of "hundreds of motor-cars crashing through the trees." The storm occurred at about 4 p.m. in Devon, at 5.40 to 5.50 p.m. in South Wales, at 7.35 to 7.45 p.m. in Shropshire, and at 9 p.m. in Cheshire. The progress of the central area of the storm is given as 36 miles an hour No absolute measurement of wind velocity was secured, and a similar absence of barometer records is mentioned, with the exception of one station only a few yards from the South Wales track, where the record shows a fall of pressure from 29·20 in. to 28·91 in., followed by an almost immediate rise.

THE *Scientific American* for February 13 contains the third of the series of articles entitled "Doing without Europe," to which we referred in these columns a month ago. The principal object of the articles is to show how vast are the mineral resources of the country and how little they are utilised. The present article deals mainly with the barium salts used in the manufacture of paint. Up to the commencement of the present war these had been imported from Germany, but one of the largest paint manufacturers of New York has commenced manufacturing them from an ore found in Tennessee, and now turns out 15 tons a day. In respect to potash salts, of which the annual import from Germany exceeded 3,000,000*l.*, the United States Government has directed attention to the natural deposit of the salts at Searles Lake, California, and a manufacturing plant has been set up there the success or failure of which will be watched with interest. Soda, magnesia, and several other substances are also mentioned as being found in abundance in the country, and as only requiring working to supply all requirements.

AN interesting paper on the internal-combustion engine in the oil field was read at the Institution of Petroleum Technologists on March 18 by Mr. F. G. Rappoport. It appears that the steam engine still largely holds its own despite its inefficiency, the reason for this being in the special character of the work to be done in boring and baling oil wells. Great flexibility in power and speed is required, and while electric power distributed from central stations is ideal from other points of view, electricity lacks that flexibility at the well which makes steam power so convenient. The oil engine has created a large and important sphere of its own by facilitating profitable operation of a large class of wells having a small yield. Such wells had formerly to be closed, and the advent of the oil engine with its low fuel-consumption has rendered possible their operation. The oil engine is well adapted for outlying districts and for prospecting work; the Binagadi oil field, without adequate water supply, is worked almost entirely by means of oil engines. The new Ural and Biellik districts in Russia are largely worked by oil engines. Applications of the gas engine are also discussed, and reference is made to an engine made by Messrs. Tangye, which can be run as a gas engine, or as an oil engine, by alteration of certain parts. Several of these engines are in successful operation on the Baku oil field.

MESSRS. W. HEFFER AND SONS, LTD., Cambridge, have just issued a classified catalogue of numerous scientific books, periodicals, and publications of scientific societies which they offer for sale, including large selections from the libraries of the late Sir Robert Ball and Dr. J. Reynolds Green. The catalogue contains titles and descriptions of many rare and valuable works which may be purchased at reasonable prices for private or public libraries.

OUR ASTRONOMICAL COLUMN.

COMET NOTES.—In the *Astronomische Nachrichten* (No. 4789) Dr. Elis Strömgren communicates an ephemeris up to March 29 for comet Mellish (1915*a*), computed by Herren J. Braae and J. Fisher-Petersen, from the parabolic elements given by the latter, with Herr R. Andersen. The data for the present week are as follows:—

	R.A. (true) h. m. s.	Dec. (true) ° ′	Mag.
March 25 ...	17 55 53	... −0 34·9	... 8·8
27 ...	17 58 13	... 0 50·0	
29 ...	18 0 33	... 1 6·1	... 8·6
31 ...	18 2 51	... 1 23·1	
April 2 ...	18 5 9	... −1 41·2	... 8·5

The comet lies approximately between γ Ophiuchi and η Serpentis.

Herr K. Hillebrand, in an Ephemeris Circular of the *Astronomische Nachrichten* (No. 478), publishes the elements and ephemeris of the periodic comet of Winnecke for its appearance in the current year. The latter extends from April 16 to the end of August.

A search ephemeris for Tempel's comet (Ephemeris Circular, No. 479) is given by Herr J. Braae. In 1910 this comet was not seen, but it is pointed out that this year it will be a little more favourable for observation. The ephemeris is extended to the end of June of the present year, and will be continued later.

THE STRUCTURE OF THE Hγ LINE IN STELLAR SPECTRA.—In this column for July 31 of last year attention was directed to a paper by Herr K. F. Bottlinger, in which was shown the result of a study of the intensity distribution of lines in many of the brighter stars. In a recent number of the *Astronomische Nachrichten* (No. 4788, vol. cc., No. 12) Dr. Adolf Hnatek gives his conclusions from rather a similar investigation. The author has measured both the intensity (Linientiefe) and breadth (Linienbreite) of the Hγ line in several bright stars, and summarises the values deduced according to the spectral types of the stars examined. Thus, in the case of the line-width the following are mean values in Angström units which he has deduced.

Maury	Cannon	Width	Intensity
II–VI ...	B ...	16 ..	0·55
VII–VIII ...	A ...	26 ...	1·40
X–XI ...	F ...	17 ...	0·81
XIII–XV ...	G–K ...	8 ..	0·35

Summarising the values of the line-intensity (Linientiefe), he points out that they show also a similar relation to the spectral types; these intensity values are added in the last column of the above table. The paper contains also a number of curves of the Hγ lines in the individual stars arranged in groups according to their spectral classes. While the above investigation deals only with one line and a small number of stars, the author hopes to extend the research to more lines and stars in order to deduce results of a more definite and trustworthy value.

THE HARVARD COLLEGE OBSERVATORY REPORT.—The annual report of the director of the Astronomical Observatory of Harvard College for the year ending September 30, 1914, indicates the completion of a large amount of work in both observation and publication. Prof. E. C. Pickering refers in the first place to the principal work of the observatory, namely, its publications and the importance of issuing these as soon as possible to prevent loss by fire. Thus observations from 1892–1912 with the 15-in. equatorial, from 1888–98 with the 8-in. transit circle, and from 1898–1912 with the 12-in. meridian photometer are now printed, and the discussions are in progress. The director directs attention to the improvement in photographic processes resulting in the replacement of practically all visual work. The report then describes in more detail the work of the Henry Draper Memorial, the principal research of which is the New Draper Catalogue; last year Miss Cannon classified 60,386 spectra, making a total of 160,541. The activities of the Boyden department, the Bruce photographic telescope, and the Blue Hill Meteorology Observatory are briefly summarised, while among the many items mentioned under the heading "Miscellaneous" the work of Prof. W. H. Pickering at the Mandeville Station, in Jamaica, is described, much time having been devoted to the study of the planet Mars during its recent opposition.

STAR CHARTS FOR METEOR OBSERVERS.—One of the contributions to the January number of the Journal of the Royal Astronomical Society of Canada (vol. ix., No. 1, p. 7) is entitled "A Gnomonic Star Atlas," and contains a set of thirteen maps, prepared by Mr. Reynold K. Young, intended to facilitate the observation of meteors and the plotting of their paths. The method of the projection of the map is such that great circles in the sky are equivalent to straight lines on the map, thus making the plotting of the meteor trails more easy. The maps are devoid of unnecessary detail. The positions of the stars are given for the epoch 1900 correct to within one-tenth of a degree, and all stars down to 5th magnitude and the brighter variables are included. A good margin of overlap has been allowed in each map, which should prove very useful.

FLUCTUATIONS OF TEMPERATURE IN EUROPE AND AMERICA.

MR. H. ARCTOWSKI, in a paper published in vol. xxiv. of the Annals of the New York Academy of Sciences, considers the problem of variation of temperature over the whole earth. After a brief statement of the general problem and the methods by which it may be attacked, he explains that he could not deal single-handed with the arrangement and discussion of the actual values even over the whole of the northern hemisphere, and confines himself to the detailed survey of the variations over North America and Europe. He also compares the results with one or two representative equatorial and southern hemisphere stations. From a study of the values at one of these, Arequipa, in Peru, he deduces that the temperature changes are partly of a short period of about fifty-five days, brachypleionian waves; partly of a long period of twenty years or so, macropleionian waves; and partly of an intermediate period of between one and two years, pleionian waves.

In dealing with the longer periods the normal annual variation is eliminated by taking a series of means for twelve months beginning with each consecutive month of time. For the European stations he finds that the continental ones resemble Arequipa in having marked pleionian waves, while those stations near the Atlantic are characterised mainly by brachypleionian variations.

In an earlier paper Mr. Arctowski dealt with the period 1891–1900, and he takes the mean values for this period as normals, and plots on maps the difference from normal of the values during each year of the decade 1900–09. The areas where the differences are positive he calls thermopleions, and the areas of negative differences antipleions. He finds that certain years, in particular 1900, 1908, are characterised by thermopleionian areas, while others, such as 1904, 1907, are years of antipleions. The most important cause of these differences is the variation of solar radiation, but there are also supplementary causes such as the presence of volcanic dust in large quantities, or exceptional ice conditions in the polar regions.

Many of the maps which illustrate the results of the investigation are on a very small scale; the course of the thermopleions and thermomeions is obscured by the attempt to show relatively microscopical geographical details.

Mr. Arctowski finds it astonishing that after all the efforts which are made to organise and maintain meteorological stations all over the world, the actual results of the work are so inaccessible. Even for the area with which he dealt he could only get much of the data by writing personally to the directors of the different meteorological institutes. This is a defect which will be remedied when meteorologists of different countries undertake to contribute to a central bureau representative regional values based on a selection of stations which can only be chosen satisfactorily by the local organisation.

There is another defect which is almost more serious, viz., the lack of continuity in the records for individual stations due to changes of situation or instruments. For example, Mr. Arctowski finds that the difference of temperature between Chicago and Milwaukee was nearly 4° F. in the decade 1873–82, while in the decade 1896–1909 the difference was only 2° F. The change is almost certainly due to change of instrument or site, and as it is of the same order of magnitude as the changes with which he deals, it indicates the need for great caution.

The difficulty of securing comparable continuous records is indeed one of the most serious problems with which organised meteorology has to deal.

E. G.

REFINING GOLD BY ELECTROLYSIS.[1]

THE problem presented by the necessity of refining gold was one for which a solution was sought at least as early as the time, about B.C. 700, when coins were first manufactured in the Western world. Apart from toughening or the removal of base metals, which was sufficiently cared for by the ancient process of cupellation, it is clear that some measure of success attended the efforts made to part gold and silver. Thus, some of the ancient Greek coins containing 997 or 998 per 1000 of gold. The earliest parting process used was one of cementation, which was succeeded by the nitric acid process. At the present day chlorine is the predominant agent for parting gold from silver in Australia, electrolysis in America, and sulphuric acid in Europe.

The electrolytic process was brought forward by Charles Watt, at Sydney, in 1863, and was first put into operation by Wohlwill at Hamburg in 1878 and by Tuttle at the Philadelphia Mint in 1902. In the gold chloride process the solution used in the bath

[1] Abstract of the presidential address delivered before the Institution of Mining and Metallurgy on March 18, by Sir T. K. Rose.