enlightenment and of high ambition. The tone, withal, of a good part of his report, is excellent. To follow in the footsteps of Pasteur and Koch in the study of contagious diseases, to popularize the results of these investigators, and to surpass their results when possible, are certainly aims worthy the aspiration of any man. But the sympathizing reader cannot avoid the thought, that, while anticipation must necessarily come before fulfilment, past history most distinctly teaches that high hopes of future deeds and glory are wholly out of place in the offices and laboratories of the American agricultural department. The methods of Pasteur not only require intelligence, experience, scrupulosity, and the peculiar knack or good judgment which constitutes the so-called gift for experimentation, but the experimenter must needs have composure of mind, and a sense of continuity; i.e., a reasonable certainty of furtherance and support from year to year, such as a connection with the department of agriculture is little calculated to give. One of the chief objects of Dr. Salmon is said to be to discover the best means of introducing and diffusing the European methods of inoculation for rendering fowl, cattle, sheep, and hogs, insusceptible to various contagious diseases. To an ordinary citizen it would have seemed manifest that the veterinary profession throughout the country must be a fitting vehicle, both for the conveyance of the necessary viruses, and the application of them. It would seem, too, as if the members of the veterinary profession, if anybody, would be keenly alive to the duty of procuring the needful 'attenuated virus,' even if the object had to be studied in European laboratories. Where such enormous money interests are at issue, and open, for that matter, for the remuneration of competent practitioners, it seems well-nigh incredible that the profession should idly await the action of a government official before advancing upon the common enemy with all the appliances of modern warfare. It is plain enough that the protection of domestic animals from contagious diseases is a subject which must necessarily become very prominent in this country in the near future; and time alone can tell how the doings of the unattached veterinary doctors will compare with those of their brethren in government employ. But assuredly there must be some misconception lurking in the minds of the department officials, if they really suppose that the veterinary profession is necessarily incompetent to deal with a problem because, forsooth, the known methods of solving it happen to be delicate and expensive. We would have argued, rather, that it would be distinctly discreditable to the profession in this country, unless it should be found foremost in applying known remedies of approved efficacy.

THE PANTHER-CREEK COAL-BASIN.

Second geological survey of Pennsylvania, A. A. First report of progress in the anthracite coal region. The geology of the Panther-Creek basin, or eastern end of the southern field. By CHARLES A. ASHBURNER. Harrisburg, *Survey*, 1883. 47+ 407 p., 7 pl. 8°.

THERE is evidently some divergence of opinion as to what is the proper scope of, and what the best method of conducting, a geological survey. All, undoubtedly, would admit, to the public at least, that its primary object is the development of the mineral resources of the region under survey. As to whether, for the accomplishment of this purpose, it is better to devote the main part of the work to those general questions which form the basis of all geological investigation, making the practical application of geology to economic ends a secondary matter, or whether, on the other hand, it is better to lay more stress upon the practical solution of the problems of most pressing economic importance, and let the facts which bear upon the general questions slowly accumulate, to be treated systematically later on, there is, however, less unanimity.

The second geological survey of Pennsylvania has apparently followed the latter system; and Mr. Ashburner's work in the anthracite regions is among the best specimens of this kind of work. In his prefatory letter he says, —

"My principal object has been to make the results of the survey practically useful to those directly interested in the exploration and exploitation of the anthracite fields; and therefore the work in the field has been prosecuted under the constant review of those connected with or engaged in the mining of coal.

"The policy of pushing the purely geological and mining work of the survey at the outset, in order that practical men might see some results, and be able to judge their utility, not only to themselves, but to all having interest in the anthracite region, has proved a wise one. The publication (in advance of the report) of 13 atlas sheets, accompanying this report, has already secured to the survey the support of every one in the region, from the miner engaged in cutting coal in the mines, to the presidents of coal transportation companies, all of whom were unanimous in urging the appropriation which was made by the legislature of 1883."

The maps themselves have already been referred to in this journal (vol. i, p. 309). The

present report is practically a series of explanatory sheets accompanying the maps, it being intended, after the survey of the entire region is completed, to publish two volumes summarizing the results, — one on descriptive, the other on systematic geology.

Besides the explanations of atlas sheets and sections, which will find ample criticism and verification at the hands of the multitude who will practically use them in the field, the volume contains some practical investigations into the character and composition of the different coals; the amount of coal already mined, and that which probably remains in the basin, not yet taken out; together with an elaborate description of the methods employed in preparing the various maps, and in obtaining these results.

In no scientific work is the personal equation of the observer so large as in geological investigation; and it would be well if all our geological workers felt as Mr. Ashburner does when he says, "In the case of a public survey, I believe that all the facts which are used in any investigation should be clearly stated, so that, from a personal examination of the subject by an expert, the results can be accepted with confidence, or can be rejected with reason."

In estimating the amount of commercial coal under a given area, Mr. Ashburner first develops each bed upon a horizontal plane, to obtain the actual area of the bed, and then calculates the average thickness of coal, not only from measured sections, but from practical results of shipment from different mines; he also wisely distinguishes the regular from the overturned dips, as the amount of marketable coal obtained from beds in the latter position is very much less than the average.

In comparing the thus calculated amount of coal originally contained in the Panther-Creek basin with the amount that has been taken out since the commencement of mining, in 1820, he finds that only twenty-seven per cent has been sent to market as fuel; while thirty-two went to the dirt-banks as refuse, and forty-one per cent was left in the mines for roof-supports, etc. A practical loss of seventy-three per cent of all the coal in a given bed seems much too large, and suggests wasteful methods of mining and preparing. That these have already been somewhat improved, is shown by the same figures for the years 1881 and 1882, when the percentages are respectively forty-six, twenty-four, and thirty, or a loss of only fifty-four per cent.

The fact that the analysis of bony coal taken from the dump of one of the collieries (p. 181) gives a higher percentage of fixed carbon, and less ash, than the analyses of coal sent to market from the same colliery, would seem to suggest one way in which present processes might still be improved.

Mr. Ashburner recognizes the insufficiency of present methods of the analysis of coal as a means of determining its relative value as a fuel, and it is to be hoped that his future investigations will result in some practical improvement in them. In a paper in this journal (No. 58), he has already pointed out to its readers that the previously received estimate of the percentage of fixed carbon in anthracite is too high.

At the close of the chapter containing the many vertical sections obtained of the coal series, showing the respective coal-beds in each, Mr. Ashburner remarks, that no attempt has been made to systematize them, and that he believes that it would be impossible to do so. He then proceeds to point out some of the many inconsistencies in the existing nomenclature of coal-beds, but fails to note the reason for these inconsistencies. They arise from the assumption that a given coal-bed is continuous over the entire area of a basin; whereas the fact is, that, while a certain series of rocks may be regarded as coal-bearing throughout the basin, individual coal-beds are of only limited continuous extent; the coal having been formed in small, interrupted areas, not in one broad, contemporaneous sheet over the whole area.

The appendix contains a paper by Mr. Arthur Winslow, on the use of stadia measurements in surveying. This very simple, and by no means new, substitute for chaining, is, Mr. Ashburner remarks, not generally used by surveyors in the region; but we doubt, from what we know of the average surveyor, if Mr. Winslow's use of the calculus in its discussion will add as much to its favor in their eyes as the few practical tests which follow.

MINOR BOOK NOTICES.

Logarithmisch-trigonometrische tafeln mit fünf decimalstellen. Bearbeitet von Prof. Dr. TH. ALBRECHT, Sectionschef im königlischen preussischen geodätischen institut. Stereotypausgabe. Berlin, 1884. 16+172 p. 8°.

IN *Science*, vol. ii. p. 174, the six-place tables of Dr. Albrecht were spoken of with the praise which they deserve. They will be found superior to any other six-place tables. It is harder to make an improvement in five-place tables, since we already have many excellent tables of this kind. But Dr. Albrecht