage system a new set of circumstances had to be faced. Large volumes of water polluted with fæcal matter had to be dealt with, and the disposal of this, without causing a nuisance or contaminating drinking-water supplies, became the problem which is even now but partly solved. Mr. Scott-Moncrieff shares the very general view that it is by methods in which "nature's scavengers" are placed under the best conditions for their work that we are likely to obtain the best all-round results.

#### LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

#### The Temperature of the Upper Atmosphere.

SINCE my last letter on the above subject the columns of NATURE have contained some interesting data from Mr. E. Gold, and an account of the meeting at Monaco on April 1 of the International Commission for Scientific Aeronautics. The proceedings of the commission seem to have included the enunciation of a creed in which the members expressed their individual belief in the existence of an "isothermal layer" (*aliter* "stratosphere"). This promulgation was apparently intended mainly for the benefit of heretics in England. As is not unusual with creeds, an exact definition of the essential term *stratosphere* does not seem to have been supplied, and I am thus in doubt whether I am or am not one of the elect. The term "stratosphere" can hardly have been employed in its very strictest sense, which would seem to imply that at any given instant of time temperature is a function only of the distance above the ground. This obviously could not be true at altitudes where either a diurnal or an annual variation was sensible, and I doubt whether members of the commission are yet prepared to deny the existence of these variations at the heights with which they are concerned. In the recent German balloon ascents in Central Africa temperatures were recorded which differ somewhat notably from those met with at corresponding heights in Europe, while in the polar regions temperatures are sometimes recorded at ground-levels which are lower than those usually encountered in balloon ascents here.

The term *stratosphere* is thus presumably intended merely to indicate in a general way that at high levels the rate of change of temperature in any horizontal direction is normally very small. In this sense I too am rather disposed to be a stratospherist. What has been objected to by myself, and I believe I speak for others in this country, is the application of the term "isothermal layer" to the whole of the upper atmosphere—so far as yet explored by kites and balloons—which exists above the level where fall of temperature with increase of height ceases (*cf.* Mr. W. H. Dines, NATURE, February 27, 1908, p. 390). I see no objection to the application of the term to a layer of finite thickness, if such exists, throughout which rate of change of temperature with height is vanishingly small. If  $t$  and  $h$  denote temperature and height, then, according to most Continental balloon