THE First Biennial Report, for the years 1892 and 1893, of the Maryland State Weather Service, which was organised on May 1, 1891, has been published. As in other States, the observers are voluntary, and the Weather Bureau supplies instruments, &c. The present report is intended to give a general view of the climate, so far as conclusions can be drawn from data yet obtainable; it also contains a general summary of the physical features of Maryland, and of the different types of soil, each of which is specially adapted to the cultivation of certain classes of plants. The Director of the service, W. B. Clark, points out that the climate is generally what is known as continental, but is greatly modified in the eastern part of the State by the ocean. The average mean temperature of January is 32°·8, and of July 75°·8, a mean range of 43°, but the differences in certain localities are very considerable. Rainfall is fairly equally distributed throughout the year, the maximum occurring in the spring; the mean annual fall is 42·4 inches. Snow never fails completely, even with warmest winters.

THE *Reports of the Director of the Michigan Mining School* for 1890-1892 have just been distributed, and tell of much good work having been accomplished at this popular institution during the years under review. In the report for 1891-92 mention is made of a number of changes which were to come into effect in 1893, one being the lengthening of the course from three to four years, and the raising the age for admittance into the regular course to twenty years, unless the intending student shall have completed a regular course in some good high school or academy. The need of some kind of endowment is pointed out, the school being at present entirely dependent upon legislative aid. The report also calls attention to the necessity for the erection of an additional building on grounds belonging to the school. This building would be used for machine shops, testing and electrical laboratories, the mining engineering laboratories, &c. A metallurgical laboratory is much needed, but cannot at present be proceeded with for want of funds. The work in each department has developed so much that an increased expenditure all round is deemed necessary.

DIAZOMETHANE, $H_2C\begin{smallmatrix}N\\ \|\\ N\end{smallmatrix}$, has been isolated by Prof. von Pechmann, of Munich, and a preliminary communication concerning it is contributed to the current *Berichte*. This interesting substance is a yellow gas at the ordinary temperature, which condenses when cooled to a yellow liquid. It appears to be odourless, but is extremely poisonous, so much so that Dr. Pechmann finds it very difficult to work with in the gaseous state, owing to its violent action upon the respiratory organs. The principal properties of the substance have therefore been studied with its solution in ether. It is obtained by the action of alkalies under special conditions upon any of the nitrosamines of the type NR . Ac . NO, where R represents an alkyl radical such as methyl, ethyl or benzyl, and Ac stands for acetyl, benzyl, or the radicals $CONH_2$ and $COOC_2H_5$. The yield of the gas is at least fifty per cent. of the theoretical when nitrosomethylbenzamide or nitrosomethylurethane are employed. The reaction appears to be a very simple one, represented by the following equation:—

$$CH_3N\begin{smallmatrix}NO\\ Ac\end{smallmatrix} + NaOH = CH_2N_2 + H_2O + AcONa.$$

The new substance behaves in a characteristic manner towards dilute acids. The yellow solution in ether is instantly decolourised upon the addition of the acid at the ordinary temperature, nitrogen being evolved. Water acts in a similar manner and almost as vigorously as when acidified. It is much more stable, however, towards alcohol. Iodine decomposes diazomethane with formation of methylene iodide CH_2I_2 and evolution of nitrogen. The reaction may be carried out volumetrically if the iodine is likewise employed dissolved in ether, the completion being indicated by a sudden decolourisation of the liquid; the nitrogen can readily be measured by means of the nitrometer, over mercury. Diazomethane reacts with silver nitrate and Fehling's solution in a similar manner to the diazoacetic ether described by Curtius. Mercuric oxide is reduced in the cold. Cork is bleached and eventually destroyed by the gas, so that the ethereal solution cannot be preserved in vessels closed with cork stoppers. The best proof of its composition and constitution is considered by Prof. Pechmann to be afforded by its reaction with the methyl ether of fumaric acid. The yellow ethereal solution of diazomethane is instantly decolourised upon admixture with the fumaric methyl ether; the substance produced is a direct addition product which has been obtained in crystals, and which upon boiling with dilute hydrochloric acid evolves carbon dioxide and yields crystals of hydrazine hydrochloride. Moreover, the silver salt of this compound is stable, and has been analysed. In concluding his preliminary notice, Prof. Pechmann states that he has likewise isolated diazoethane in a similar manner, employing, of course, an ethyl instead of a methyl nitrosamine. Further particulars of these compounds will doubtless be awaited with considerable interest.

THE additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*) from East Africa, presented by Mrs. Keirnander; a Blotched Genet (*Genetta tigrina*) from Lamoo, East Africa, presented by Miss M. Clode; a Grey Ichneumon (*Herpestes griseus*) from India, presented by Miss Sullivan; a Four-horned Sheep (*Ovis aries*, var.) presented by Mr. Frank C. Strick; a Blackcap (*Sylvia atricapilla*) British, presented by Captain John Richardson; a Smooth Snake (*Coronella lævis*) British, presented by Mr. John Gray; a Common Viper (*Vipera berus*) from Scotland, presented by Mr. J. Anderson; a Red and Blue Macaw (*Ara macao*) from South America, deposited.

OUR ASTRONOMICAL COLUMN.

THE MAGNESIUM SPECTRUM AS A CRITERION OF STELLAR TEMPERATURE.—The variations undergone by the spectrum of magnesium when the element is subjected to different temperatures were studied some years ago, and their use in estimating the comparative temperatures of celestial bodies have been pointed out. Prof. J. E. Keeler contributes a note on the matter to the *Astronomische Nachrichten*, No. 3245, his remarks referring especially to some observations recently published by Prof. Scheiner on the behaviour, under different temperatures, of the lines at λ 4482 and λ 4352. The former line is strong and broad in the spectrum of magnesium, when luminosity is produced by means of the electric spark with Leyden jar in the circuit, but it does not appear in the arc spectrum; on the other hand, the line at λ 4352 is strong in the arc spectrum, but faint in the spark spectrum. Similar differences of relative intensity are found to exist in stellar spectra, and Prof. Scheiner is not alone in thinking that they afford a means of estimating the approximate temperatures of the absorptive atmospheres of celestial bodies exhibiting them. In connection with this subject, Prof. Keeler comments upon the absence of the magnesium triplet *b* from the spectrum of Rigel, while the line at λ 4482 is conspicuous. He suggests that the star is at too high a temperature for the production of the *b* group, and uses the relative strength of the group in different spectra as a criterion of stellar temperature. It is pointed out that Kayser and Runge have shown that the group is characteristic of a molecular structure which cannot exist at a very high temperature, whereas the lines at λ 4482 and λ 4352 do not represent the same molecular state. These considerations lead to the conclusion that the aspect of the *b* lines in stellar spectra may be used as an index to the temperature in the same way as the two lines selected by Prof. Scheiner. And since the *b* group is absent from the spectra of Rigel and

certain other stars, it is thought that these bodies must be at a temperature higher than that of the most powerful electric spark, for, were they at this temperature, laboratory observations indicate that the group should be well visible in their spectra.

THE AUGUST SWARM OF METEORS.—Many have already begun to observe, during the past few evenings, some of the forerunners of the August swarm of meteors which at this time are visible in very considerable numbers. Although, at its best, this swarm does not offer such beautiful displays as those which occur when the earth meets with the densest part of the November swarm, yet, on account of their uniform distribution and moderate density along their orbit, the shower is always fairly bright and distinct. Unlike the November meteors, the Perseids always herald their approach a few days beforehand by an increasing number of outliers as the maximum approaches; on the 10th this is reached, and from that time a decrease in their number rapidly diminishes. Another peculiarity of this swarm is that the average intensity year by year does not exhibit such wide variations as those shown by the Leonids, which attain a maximum every 33¼ years. By plotting the paths of the observed meteors on a globe or star chart, the radiant point so found should be approximately 45° R.A. and 57° Declination for the 10th. Close observation every evening will reveal a daily movement of the radiant point eastward among the stars, as shown in the following ephemeris, taken from Mr. Denning's table in the "Companion to the Observatory." The dates before the 10th are given for the sake of those who have commenced their observations early, and would like to compare their observed radiant points with those calculated:—

Date.	Radiant. α.	Radiant. δ.	Date.	Radiant. α.	Radiant. δ.
	°	°		°	°
July 19	19	+51	Aug. 2	36	+55
,, 21	22	52	,, 4	38	56
,, 23	25	52	,, 6	40	56
,, 25	27	53	,, 8	42	57
,, 27	30	54	,, 10	45	57
,, 29	32	54	,, 12	47	57
,, 31	34	55	,, 14	50	58
			,, 16	53	58

The comet with which these Perseids are supposed to be connected, is that which appeared in 1862, and was discovered by Mr. Swift, of Rochester, New York, on July 15. The orbit, after a calculation made by the late Dr. Oppolzer, of Vienna, was found to be elliptic, and the periodic time 120 years. Schiaparelli it was, however, that drew attention to the similarity between the meteoritic and cometary orbits. The next appearance of the comet does not take place before another half-century.

INSTITUTION OF MECHANICAL ENGINEERS.

THE annual summer meeting of the Institution of Mechanical Engineers was held last week in Manchester, under the presidency of Prof. A. B. W. Kennedy, the President of the Institution. The meeting commenced on Tuesday, the 31st ult., and concluded on the Friday following. There were but two sittings for the reading and discussion of papers. The following is a list of the papers on the agenda:—

(1) "Description of the New Electric Lighting Works, Manchester," by Dr. John Hopkinson, F.R.S.

(2) "Electric Welding," by Benjamin Alfred Dobson.

(3) "Description of Twin Screw-Propellers with Adjustable Immersion, fitted on Canal Boats," by Henry Barcroft, of Newry.

(4) "Description of the Manchester Main Drainage Works," by Wm. Thomas Olive, Resident Engineer.

(5) "The Manufacture of Standard Screws for Machine-made Watches," by Charles J. Hewitt, of Prescot.

(6) "Drilling Machines for Cylindrical Boiler Shells," by Samuel Dixon, of Manchester.

The last two papers were adjourned until the next meeting in London. Dr. Hopkinson's paper was a short one, the scope of which is sufficiently indicated by the title. Outlined particulars were given of the new installation at Manchester. There were, however, no special features which require notice in the present instance. The discussion which followed chiefly turned on the use of jockey pulleys. It is interesting to notice, however, the progress that has been made in electric lighting since the author read his first paper on the subject before the Institution, now fifteen years ago. Since that time this department of practical science has undergone an extraordinary development. The only electric lights then were arc lights, the first incandescent lights in a practical form being made about a year later. To-day there are millions of incandescent lights in use. The machine the author used for experimenting upon in 1879 was at that time considered a fairly large one and highly economical; it required six horse-power to drive it. Now many machines have been working for a considerable time, requiring over 1000 horse-power to drive them. The commercial efficiency of the machine then was about 50 per cent., but now machines are produced having commercial efficiencies of 94 per cent.

Mr. Dobson's paper on electric welding was one of practical interest, although the system of welding by electricity is one that is now well known. The author, has, however, adopted this method of joining metal for some time in the extensive works of his firm at Bolton. Practical every-day working for nearly three years of the process of welding by electric force enabled him to give certain indications and appreciations of the method considered as a practical workshop operation. During the period mentioned his firm has had two machines in operation, worked from the same generating dynamo, and engaged upon different classes of work. The one is specially arranged for joining bar iron and steel, and the other, which is a smaller machine, is used for work of a more delicate nature, such as brazing and piecing clean-finished work, where the fire-heat would have destroyed the quality of the work on the adjacent material. Great difficulties were experienced at first in regard to the requisite mechanical power, it being found that this power had been much understated. The author, having about 35 indicated horse-power to spare on a certain engine, and understanding that 30 horse-power would be the utmost required to piece a 2-inch round bar, determined to drive the dynamo from that engine. This practical test showed that instead of 30 horse-power as much as 80 horse-power seemed to be wanted for the larger sizes. A portable engine capable of working up to 100 indicated horse-power with 80 lbs. pressure was supplied and placed at a distance of about 45 yards from the welding machine. Even with this engine it was found that when piecing the larger diameters—as yet nothing over 2¼ inches has been pieced—if the work was to be done in reasonable time, the speed of the engine was greatly checked. A Thomson-Houston welding dynamo was used by the author's firm. Its speed is 1000 revolutions per minute, and it gives at full load a current of 200 ampères at 300 volts with 100 alternations per second. Transformers are used. The author gave full particulars of the work done and tests made. The question of cost had not been alluded to in detail by the author, who admitted, however, that the payment of royalty, the cost of horse-power, and the depreciation, which on electrical apparatus is heavy, together brought the cost considerably over the net cost of the ordinary smith's hearth work; the payment in wages, &c., being considerably less. The loss in weight of iron is about one-twentieth. On straightforward welds the total cost is between ten and fifteen per cent. more than the ordinary smith's work; but in the case of delicate work and difficult operations, the cost is about one-third of that of the smith's work. The real advantage of the apparatus, as at present arranged, is not so much an economy as a method of securing an absolutely reliable result, and occasionally saving considerable expenditure by its adaptability.

In the discussion which followed the reading of this paper, no important points were brought forward.

Mr. Barcroft in his paper described an arrangement by which steam power could be applied to ordinary canal boats. Although doubtless the application was suitable for the position it had to fill, the machinery possessed neither scientific nor engineering interest, except of a very limited order.

Mr. Olive's paper on the Manchester Main Drainage Works was a useful description of an ordinary installation of this nature. The Manchester works have but recently been put up, and are indeed hardly yet in full working order.