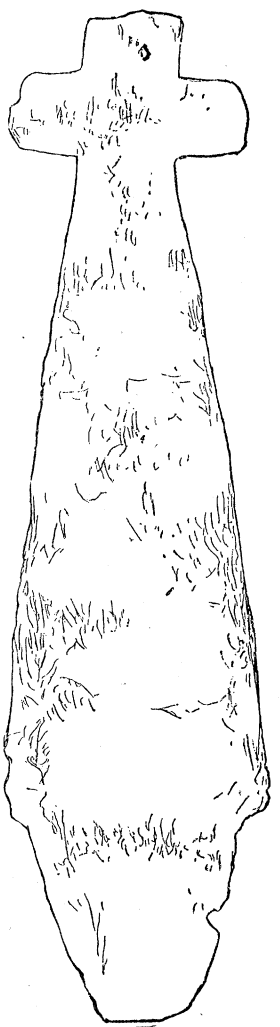
and South America contained in the collections of the museum.

The extent to which copper implements were disseminated among the aboriginal tribes of America will be surprising to many. The ornaments and implements lucidly described by Mr. Putnam are from places as widely separated as the burial-fields of Maine, Vermont, Massachusetts, and the mounds of the central and south-western states; besides a fair representation from Mexico, Central America, and Peru. In fact, objects made of copper are as widely distributed in America as are the stone implements of neolithic forms. This, however, does not imply that the same stage of advancement had been reached by copper-using tribes all over this territory. In Mexico, Central America, Peru, and Chili, copper ornaments and implements were cast, and then finished by hammering. Mr. Squier reports remains of furnaces in the ruins of Chimu, where, in early times, copper ores were smelted. In Mr. Putnam's opinion, there is no evidence that copper was ever cast in moulds by the aboriginal tribes of the United States; but native copper was hammered by them, as these cuts show, into innumerable shapes. Figs. 3 (here reproduced), 10, and 11 represent cruciform copper ornaments; but this seems to be a design of natural conception, rather than a symbol of Christianity, as some have supposed. The Sioux draw a figure of the cross to signify the four winds.



CRUCIFORM PENDANT FROM A STONE GRAVE IN TENNESSEE.

Besides the above notes, the report contains, among other things, a brief account of the important exploration now in progress under the auspices of the museum, of an extensive ancient cemetery at Madisonville, near Cincinnati.

The institution needs a great increase of its funds to equip it for its pressing work. Civilization is fast destroying all vestiges of prehistoric races. The science of the whole world and of all time will be enriched by any enlargement of the Peabody museum.

THE PANTHER CREEK COAL-BASIN.

Second geological survey of Pennsylvania. J. P. LESLEY, state geologist. *Anthracite district*, CHARLES A. ASHBURNER, geologist in charge. *Panther Creek basin*, [*in*] *Carbon and Schuylkill Counties*, 10 sheets [vertical sections, 3 sheets; horizontal sections, 3 sheets; map of the mines, 3 sheets; diagram of surface-area, 1 sheet]. — *Topographical map of the Panther Creek coal-basin*, 1 sheet. — *Preliminary map anthracite coal-fields*, 1 sheet. — *Production anthracite coal-fields*, 1 sheet. In all, 13 sheets, 605×725 mm. 1882.

THE constantly increasing use of cartographic and diagrammatic methods in illustration is an evidence of a most healthy advance in thoroughness and accuracy in geological work in this country. It is only within a comparatively few years that any trustworthy topographical maps at all have been available for our geological workers; and even now, outside of those made by government surveys in the west, they cover but a very small proportion of the area of the United States.

The theoretical as well as practical value of a geological map is directly dependent upon the accuracy and detail of its topographical basis; and, no doubt, many bitterly disputed questions which came up in earlier geological work in this country, some of which are still unsettled, would not have arisen, had it been possible to carry on the work originally on a systematic basis, instead of by individual observers who had not the advantage of comparing notes in the field, and who had either no map at all, or such as, from want of accuracy and detail, would be comparatively worthless. For practical purposes, such as the development of mineral deposits, the theoretically perfect map should contain in itself all the necessary data; so that no text would be required as an aid to its use in exploration, this being employed simply for explanation of methods of work and for theoretical deductions.

The thirteen charts now before us, recently prepared by Mr. Charles A. Ashburner, geolo-

gist in charge of the anthracite division of the Second geological survey of Pennsylvania, are a very close approach to this theoretical perfection. They are devoted to the illustration of the Panther Creek coal-basin, the north-eastern portion of the southern anthracite field, included between the Little Schuylkill River on the west, and Mauch Chunk on the east. Of these charts, one sheet gives the reproduction of a topographical map of the basin, made by Mr. R. P. Rothwell in 1869, on a scale of 1,600 feet to the inch, with contour-lines at vertical intervals of 10 feet. Three sheets, forming but one map, show the shape of the floor of the mammoth coal-bed, on a scale of 800 feet to the inch. This is practically an underground map; and in it Mr. Ashburner has introduced the somewhat novel system of representing the shape of a certain bed in the basin by contours, in the same manner as the surface of the ground is represented in our grade-curve maps. These underground curves are printed in red, and are drawn at 50-feet vertical intervals; some of the prominent surface features, such as railroads and important buildings, being printed over them in black.

It seems a pity that Mr. Rothwell's map should not have been published on the same scale, so that it might be superposed upon the underground map; thus showing, at a glance, the difference between surface and underground topography. Such a map shows at once the shape of the basin, and, by the relative closeness of contour-lines, the angle of dip at any point; and from it may be constructed an actual section of the coal-basin on any given line. Twelve of such sections are actually constructed at favorable points, and represented on three other charts on a scale of 400 feet to the inch. They are also given on the same charts on a scale of 1,500 feet to the inch, drawn one under the other, so as to represent more graphically the general shape of the various folds, and the position of the underlying rocks. They are accompanied by a sketch-map of the whole basin on a scale of 2,300 feet to the inch.

On still three other sheets are given columnar sections, representing the thickness of the coal and intervening beds at a number of different points where they have been determined, constructed on various scales, from 10 feet to 300 feet to the inch. One of these sheets also contains a skeleton map of the basin, showing the locality of these sections as well as of the cross-sections.

Furnished with these maps, the mine-owner can tell at what distance a shaft or tunnel may reach the coal-bed from any given point, and the inclination of such bed when reached. He can determine the proximate line of the bottom of the various synclinal basins along which he wishes to run his galleries, and which coal from the various breasts may reach by gravity.

Of the three remaining sheets of the series, one gives a diagram showing, in different shades of color, the area of the respective coal-beds, developed on a horizontal plane; the second, a skeleton map of the entire anthracite region on a scale of $\frac{1}{300000}$, with columnar sections showing the local names of the various coal-beds in different parts of the region, and the names of all the collieries. The third sheet shows the production of anthracite coal, from its earliest development to the present day, both in columns of figures from different districts, and in curves forming a pyramidal diagram for the total product; also some brief historical notes.

The sheets are 26 by 32 inches in size, and are engraved by the reliable firm of Julius Bien & Co. They bear evidence of an immense amount of accurate detail-work; and the only serious criticism we have to make, is the use, by Mr. Ashburner, of the magnetic instead of the true meridian.

The practical value of such maps as these, where underground developments have been carried on to a sufficient extent to furnish data which will make their deductions trustworthy, must be evident to the most untechnical; and that it has been appreciated by the mine-owners of the anthracite region is proved, not only by the practical aid they lent to the work by furnishing all their surveys and measurements, but also by their contributions of money to help defray its expenses. They form a highly instructive lesson of the practical value of a properly conducted geological survey, and one to which the legislators of Massachusetts and Rhode Island would do well to turn a listening ear; for it is certainly a disgrace, in these enlightened times, that they have within the borders of their states a coal-basin of which less is known than of those of the wild, almost uninhabited, regions of the Rocky Mountains.

THE SMITHSONIAN PUBLICATIONS.

Catalogue of publications of the Smithsonian institution, 1846–82, with an alphabetical index of articles. By W. J. Rhees. Washington, *Smithsonian institution*, 1882. 14+328 p. 8°.

A preface states in a general way what the institution has published, the rules for distribu-