surface, where solidly frozen, practically no erosion of rock surfaces takes place.

The wind carries away the dust of disintegration; loose stones are often smoothed and pitted by the sand blast, as in desert regions; and some of the harder surfaces receive a superficial glaze. Wind carries away the smaller rock fragments, and, on rare occasions, the sudden outbursts of short-lived glacial torrents spreads mud and sand over the surface of floating glacier ice.

Sulphate and chloride of sodium occur on the floating ice, partly as concentrates or exudates from freezing sea water, sometimes in mounds several feet across and as much as two feet thick.

In a general way the ice must be regarded as at present retreating, though the amount of retreat is moderate. The rocks in their petrologic aspect are thoroughly discussed by Dr. Prior.

The text of the volume is replete with excellent half-tone cuts from photographs, and to the plates are added two well-executed charts.

WM. H. DALL

Clean Water and How to Get It. By ALLEN HAZEN. New York, John Wiley & Sons.

Nothing could be more timely than a book dealing with the subject of water supply, for all over the country there is a remarkable awakening of interest in improvements along this line. High death rates from typhoid fever in American cities have too long been a reproach to our civilization and the inaction which has permitted them is rapidly giving way to a wholesome spirit of reform. No one is better fitted to meet the need for popular treatment of this subject than Mr. Allen Hazen, whose own engineering skill has contributed so largely to develop the newer methods of water purification. This book is, therefore, a doubly welcome one.

The popularization of the results of scientific investigation is a difficult task. On the one hand is a mass of fresh information which needs only popular education to make it effective in practise; on the other hand is a large and intelligent public waiting for the information which it would gladly apply. The intermediary is still too often lacking because the qualities of scientific grasp and popular exposition are so rarely joined. On one side lies the pitfall of patronizing oversimplicity into which certain well-known authorities have recently so notably fallen. On the other side is the danger of being too technical, lacking in the clear analysis and telling exposition necessary to appeal to the untrained mind; this, if anything, is Mr. Hazen's error. His book is designed, as he states, especially for public officials who have been drawn from walks of life in which they have had no water-works experience and who wish to serve their cities well and can perhaps be aided in doing so by very simple statements as to certain matters. He modestly disclaims any intention of helping members of water boards and water-works superintendents, whom he believes to be familiar with the information which he gives. If the reviewer is not mistaken, however, the book will prove of very great value to the latter class of readers and will reach only exceptional individuals among the former. In a new edition, which is sure to be called for soon, the path to the solid knowledge the book contains might be made easier by a more logical arrangement of its contents and by the addition of two elementary chapters, one outlining, at the beginning of the book, the general characteristics of a good water-supply, and one, in the middle of the book, on the general plan and principles of water filtration.

In the present work the author begins with a detailed description of certain surface supplies. Then follows, in the next succeeding chapters, an admirable review of various sources of water supply, in which the grasp of trans-Atlantic conditions made possible by the writer's wide experience is tellingly evident. He discusses the use of large lakes for water supply and shows why Milwaukee and Duluth are comparatively free from water-borne typhoid, while Chicago and Cleveland have suffered so heavily. River waters are next discussed, and the ground is wisely taken that a certain amount of bacterial pollution is a necessary characteristic of surface waters and that the responsibility for the re-

moval of bacteria rests on the town drawing water from streams rather than on the community which discharges a reasonable purified sewage into them. In chapter five he points out the difficulty of securing good ground water supplies in America and contrasts this condition with that which obtains in northern Europe, particularly in Germany. It is evident that the water supplies of the United States must be drawn mainly from rivers and in this connection the author might well have emphasized somewhat more distinctly than he has done the modern dictum of sanitary science that no surface supply can be considered entirely safe for drinking without preliminary treatment. Filtered river and lake supplies must in the end offer the well-nigh universal solution of the water problem.

The question of tastes and odors in water is particularly well treated. Their origin is discussed in chapter one, a clear distinction being made between the odors of putrefaction produced at the bottom of reservoirs and the odors caused by the growths of organisms at their surface. The merits of stripping and of the copper sulphate treatment are conservatively handled and in chapter nine the removal of tastes and odors by filtration and aeration is discussed.

The subject of water filtration in general suffers a little, as pointed out above, by the lack of preliminary general statements, but the account of recent progress is excellent and the discussion of the possibility of securing a higher percentage purification than is obtained by sand filters to-day is eminently suggestive. Here, as elsewhere, the engineer can furnish any results for which it is worth while to pay.

The last six chapters of the book must be particularly commended; here, Mr. Hazen succeeds admirably in making complicated problems stand out clearly in their main outlines. In chapter eleven the fundamental engineering principles underlying construction, with its necessary allowance for excessive demands, and in chapter twelve the problem of securing adequate pressure, are excellently treated.

Chapter thirteen contains a good statement of the importance of metering water with a table which shows in a striking way the excessive consumption, in the neighborhood of 200 gallons per capita per day, in the large cities which have no meters, a wanton waste of water which is cut down more than three quarters by the installation of a considerable proportion of metered services.

Chapters fourteen and fifteen deal with the financial aspects of the water-works problem. Mr. Hazen estimates that the amount of money spent on construction and maintenance of water-works is no less than thirty millions per year and that, of this, something like one quarter is wasted by careless and inexpert methods. The problem of securing pure and wholesome water supply is a difficult one and requires technical expert service of a high grade.

It might be shown how in some lines of work the development is so rapid that even the most recent text-books are hopelessly out of date; how the subjects are becoming so complex that only the principles and not the important details can be treated in them; how the most efficient works are designed by groups of men, each attending to the parts which he best understands, and all under the general direction of a chief who has a clear idea of the end to be reached and the way of reaching it, though he may know less of many of the details than his subordinates; how the only way to learn a business is to be brought up in it; and how it can not be learned by a casual inspection from the outside.

Mr. Hazen rightly pays a tribute to the faithful, devoted and inadequately remunerated work of water boards and water superintendents at the present day, but his presentation makes it increasingly clear that the water supply problem is one of the many municipal questions which must be treated as technical engineering problems demanding expert service, properly rewarded, and unfettered by any demands other than those of economy and efficiency. The attainment of these ends will be furthered appreciably by a book so excellent, in the main, as Mr. Hazen's.

C.-E. A. WINSLOW

Die Ausgleichungsrechnung nach der Methode der Kleinsten Quadrate. By F. R. HELMERT, Director of the Royal Prussian Geo-