THE TENTH VOLUME OF THE CENSUS REPORT.

THE quarto volumes comprising the final report of the tenth census are not only more numerous and larger, and contain more detailed and perfect statistical exhibits of the population and products of the United States, than those of the ninth census, but they are also less purely statistical; the statistics being, in most cases, accompanied by elaborate discussions, which add much to the interest and usefulness of the figures. This statement is applicable to the whole of the tenth volume, but especially to the report on petroleum, by Professor Peckham. The statistics of the production, manufacture, and uses of petroleum, although set forth with all the fulness and detail desirable, are by no means the most prominent feature of this monograph of three hundred solid pages. The literature of petroleum, prior to 1860, was very scanty; but it has kept pace with the phenomenally rapid growth of this industry, being at the present time very voluminous and very fragmentary. Hence it was considered advisable to make this report an authority upon the subject by embodying the results of a careful examination of the entire literature of petroleum, supplemented by the results of the author's own researches before and during the census year. Fortunately, the work was placed in charge of a man well equipped by previous study and investigation; and the outcome is a monograph which the future student of petroleum will not ignore. And a feature not to be overlooked in this connection is the bibliography of petroleum, including more than eight hundred titles chronologically arranged, the earliest dating back to 450 B.C.

Although this work is, in its plan, a comprehensive treatise on the native bitumens of the globe, yet the author has not forgotten that it is in reality a part of the census report; and for this reason, and because of their preponderating importance, it is devoted mainly to the liquid bitumens of the eastern United States. It is conveniently divided into three parts, — the natural history, technology, and uses of petroleum. Part i. is the most important in point of size and general interest, including every thing relating to the mode of occurrence, distribution, origin, and production of petroleum. The geographical distribution of bitumens is illustrated by a series of maps, which show, among other important facts, that east of the Mississippi River the localities affording petroleum — in Canada, Michigan, Indiana, Kentucky, Tennessee, West Virginia, Pennsylvania, and New York — describe an ellipse upon the border of the Cincinnati anticlinal. This correlation of the distribution with the geological structure of the region introduces the very important chapter on the mode of occurrence of bitumens. It is shown here that the statement that bitumens are found in all formations, from the Cambrian to the tertiary, is misleading; since the really productive deposits occur chiefly at two horizons, — the tertiary in Europe, Asia, West Indies, South America, and California; and the Silurian and Devonian in eastern North America. For obvious reasons, the interest centres in the precise geological position of the petroleum in the last-named region; and Professor Peckham, after quoting the views of Hunt, Carll, and Andrews, concludes with the statement that each of these gentlemen is right in his own district; that the petroleum of Canada and West Virginia certainly does, and that of Pennsylvania does not, occur along anticlinal axes.

The scientific student of petroleum will turn eagerly to the chapter on the origin of bitumens, to find each theory explained by copious quotations, and the author's own conclusion, that while the asphalts and oils of California are of animal origin, and indigenous in the strata from which they are obtained, the petroleum of Pennsylvania and West Virginia is clearly of vegetable origin, and a distillate from formations below those in which it is found.

The practical side of the subject next claims attention in the sections on the development of oil territory; the drilling, pumping, blasting, flooding, and general management of wells; and the transportation and commerce of the crude petroleum, with the accompanying statistics. The unpoetical aspect of this industry is very vividly portrayed in the frontispiece and in the following paragraph: —

"The development of the oil territory proceeds without regard to any other interest. The derrick comes like an army of occupation. In the towns a dooryard or a garden alike surrenders its claims. The farms, fields, orchards, or gardens alike are lost to agriculture, and given to oil; and on the forest-covered hills the most beautiful and valuable timber is ruthlessly cut, and left to rot in huge heaps, wherever a road or a derrick demands room. Pipe-lines are run over the hills and through the valleys, through dooryards, along streets, across streets and railroads; and here and there the vast storage-tanks stand, a perpetual menace to every thing near them that will burn. Nothing that I ever beheld reminded

Production, technology, and uses of petroleum and its products, by S. F. PECKHAM. *The manufacture of coke*, by JOSEPH D. WEEKS. *Building-stones of the United States, and statistics of the quarry industry for 1880.* Census report, vol. x. Washington, *Government*, 1884. 26+806 p., 119 pl. 4°.

me so forcibly of the dire destruction of war as the scenes I beheld in and around Bradford at the close of the census year; and nothing else but the necessities of an army commands such a complete sacrifice of every other interest, or leaves such a scene of ruin and desolation."

One important reason for the wonderfully rapid development of oil districts is thus forcibly presented: —

"The owner of oil territory must have it drilled, or it will be exhausted by his neighbors drilling a cordon of wells around his property. After it is drilled, the well must flow until the pressure of gas is exhausted; and after the oil has stopped flowing, if the owner does not pump, his neighbor's pumps will drain his territory; and if he 'pulls out,' the law compels him to fill his well with sand, and ruin it forever, to prevent the public injury resulting from letting surface-water into the oil-sand. There is, therefore, no other alternative presented to the unfortunate possessor of oil territory but to drill and produce, whatever the price of oil may be."

The encyclopedic character of this report is very clearly shown in the second and third parts, in which the statistics of the manufacture and uses of petroleum are preceded by historical and descriptive accounts, either original or compiled, of the apparatus, methods, products, and various applications in the arts; the sections on the use of petroleum for lubricating and illuminating purposes being especially full.

The report on coke is restricted to the coke made as a direct product, and used in blast-furnaces, and does not include that produced in the manufacture of gas. Nor are the coking coals taken into account, except incidentally. This is, like petroleum, essentially a new industry in the United States, the annual value of the coke produced having increased from $189,184 in 1860, to $5,359,489 in 1880; and this is the first time it has appeared prominently in a census report.

The statistics of production for the census year are very full, and are followed by a historical and descriptive account of the industry in the different states and in foreign countries. In the concluding sections, the preparation of the coal, and the various forms of coke-ovens, are described in detail. The statistics show that coke is probably, by weight, the cheapest of all manufactured products, selling for less than two dollars per ton; and that it may be considerably cheapened in the future by the utilization of the waste-products, which greatly exceed in value the coal from which the coke is made.

The census of the building-stones and quarry industry of the United States was planned and organized by the late Dr. George W. Hawes. His untimely death led to a much greater division of labor than is apparent in the preparation of the reports on petroleum and coke, the list of the more prominent contributors to this report comprising nearly a dozen names; and, what is more to be regretted, it also necessitated the curtailment of the strictly scientific portion of the work. The most noticeable feature of this report, from the scientific standpoint, is the absence of any evidence of a serious attempt to improve the really splendid opportunity which the thoroughly representative collection made by the agents of the census bureau presents to investigate the building-stones of this country. The census reports are far from uniform in this respect; some classes of products, such as the woods, cotton, wool, etc., being worked up much more thoroughly.

We do not find in this report any systematic statement of the composition, microscopic structure, texture, specific gravity, crushing strength, porosity, chemical behavior, etc., of our building-stones. In short, the report presents no data forming a basis of comparison by which, to take a practical view of the subject, we can determine the relative merits for particular uses of the products of the fifteen hundred and twenty-five important quarries operated in the United States during the census year. Almost the only distinctly scientific sections of the report are the chapter on the microscopic structure of building-stones, by Mr. Merrill, and that on the durability of building-stones in New-York City and vicinity, by Professor Julien. But the former is short, and on the text-book plan, with but few references to the stones of particular localities. The figures are few and unsatisfactory; the component minerals not being sufficiently distinguished by colors, or otherwise. And, although Professor Julien's essay is excellent so far as it goes, yet it is only a partial and local treatment of the subject.

The student of economic geology will, however, find chapters four to seven, which constitute the main part of the report, very valuable as reservoirs of field-observations, notwithstanding the general lack of experimental or laboratory data. These chapters are devoted to quarry methods, the statistics of production during the census year, descriptions of quarries and quarry regions, and stone-construction in cities. The thirty-two chromolithographic plates which conclude this volume are one of its most attractive features. They show the appearance of polished surfaces of our handsomest marbles, granites, etc.