chapters; the second of real algebraical quantity; and the third of complex numbers. The first two parts contain what is requisite for school use, the third is beyond the ordinary run of junior students. The whole has, we believe, stood the test of class work. In the second part the application of trigonometry to surveying is made interesting by treating the subject as practically as possible. There is a copy from a photograph of a theodolite, and a conversational description of the same, and in Part I., through the permission of the publishers, there is printed a portion of the map of the *Mer de Glace* given in the "Life of Prof. Forbes." These little points are likely to interest young students. Of course the hyperbolic functions are discussed, but they are discussed in a way that is novel to us in some of the details; for instance, geometrical proofs are given of $\cosh(u+v)$ and $\sinh(u+v)$. These strike us as being very elegant and quite within school range, as they need only a moderate acquaintance with the properties of the rectangular hyperbola. A short space is occupied with the Gudermannian function, and a table of approximate values of hyperbolic functions is given in the same section. The section on convergence and continuity of series, and, in fact, the whole discussion of series, is very carefully done.

Our summing up is that the book is one of the best we have met with on the subject, and quite fitted to hold its own against the two or three formidable rivals that have lately appeared in the field. There is a plethora of carefully chosen examples, which we advise the junior student to use with Prof. Chrystal's caution in mind: "I should much deprecate the idea that any one pupil is to work all the exercises (in the 'Algebra') at the first or at any reading. We do too much of that kind of work in this country." The text is further illustrated by many *graphs* of different functions, and answers, carefully tested from working with pupils, are appended at the end, with tables of the logarithms required for the exercises.

Les Fleurs à Paris: Culture et Commerce. Par Philippe L. de Vilmorin. (Paris: J. B. Baillière et Fils, 1892.)

THE trade in cut flowers is now quite an important department of commerce, and it is rather surprising that a good many attempts have not been made to give a full and connected account of it. In the present volume M. de Vilmorin deals with the subject chiefly in its relation to Paris, and he has brought together many facts which will be of interest both to lovers of flowers and to students of social economy. He describes the various ways in which the trade is organized in the French capital, the sources from which the flowers are derived, the manner in which they are cultivated, and the means by which they are distributed. He then presents an account of the various kinds of flowers used for decorative purposes, giving in simple language such botanical details as are likely to be intelligible and attractive even to non-scientific readers. The volume is abundantly and very prettily illustrated.

Health Springs of Germany and Austria. By F. O. Buckland, M.D. Second Edition. (London: W. H. Allen and Co., 1892.)

THIS little book ought to be of considerable service to invalids who may desire to obtain aid in the choice of a Continental health resort. The author does not profess to present elaborate details as to the various springs with which he deals; but he says enough about each to give a sufficiently clear idea of its merits and defects. He offers also some good general remarks on the nature and uses of health springs. In the present edition he has made little change, but he has increased the value of the book by adding an index.

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LETTERS TO THE EDITOR.

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Heat Engines and Saline Solutions.

I HAVE nothing to modify in what I have written under the above heading (p. 438); but to deal completely with all the questions raised by Mr. Macfarlane Gray (p. 436) would require half a treatise. I will limit myself to a few brief remarks.

(1) In Carnot's engine there is no (separate) boiler or condenser.

(2) When I spoke of the various parts of the working substance being in equilibrium with one another, I referred to complete equilibrium, thermal as well as mechanical. If the temperature varies from one part to another there is no equilibrium.

(3) On the above understanding the pressure of vapour in equilibrium with a saline solution of given strength is a definite function of the temperature.

(4) Let me suggest that the origin of the difficulty may lie in the phrase "superheated vapour," which has not so definite a meaning as Mr. Gray seems to ascribe to it. Whether vapour be superheated or no, depends, not only upon the condition of the vapour itself, but also upon the bodies with which it is in contact. Vapour which is merely saturated in contact with a saline solution must be regarded as superheated when contact with the solution is cut off. In the first situation it would condense upon compression, and in the second situation it would not.

In conclusion, I will hazard the prediction that, if the heat engines of the distant future are at all analogous to our present steam engines, either the water (as the substance first heated) will be replaced by a fluid of less inherent volatility, or else the volatility of the water will be restrained by the addition to it of some body held in solution.

RAYLEIGH.

On Earth Vibrations.

IT seems that the earth, once set in vibration, maintains this state for a long time before coming to rest. The observers of Greenwich (see Major H. S. Palmer in the Transactions of the Seismological Society of Japan, vol. iii., p. 148) found that from time to time, at considerable intervals, there was an evening when the usual observations for determining the collimation-error of the transit-circle by means of reflection in a tray of mercury could not be taken, on account of the constant trembling of the surface of the mercury, which on such occasions continued until long past midnight. These are occasions when crowds of the poorer classes of London flock for amusement to Greenwich Park. A favourite pastime with the young people, often prolonged until after nightfall, is to clamber to the top of the steep slopes of the hill on which the Observatory stands—in fact, to the paling of the enclosure—and then, joining hands in twos or threes, to bolt precipitately to the bottom, where, as may be imagined, they usually arrive "all in a heap." Hundreds join in this sport on fine evenings, and the result, as shown by the behaviour of the mercury, is to set the whole of Flamsteed Hill in a tremor, which does not subside until early next morning, many hours after the people have left.

Another very beautiful proof of this fact offered itself to me in the Geophysical Observatory of Rocca di Papa, Rome. A slight earthquake coming from Aquila (at 110 kilometres north-east of Rocca di Papa) was felt and registered by the instruments at 9.39 a.m. mean time of Rome, on the 8th of last February. Just at that time I was casually observing through a microscope a pendulum 6 cm. long, which suddenly began to display great agitation.

Now such a pendulum, when removed from its equilibrium position for an amplitude equal to the observed, comes to rest in about half-an-hour. In the present case the pendulum continued to oscillate till the afternoon. Nor did the character of the vibrations correspond to the gradually and regularly diminishing oscillation of a pendulum which has received a single shock.

The pendulum is firmly fixed to a big column, deeply founded