proved highly productive, as shown by the publications issued and in press. Similarly, attention may be called to the fruitful studies of Dr. Osborne and Professor Mendel, which promise to throw important light on the intricate physico-chemical processes of animal nutrition and growth. The older sciences of chemistry and physics have made not less important progress through the contributions of a dozen associates and many more collaborators. A very noteworthy advance has been secured in meteorology by Professor Bjerknes through the international adoption of his methods and units for expressing meteorological data. Beginning with this calendar year and continuing up to the onset of the European war, the United States Weather Bureau issued daily weather maps of the whole northern hemisphere in conformity with these new methods and units, greatly to the advantage of theoretical and applied meteorology. The comprehensive and always highly suggestive expositions in geology and in cosmogony for which Professor Chamberlin has long been distinguished have stimulated his colleagues, Professors Michelson, Gale and Moulton, to the production of a capital contribution to geophysics in an ingenious and conclusive proof that the rigidity of the earth is about the same as that of steel. And finally, in illustration of the ease of passage from one field to another in this complex miscellany of independent researches, there may be cited the concordances of the earlier poet Horace and the later poet Spenser, now in press as numbers 202 and 189, respectively, of the institution's series of publications.

FINANCIAL RECORDS

The following list shows the departments of investigation to which the larger grants were made by the trustees at their last annual meeting and the amounts allotted from these grants by the executive committee during the year:

Department of Botanical Research.....	$42,140
Department of Economics and Sociology.	5,000
Department of Experimental Evolution...	63,479
Geophysical Laboratory	85,500
Department of Historical Research	31,100
Department of Marine Biology	19,150
Department of Meridian Astrometry	25,180
Nutrition Laboratory	45,798
Division of Publications (office expenses).	10,000
Solar Observatory	220,892
Department of Terrestrial Magnetism	157,406
Researches in Embryology	26,900
Total	$732,545

THE BUREAU OF MINES

IN his annual report to the secretary of the interior Director Joseph A. Holmes, of the United States Bureau of Mines, states that excellent progress has been made during the past fiscal year in the investigations of the explosibility of coal dust at the experimental mine near Bruceton, Pa. These investigations included a careful examination into the inflammability of coal dust collected from hundreds of mines in different coal fields and a systematic study of the possibility of coal-mine explosions starting from the improper use of explosives or the use of improper explosives, or from electric sparks, miners' lamps, mine fires, or other agencies.

Probably the most important feature of the year's work was the development of four types of explosion-stopping devices in which rock dust is used, as follows: Box barriers, concentrated barriers, ventilating-door barriers and ventilation-stopping barriers. The barriers were tested in strong and weak explosions and were effective in preventing propagation of flame beyond them. After being placed in a mine they are easily inspected and require little attention. Demonstrations before mining men led to inquiries from a number of companies, with a view to the erection of the devices in mines. The results of the tests at the experimental mines have shown the value of watering.

Four great explosions occurred during the year, as follows: One in the Stag Canyon mine, at Dawson, N. Mex., October 22, 1913, resulting in the death of 263 men; one at Acton, Ala., November 18, 1913, in which 24 men were killed; one at the Vulcan mine, New

Castle, Colo., December 16, 1913, in which 37 men were killed; and one at Eccles, W. Va., April 28, 1914, in which 181 lives were lost. The general ventilation in most of the mines involved in explosions was good, but the defect in certain mines was in permitting the local accumulation of gas through not bratticing up to the face of gaseous entries or working places. One of the great disasters was probably caused by the use of dynamite for blasting, and by disobedience in firing a shot or shots when miners were in the mine, in spite of the fact that an outside shot-firing system had been installed.

Other lesser disasters occurred during the year. Many shot firers lost their lives in the Pittsburg, Kans., district, and in Oklahoma, Indiana and Iowa. Although the system of employing shot firers to fire the shots when all others are out of the mine lessens the number of deaths, yet in many districts the methods of shot firing employed are still so extremely hazardous that only the most reckless men are willing to act as shot firers. In any mine in which this system is used there seems to be no good reason why shot firing from without the mine by electrical means should not be employed, at least if permissible explosives are not used.

Director Holmes strongly urges the purchase by the government of the grounds on which the experimental mine is situated. He declares that the Bureau of Mines should own these grounds, now merely leased, in order to safeguard the large expenditure already made in developing the mine thereon and equipping it with expensive appliances.

Looking to the future, the director observes that, despite the progress made in ascertaining the nature of mine explosions and in devising methods of prevention, they still continue to occur, and it is to be feared that complete prevention will be difficult, owing to the inherent difficulty of eliminating errors of observation, judgment, or understanding from among miners or mine officials. Thus, one of the shocking disasters of the past year was brought about because of one man's willingness to risk the sacrifice of not only his own life, but the lives of many others in order to gain a few tons of coal. It is difficult to meet such a case, and yet with the progress that is being made in the methods of preventing or limiting explosions, it is certain that hereafter in a well-protected mine properly cared for there will be much less danger of a widespread explosion.

THE UNIVERSITY OF CINCINNATI BUREAU OF CITY TESTS

THE Bureau of City Tests aids the city in two ways. It helps the government to purchase the best materials, by examining the dealers' samples, and, by making further tests from time to time, enables it to receive supplies of good quality throughout the year.

Cincinnati is one of the first large cities to purchase coal under competitive bidding in accordance with well-drawn specifications. All its purchases are made on the British thermal unit basis. In submitting bids, dealers guarantee a certain number of heat units per pound, and a certain percentage of ash. The cost per heat unit in the various bids is then calculated and the contracts awarded. All moisture in excess of the amount normally present is deducted from the tonnage delivered. The result of this new system has been the receiving of a good uniform grade of coal.

The bureau tested the 450 or more carloads of cement used, during the year, for various city improvements. In spite of the fact that only standard brands which have proved dependable are used, 11 carloads of cement of poor quality were rejected. The steel employed to reinforce concrete work is tested physically, and of this but one questionable sample was received.

By testing fire hose, the city saved $11,000 on the contract of 1912, and about the same amount on that of 1914. The bureau analyzes samples without any knowledge of the bidders' prices, and contracts are let on a quality basis to the lowest bidder whose product conforms to the standard underwriters' specifications. The satisfactory performance