

precisely the same whether the neck was opened or closed. The only work the gas would do in expanding would be that which it did in inflating the balloon, or it would simply displace a volume of gas equal to the enlarged volume of the balloon. It is easy to see that this work would be almost inappreciable.

It may help to clearness if we consider two balloons suspended by an endless rope passing over a pulley situated at the extreme height to which the balloon rises. This rope has no weight, and there is no friction at the pulley. One of the balloons is at the earth's surface, and the other at the highest point. The system is in equilibrium, and it would require but the slightest weight at the topmost balloon or a diminution of weight in the balloon at sea-level to disturb the equilibrium and cause the balloons to change places. It is very evident that throughout this motion the air sustains both balloons, and the work of expansion in one balloon or the work done by the air in compressing the gas in the other balloon would be almost inappreciable.

Instead of using hydrogen in our balloons we may use heated air and the results of the analysis would be exactly the same. Lastly, we may dispense with our envelope, and simply consider the heated air as rising in the atmosphere. As we have just seen, this air would do very little work, and the consequent cooling would be very slight; the converse would also be true, that the work of diminishing the distance between the molecules of the gas would be very slight, and the heating almost inappreciable so far as the compression was concerned.

The application of these views, if they shall be sustained, to nearly all theories in meteorology is very obvious. It has been only after the most careful study and analysis of all the questions involved, and a taking up and explaining all the apparent contradictions between the older views and these, that I have felt justified in presenting them so much in detail. I bespeak for them a most searching examination and criticism, hoping that thereby the whole truth may be established.

H. A. HAZEN.

March 2.

#### Pyrite Incrustations of the Cretaceous Formations of Middlesex County, N.J.

ONE would scarcely expect to find beautiful mineralogical specimens in so uninviting a place as a clay pit. The specimens of pyrite incrusting wood and bark, that may be found in most of the clay pits of Middlesex County, N.J., are very beautiful, whether viewed æsthetically or as cabinet specimens. The incrustations as found near Ford's Corners occur in the black and dark-colored clays which usually overlie the lighter and better clays. This dark stratum of clay contains many remains of leaves, twigs, and bark, which have been partially changed into brown coal. Occasionally whole trunks are found which yield wood which may be wrought into a variety of ornamental objects which are capable of taking a good polish. As waters containing sulphates of iron come in contact with this carbonaceous matter the carbon unites with the oxygen of the sulphates and sulphide of iron is left in its place. In some specimens the pyrite is found covering the carbon, while in others the carbon has been completely replaced by pyrite; at the same time the form of the wood is perfectly retained.

Specimens having the form of twigs not thicker than a lead pencil, and having a fine crystalline surface, are occasionally found. These make very pretty breast-pins when suitably mounted. Some specimens look as though the material of which they were formed had been poured out whilst hot, and had spread on cooling much as hot lead does when poured out on a flat plate. Many specimens occur in the shape of balls as large as hen's eggs. These are made up of concentric layers of scale-like crystals formed about a nucleus at the centre. As these are exposed to the weather they scale off gradually, sometimes remaining bright until the balls disappear completely, while at other times they turn dark immediately.

The pyrite weathers very quickly when left exposed to the action of the air, and the clay waters. If, however, the specimens are collected and washed as soon as they are removed from their native beds, they will remain bright indefinitely.

Specimens are occasionally found weighing four or five pounds. When the pyrite is exposed to the weather in contact with sand or gravel, as the iron is changed to the ferric oxide it cements sand and gravel together so that very often the resulting conglomerate retains the form of the original lump of wood. Your clay-pitter does not look with a favorable eye on the "sulphur balls," as he calls them, for clay containing much sulphide of iron is worthless for brick-making.

Of late years large amounts of clay containing iron have been used for making the so called mottled bricks.

D. T. MARSHALL.

Metuchen, N.J., March 2.

#### AMONG THE PUBLISHERS.

THE American girl is not slow to grasp a chance. Some time ago *The Ladies' Home Journal* organized a free education system for girls, and the magazine is now educating some forty odd girls at Vassar and Wellesley Colleges, and at the Boston Conservatory of Music, all the expenses of the girls being paid by the *Journal*.

— The March number of *Babyhood* contains an article on "Getting the Teeth — First and Second," by the medical editor, Dr. L. M. Yale, which corrects certain misapprehensions as to the teething process and the troubles which are popularly supposed to accompany it. Similarly helpful medical articles are "The Care of Delicate Children," by Dr. H. D. Chapin, and "Cuts and Scratches," by Dr. H. Power. An alleged "sure cure" for diphtheria is also discussed by a competent writer. Of most general interest, perhaps, is a curious article on "What Shall be Done with Him?" — an account of a completely unmanageable though not at all vicious boy, which is sure to give rise to considerable discussion.

— We have received a copy of the American edition of "Longmans's New School Atlas," the joint work of George G. Chisholm of the Royal Geographical Society and C. H. Leete of the American Geographical Society. It contains thirty-eight double-page maps; but in many cases what is numbered as a single map is really a collection of two or three maps. The introductory maps illustrate the various physical and astronomical phenomena of the globe, the climates and vegetation of different regions and the distribution of races and religions, while the remainder of the book is mainly devoted to political geography. There are, however, several special maps illustrating the climate, geology, and industry of the United States and Canada, and one showing the several acquisitions of territory by the United States. Most of the maps are so colored as to show the elevation of the different sections of land above the level of the sea; which seems to us to be making too much of a very small matter. The selection of maps is very judicious, and the United States does not appear with such overweening importance as it does in most American atlases; though it receives as much attention as the British Empire, and much more than any other part of the world. The number of towns indicated on most of the maps is small; and though a school atlas ought not to be overburdened with town names, the present work would have been better if it had contained more of them. The maps are well engraved on excellent paper, and as a general atlas of the world for school use, the book is meritorious. It is published by Longmans, Green, & Co. of New York, at one dollar and a half.

— Professor David Starr Jordan makes the inspiring influence of a great teacher of science strongly felt in the account of "Agassiz at Penikese," with which he is to open the April *Popular Science Monthly*. The article contains many of Agassiz's own words, which reveal the master's spirit better than pages of description. An authentic account of what treatment the Catholic Church actually gave to Galileo and his discoveries and writings will be given by Dr. Andrew D. White in one of his *Warfare of Science* papers. Attempts have been made to disprove or explain away much of this ecclesiastical persecution, but Dr. White's statements are fortified by copious citations from authors of unquestioned orthodoxy. The same article tells just how far into