patent rights. It is not our province to enter into the details of this controversy; we need only say that Mr. Schulz claims that he has succeeded better than any other inventor in solving the difficult problem of designing a practical and not too complicated turbine in which the steam consumption per horse-power hour is economical, not only at full power, but also when the engine is working at low loads, and he also claims that he has simplified the arrangements necessary on board ship, where go-astern machines must be provided as well as the go-ahead turbines. The author gives a clear description of the mechanical details by which the inventor has secured the results he claims. This book should be carefully studied by all those interested in the history of the development of the steam turbine. T. H. B.

OUR BOOK SHELF.

Ueber chitinöse Fortbewegungs-Apparate einiger (insbesondere fussloser) Insektenlarven. By Dr. Wilhelm Leisewitz. Pp. iv+143; with 46 illustrations in the text. (Munich: C. Reinhardt, 1906.) Price 4 marks.

THE author commenced his observations with the terminal appendage in the larva of *Xiphydria dromedarius*. This larva, which is almost apterous, lives in galleries in rotten wood, and the appendage is used firstly as a prop and partly to compress the loose substance behind it to give it a firm support as it gradually progresses by gnawing away the wood in front. He then extended his researches to the hairs, bristles, &c., of other internal-feeding larvæ, especially those which are apterous or subapterous, and in this small volume we have the results of his careful investigations.

The chitinous appendages used for locomotion by such larvæ consist chiefly of (1) undifferentiated hairs, (2) spines, (3) warts, and (4) bristles. Where the larvæ live in hard substances, like wood or bark, the appendages consist of short, stiff hairs or spines and warts, but when the larvæ live in soft substances like rotten wood or mould, they are provided with long, slender hairs or bristles of varying form.

The greater portion of the essay is devoted to larvæ of Coleoptera, though a few others belonging to the orders Neuroptera, Lepidoptera, Diptera, and Hymenoptera are also noticed.

Apart from the physiological interest of the inquiry, it is also of some importance to the systematist; for the author claims to have discovered trustworthy characters in the chitinous appendages, which will allow many species of Coleoptera, hitherto supposed to be indeterminable in the larval state, to be easily recognised. W. F. KIRBY.

Map of the British Isles. Constructed by W. and A. K. Johnston. Size 72 inches × 63 inches. Mounted on cloth with rollers and varnished. (London: W. and A. K. Johnston, 1906.) Price 21s.

THE teaching of geography has received much attention in recent years, and the increased importance given to the subjects in schools has led to the production of several new series of excellent wall maps. The present map is a new addition to one of these series. It is boldly printed, and coloured in a manner to make it easily visible in all parts of a large classroom. The scale is 1:633,600, or ten miles to an inch. The populations of the different towns are indicated by means of symbols, but it is to be feared that these will be of little use to anybody but the teacher. The map will require to be supplemented by an orographical one if the physical geography of our country is to be studied satisfactorily.

LETTER TO THE EDITOR.

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The Production of Radium from Actinium.

THE experimental evidence on the growth of radium from uranium has in the past been somewhat conflicting. Both Mr. Soddy and Mr. Whetham have stated that they observed an increase with the time in the amount of radium in solutions of certain uranium salts which were under examination. The writer, however, was able to show that, starting with a solution of uranium nitrate carefully purified by repeated crystallisation, the amount of radium formed in an interval of eighteen months was less than one two-thousandth of the amount which was to be expected from the disintegration theory.

I think that this discrepancy is readily explained by the results of an experiment which I have just made on the growth of radium from actinium. A kilogram of carnotite ore containing about 20 per cent of uranium was decomposed with an excess of dilute hydrochloric acid, and the solution thus obtained was treated with hydrogen sulphide, the precipitated sulphides being subsequently removed by filtration. To the solution was then added a fraction of a gram of thorium nitrate, followed by a solution of several grams of oxalic acid. After standing for several days, the slight precipitate which formed was completely removed and converted into a soluble nitrate. The nitrate in dilute solution was again treated with an excess of oxalic acid, and this second precipitate was converted into a soluble chloride. I have found from a considerable number of experiments that practically all the actinium contained in a uranium mineral can be separated in this manner.

The solution of the chlorides containing the actinium was sealed up in a glass bulb, and about two months later, on April 25 last, the gases and emanation were boiled out and collected. After standing for some minutes the gas was introduced into an electroscope. The activity of the emanation corresponded to a content of $5{\cdot}7\times10^{-9}$ gram of radium in the actinium solution. The bulb was again sealed, and was allowed to remain undisturbed until to-day, when the radium emanation present was again removed and tested. The amount of radium emanation now found corresponds to $14{\cdot}2\times10^{-9}$ gram of radium, indicating that there has been formed in the solution during this interval of 193 days a quantity of radium equal to $8{\cdot}5\times10^{-9}$ gram. This is equivalent to the production of about $1{\cdot}6\times10^{-8}$ gram of radium in one year, and since the amount of radium in equilibrium with 200 grams of uranium is $7{\cdot}6\times10^{-5}$ gram, the value of $\lambda(\text{year})^{-1}$ for radium can be calculated, and is given as $2{\cdot}2\times10^{-4}$. The indicated half-value period would be about 3100 years. This number can only be regarded as approximate at present, since the original content of uranium in the material used, and the completeness of the separation of the actinium, are both uncertain. I think, however, that another step has been made towards the solution of the somewhat complex problem of the genesis of radium, and, since the amount of actinium in a mineral is apparently always proportional to the amounts of uranium and radium present, that actinium will prove to be the looked-for intermediate product. BERTRAM B. BOLTWOOD.

Sloane Laboratory of Yale College, New Haven, Conn., November 5.