which he brings out more clearly than any other writer with whose works we are familiar, and to those we desire to call attention.

In speaking of the London system, he pronounces it a failure. This system he calls Bazalgettism, from the distinguished engineer who has applied it to London. Its essential principle is to discharge either directly into an arm of the sea, or into a tidal river, at the time of ebb-tide. Sewage matters discharged into the river at Barking and Crossness are not pushed out to sea by the combined action of the ebbing tide and current, as was expected, but mingle with the water, and work their way back to points far above the outfalls, thus effecting that pollution which the intercepting sewers and the costly channels running parallel to the river were to have averted. Mr. Slater summarizes the matter as follows: "The Bazalgette process, as applied to London, is a total failure. It involves the utter waste of all the manurial matters in the sewage, it aids in silting up the bed of the Thames, it occasions a nuisance much complained of by the inhabitants of the country below the outfalls on both banks, its cost is exceedingly serious, and it does not even guarantee to the inhabitants of London an unpolluted river." It would be hard to conceive of a more vigorous and thorough condemnation than this which Mr. Slater applies to the sewerage system of London, and he is equally emphatic in reference to the proposed extension of the system to Thames Haven at an expense of $20,000,000.

The disposal of sewage by irrigation meets with no better treatment at his hands. He asks, "Does irrigation effect its object without occasioning annoyance or injury to the inhabitants of the district?" He has never failed to detect an unpleasant odor when passing near an irrigation-field in warm, still weather. At Gennevilliers, near Paris, the odor on calm, autumnal evenings may, without exaggeration, be described as abominable. Mr. Slater also believes that irrigation-fields may produce actual disease in their neighborhood, although he acknowledges that the evidence is somewhat conflicting. Irrigation does not remove germs, and it encourages flies, which act as carriers of these germs, it may be of cholera or typhoid-fever. On this danger from flies the author is very emphatic. He says that some of these insects that have become saturated with putrescent matter, or actual disease-germs, enter our houses and crawl over articles of food. Others settle upon our persons, and inflict malignant wounds. Fatal illness has not unfrequently been traced to the bite of flies which feed on sewage or carrion. These flies being now recognized as among the greatest agents for carrying putrid poisons and disease-germs to the healthy, it is important that all places where they can increase and multiply, and all matters upon which they may feed, should be made offensive to them or destroyed, as the case may admit.

These opinions are sustained by the experiments of Dr. Maddox, published in the *Journal of the Royal Microscopical Society*, by which it was demonstrated that the cholera bacillus can pass in a living state through the digestive organs of flies, and also by the experiment of Dr. Grassi, who showed that when segments of the tape-worm (*Taenia solium*) were placed in water, some of the eggs remained suspended therein, and that in the intestines and excrement of flies that drank of the fluid the eggs were subsequently found. Observations made by other experimenters are also confirmatory of the fact that insects act as carriers of germs and ova of parasites. Mr. Slater believes, too, that sewage-grass is very inferior to normal herbage, and quotes experiments made by Mr. Smee, and published by him in a work entitled 'Milk in Health and Disease,' by which it was proven that milk from cows fed on irrigation-grass became sour and underwent putrefaction much sooner than that from cows fed on grass from an ordinary meadow.

In concluding the discussion of irrigation, the author says that irrigation, though an excellent method of disposing of, and at the same time utilizing sewage, when suitable land is available, where the climate is warm, and the rainfall scanty or intermittent, is not applicable where these conditions are absent. Any attempt to represent it as the only means of dealing with the sewage difficulty, and to force it upon reluctant communities, is a grave error; in fact, a crime, the motives for which are in most cases hard to trace. The methods of sewage-disposal by filtration, precipitation, destruction, distillation, and freezing, are described, and their advantages and disadvantages pointed out.

The author, in concluding his treatise, devotes more than sixty pages to giving an abstract of the specifications of the 454 patents for the chemical treatment of sewage, occasionally adding a note pointing out what he considers to be their defects.

Letters of David Ricardo to Thomas Robert Malthus. Ed. by JAMES BONAR. Oxford, Clarendon Pr. 8°. $2.75.

THE letters in this collection were written between 1810 and 1823, the last of the series being dated only a few days before the writer's death. They are only in a minor degree personal, being mainly devoted to discussing the many questions in political economy on which Ricardo and Malthus disagreed. Unfortunately, the letters that Malthus wrote to Ricardo have never been found; so that we have only one side of the discussion, which is a drawback both to the interest and to the instructiveness of the correspondence. It is true that Ricardo often states his opponent's arguments; but such statements cannot supply the place of Malthus' own words. However, the letters will be very interesting to students of economics, illustrating as they do the views of two of the principal founders of the science. The men were personal friends, and were often in each other's company; but on economic themes they differed widely. They agreed in the main on the subjects of rent and population; but they disagreed on many matters of detail and on some of prime importance. Thus, they differed widely as to the definition of value, and as to the influence of supply and demand on the one hand, and of cost of production on the other, in determining value. They also differed as to the real nature of political economy; Malthus holding that it is an inquiry into the nature and causes of wealth, while Ricardo would confine it to the subject of distribution only (p. 175).

The two leading faults in Ricardo's published works appear with equal plainness in these letters. The first of these is his habit of fixing on one or two economic laws or forces, and tracing out their results without regard to the minor influences which often modify their action. He seems to have been aware himself of this tendency in his thinking; for he remarks in one of his letters that one of the chief causes of the differences between himself and Malthus was that he looked only to the larger and more permanent causes, while his opponent was always thinking of the minor ones. On this point, as on some others, it would have been well if the two friends had been content to learn from each other. The other defect in Ricardo's theories to which we have alluded is his constant assumption that wages are always at the starvation point, so that the slightest increase in the cost of living will necessitate a rise of wages in order that the supply of labor may be kept up. Thus, he argues that a tax on breadstuffs would lead to a rise in wages, and consequent fall in profits; whereas it might only result in reducing the standard of living among the laborers, so that the whole burden would fall upon them.

The friendship between the two correspondents, notwithstanding their difference of opinion, was of the warmest character, as is proved by many passages in these letters, and also by a remark made by Malthus after Ricardo's death, and quoted at the end of this volume. He said, "I never loved anybody out of my own family so much. Our interchange of opinions was so unreserved, and the object after which we were both inquiring was so entirely the truth and nothing else, that I cannot but think we sooner or later must have agreed." We should add, that the book is well edited, and that it contains much information, both in the text and in the notes, about Ricardo and Malthus themselves, and also about other political economists who lived in their time, so that it has a biographical as well as a scientific interest.

Lectures on Electricity. By GEORGE FORBES. London and New York, Longmans, Green, & Co. 12°. $1.50.

A NUMBER of popular works on electricity have been published in the last few years. Some are clearly written, some are interesting, very few are calculated to give correct ideas of the broad principles of the science of electricity.

There are six lectures in Professor Forbes's book, "intended for an intelligent audience, ignorant of electrical science, but anxious to obtain sufficient knowledge of the subject to be able to follow the progress now being made in the science." For its purpose the book is admirable. The simpler phenomena — if we may consider any

phenomenon as simple — are clearly explained, and illustrated by experiments, sometimes new, always well arranged.

Lectures of this kind should have two objects, — to describe the phenomena, and state and explain the laws governing the science as fully as possible; and to give the audience an interest in the subject, and a curiosity that will lead to a further study of it. They should give an impulse toward thought, with some material for thinking on. So viewed, Professor Forbes has succeeded.

The first five lectures — on potential, electric currents, magnetism, electro-magnetism, and electro-magnetic induction — are extremely satisfactory: the last, on dynamo-electric machinery, would have been better omitted. It does not logically continue what has come before, nor is it, even considered apart from the other lectures, in any way as satisfactory as they are.

Taken as a whole, however, the lectures are to be commended for the clearness of exposition, accuracy of statement, and the very interesting way in which they are written.

NOTES AND NEWS.

A CYPRUS Exploration Fund has been formed in London, the object of which will be to carry on archæological researches similar to those of the Palestine Exploration Fund. The committee of this fund have applied to the high commissioner of Cyprus for permission to excavate in the island. This application was supported by a special resolution addressed to the secretary of state for the Colonies by the trustees of the British Museum. Permission has now been obtained in respect of one site, the village of Kouklia, which stands on the site of the ancient Paphos; and operations have begun there, on a large scale, which promise to yield results of exceptional interest, the special object in view being the great temple of Venus. The work is being carried out by students of the British School at Athens, under the supervision of the director, Mr. Ernest Gardner, whose services, and a contribution of £150, were placed at the disposal of the Cyprus Exploration Fund by the managing committee of the school. The same sum has been contributed respectively by the University of Cambridge (from the Worts Travelling Fund), the University of Oxford, and the Society for the Promotion of Hellenic Studies. Individual subscriptions amounting to upwards of £600 have been received.

— George S. Mackenzie, secretary of the Emin Pacha Relief Committee, publishes the following news, which was sent by mail from Zanzibar: "It is reported in the *Bazaar* here that Tippo-Tip, after some delay, has sent a number of his men to Mr. Stanley's camp on the Aruvimi." This news, which is published with some reserve, is very gratifying, as it shows the desire of Tippo-Tip to carry out the engagements he entered into with Stanley. The arrival of Tippo's party would enable Major Barttelot to despatch without delay the ammunition and reserve stores from the camp of Yambuga, at the mouth of the Aruvimi, to Wadelai. Although Stanley's progress was evidently not as rapid as was assumed in the plan, it is not necessary to entertain serious apprehensions as to the safety of his expedition. When it was stated that news of Stanley would probably reach us early in March, it was assumed that the steamers of the Kongo Association would visit the stations at Aruvimi and Stanley Falls. The steamer 'Stanley' was to be despatched to these places under the command of Captain van der Velde. Unfortunately this able officer died at Leopoldville a few weeks ago, his death being announced in the latest issue of the *Mouvement Géographique*. He explored the lower Obangi and its tributaries, the Itimbiri, and made an unsuccessful attempt to reach the Welle, starting near the most northern point of the great bend of the Kongo. His death has delayed the expedition to Stanley Falls, and for this reason it is assumed that the first news of Stanley will reach us *via* Zanzibar. As, however, communication between the Mvutan Nsige and the coast is very irregular, it is hard to tell when definite and reliable news will reach us.

— On Feb. 17 the first memorial erected to a public man in the Brighton Museum was unveiled there in the shape of a marble medallion portrait of the late distinguished scientist, Dr. Thomas Davidson, the first chairman of the museum committee, and whose lifelong study of brachiopoda won for him a foremost name in the ranks of paleontologists.

LETTERS TO THE EDITOR.

The Snow-Snake and the r-Sound.

THE evidence on the Southern use of the snow-snake is certainly not what was expected, and, with my experience of Indian traditions, is not satisfactory. Passing by this, I will mention two things noticed while on the reservation to-day. Many Seneca snow-snakes are now made there, and these differ from the Onondaga in being flat on the opposite surfaces, with the edges slightly rounded. A good crust being lacking, an enterprising Indian had made a gutter in the snow by the roadside, about fifty rods long, and was getting a little money by its use from a number of boys.

I looked up the name carefully. It had been written for me, as before stated, and I had somewhat hastily asked several its name when last there, without noticing any discrepancy. Now, it appeared that Mr. Hewitt was partially right; but every man, woman, and child gave it as *ka-when-tah*, or *ka-wen-tah*, changing the supposed *r* into *n* uniformly, and sometimes hardening the *k* into *g*. As I paid special attention to the second syllable, my own orthography stands corrected in this case, and that of Mr. Hewitt also. I also corrected one other word in which I made a similar error in some casual work.

In testing the version of the Lord's Prayer given me, a second time, the question is not so clear. I am not in the least troubled with *otosis*, and had used reasonable care, but without regard to the objection now made. The first three instances in which I then retained the letter may be called doubtful. I went over them again with my old friend Albert Cusick, and although the letter seemed there as the words were read, — and perhaps ordinary speech is the true test, — yet the sound almost disappeared when each syllable was taken by itself. In the fourth, where a clause was paraphrased rather than translated, there is less room for uncertainty. The sound is fuller, and is not readily dispensed with. But for its rarity elsewhere, I certainly should retain it there.

The last test I used was with the numerals given by Schoolcraft in his Onondaga vocabulary. He credits some words in it to the Mohawk. I do not remember that he does these, but they are not of the Onondaga language. In the first ten Onondaga numerals, *r* does not occur.

It is evident, of course, that Zeisberger incorporated many Mohawk words in his Onondaga lexicon, and his early study of that tongue perhaps sufficiently accounts for this; but how he could have spent the time he did at Onondaga, for the sole purpose of studying the language, and yet used this letter so much, and even in proper names, without its partial use by the central nation, is not easily understood.

One of the eminent authorities cited for the early disuse of the letter seems merely to quote from another, but some historical facts may have been overlooked. The Jesuit missions at Onondaga were abandoned late in the seventeenth century, though the missionaries sometimes came there very early in the eighteenth. In preparing a list of historic Onondagas, I took notice of a half-century of this *post-Jesuit* period. From 1725 to 1775, I found the names of fifty-seven Onondagas, and twenty-three of these contained the letter *r*. *Teyawarunte*, an Onondaga sachem, was speaker in 1775, as he had been long before. The year previous, the Onondaga sachems had a private audience with the new Indian agent, Col. Guy Johnson, and some of their distinguished men were presented to him. In the names of four out of the eight mentioned, is found the nominally obsolete letter. Here I leave the question.

W. M. BEAUCHAMP.

Baldwinsville, N.Y., March 8.

Needed — An Improved Means of attaching Microscopical Objectives.

THE recent interesting discussion in *Science* regarding the defects of existing microscopes ought to lead to practical results. While the subject is under consideration, every detail ought to be passed under review, or rather studied *de novo*, accepting no legacies of the past, no matter how useful they may have been in their day, provided we can find better devices. One very important thing to be considered is the means whereby objectives are to be attached to the tube of the microscope. Obviously, what we need for this purpose is a device so simple it can be easily manufactured and