with the lapse of time. Fortunately, however, this volume also possesses features of more permanent value than mere statistics, to the students of American mining and geology. This is especially true of the extended section on the iron ores, which certainly is a boon to every student and teacher of economic geology. The treatment, both statistically and geologically, is well-nigh exhaustive. The geologist will find here a profusion of maps, sections, and diagrams, showing in all desirable detail the geographical and geological distribution of all the principal varieties of iron ore mined in this country; with an account of the extent, structural characteristics, and chemical composition of every important deposit, and, in most cases, of every important mine. The geological material, where not original, is collected from widely scattered and comparatively inaccessible sources; so that, even if regarded merely as a compilation, this treatise on the sources of our most valuable metal ranks, as a contribution to the popular knowledge, with the most important monographs of the national survey. Of the statistics of the production of iron ore in the census-year, it is sufficient to say, that, like the statistics of the tenth census generally, they are very full, and are presented in every interesting and instructive aspect.

The section on the iron ores is followed by that on the coals: and this part of the report is, for the eastern United States, very summary, and chiefly statistical; the statistics being illustrated, however, by a series of maps showing the general distribution of the coal-measures, and the production by counties. In his meagre description of the coal-fields of the eastern United States, Professor Pumpelly has evidently been influenced by the fact that very satisfactory accounts of most of them are now accessible to the public in various general works and state reports, and especially in the report of the second geological survey of Pennsylvania.

But any deficiency here is fully compensated in the very full report on the cretaceous coals and lignites of the north-west, especially on the line of the Northern Pacific railroad, in Montana and Washington Territory.

In short, Professor Pumpelly has made this volume a medium for the publication of some of the results of the northern transcontinental survey, carried on for two years (1881–83) under his charge. It is a substantial and timely contribution to our knowledge of the geology and resources of the most imperfectly known section of the country. The report is profusely illustrated by beautifully drawn maps and sections.

The remainder of the volume is devoted mainly to the usual statistics of the production of the base metals, — copper, lead, zinc, — and of the minor economic minerals, such as mica, asbestus, asphaltum, barytes, chromic iron, emery, graphite, kaolin, etc.; but it concludes with an extended and well-arranged directory of the mines and metallurgical establishments east of the 100th meridian, and of the mines of bituminous coal and lignite in the eastern states and territories.

Mineral resources of the United States, 1885. By DAVID T. DAY. Washington, Government. 8°.

This is the third of the series of annual octavo volumes on the development and production of the mines of the country, published by the U. S. geological survey; and since it represents the condition of the mining industries at the middle of the decade, it supplements in an important way the census volumes already referred to, bringing the statistical portions of these, especially, nearly up to date. These annual volumes cover the entire range of economic geology, including building-materials and fertilizers, and, besides the statistics of production, are replete with descriptions of new developments, and notes on the condition of allied industries, and on processes for utilizing materials which have no value at present.

SOME AGRICULTURAL REPORTS.

Report of the viticultural work during the seasons 1885 *and* 1886. (Univ. Cal. coll. agric. rept., 1886, Appendix No. 6.) By EUGENE W. HILGARD. Sacramento, State. 8°.

THIS report records the continuation and extension of Professor Hilgard's well-known viticultural work of former years, which has done so much towards developing the wine industry of California, and placing it upon a rational basis. The general scope and purpose of this work, as defined by Professor Hilgard, is to aid in "the establishment of more definite qualities and brands, resulting from a definite knowledge of the qualities of each of the prominent grape varieties, and of their influence upon the kind and quality of the wine in blending."

With this end in view, work has been done chiefly in three directions, — first, as a means of rectifying nomenclature and aiding in identifying varieties, a standard vine collection is being formed; second, a considerable number of samples of grapes have been made into wine on a small scale at the viticultural laboratory, and the course of the fermentations and aging of the wine and the quality of the product have been followed; third, representative samples of wine from different localities, and different varieties of grapes, have been analyzed. Some comparative experiments upon different methods of fermentation

have also been made, and a considerable amount of work upon vine-diseases is reported.

Annual report of the Connecticut agricultural experiment-station, for 1886. New Haven, State. 8°.

Like most of the experiment-stations of the eastern states, the Connecticut station is largely occupied with the analysis of commercial fertilizers; about one-half of the space in the report for 1886 being occupied with the results of this work, while a considerable portion of the remainder is taken up with the analyses of feeding-stuffs sent to the station for examination, and other matter connected therewith.

Numerous analyses of milk and of butter and butter substitutes have been made, the latter for the state dairy commissioner, and also a few ash analyses of feeding-stuffs.

The most noteworthy portions of the report are the papers upon 'The agricultural value of horn-dust and of hoof and horn,' and upon 'Methods of mechanical soil analysis.'

In the former the method of pot experiments with fertilizers, worked out with great care and labor by Wagner, was applied, for the first time in this country, so far as the writer is aware, to the solution of an important practical question. It is to be hoped that further experiments of this sort by this and other stations may supplement their work on the analysis and commercial valuation of fertilizers.

The paper upon 'Methods of mechanical soil analysis' gives the results of tests of a new method, styled 'beaker elutriation,' by which a soil may readily be separated into sediments of any desired fineness in a very simple and expeditious manner, and without the use of expensive apparatus. Should the method prove, upon further trial, to be as accurate as these trials indicate, it will be a very substantial addition to our means of studying the physical properties of soils and their relations to fertility.

Mention should perhaps be also made of the notes upon analytical methods, which contain much of interest to the chemist. The report, as in previous years, shows that the work undertaken has been most thoroughly and conscientiously done. One can but regret that so great a proportion of the time and energy of the station's officers is taken up by routine work, and so little is available for really scientific investigation.

Fifth annual report of the board of control of the New York agricultural experiment-station, for the year 1886. Elmira, Advertiser assoc. pr. 8°.

As in previous years, the report of the New York experiment-station is largely devoted to the elaboration of the directors' idea of an agricultural botany; wheat, cabbage, and lettuce being the plants chiefly studied during the year, — the first by the first assistant, and the other two by the horticulturist. The attempt is made to classify the large number of varieties given and described into 'agricultural species' with distinct and reasonably permanent characters. It would appear that the success of the gentlemen interested with these tasks has not always been commensurate with their desires; but this was to be expected in such a comparatively new field, and any very vigorous criticism of the results would be premature.

In connection with these studies, a large number of collateral points have received more or less attention, many of them important in themselves, but so superficially treated as to render the results of the trials of little or no value. It seems to be very difficult for those in charge of these experiments to restrain themselves from following up for a little distance any collateral inquiry which suggests itself, and hence their work suffers from a certain lack of concentration.

In this latter respect the reports of the botanist, chemist, and assistant chemist contrast favorably with those just spoken of; in part, doubtless, on account of the nature of the work undertaken. The paper on 'Viscometry,' by the chemist, deserves more than a passing notice. By means of a simple and inexpensive apparatus he is able to determine with great accuracy the relative viscosity of liquids, and to show that it varies greatly as between different liquids, and may be made a very delicate means for detecting adulterations in certain cases. The method has thus far been applied chiefly to dairy products, and with very satisfactory results, although the investigations are not yet completed.

The New York report, as a whole, contains the records of a vast amount of labor; but in many cases it is only a record, and nothing more. While this is necessarily the case with large portions of the work, there are other portions whose value is practically lost for lack of a careful discussion of the results, and the value of the whole to the ordinary reader would be greatly enhanced by a more free employment of the resources of typography to indicate the divisions and subdivisions of the subjects considered.

CHALLENGER REPORTS.

THE present volume is devoted to the Crustacea (Isopoda, part ii., and Brachyura) and Polyzoa (part ii.).

In his first report on the isopods, Mr. Beddard dealt exclusively with the Serolidae; and the

Report of the scientific results of the exploring voyage of the Challenger. Zoölogy, vol. xvii. London, Government. 4°.