

most, but even the declination instrument gave trouble at times.

THE leakage of steam past piston valves has formed the subject of a research conducted at Birmingham University by Mr. H. Denzil Lobley, and the results are given in an article in *The Engineer* for February 9. A special jacketed cylinder was used, and could be supplied with either saturated steam or with steam superheated up to 900° F. The valve could be driven at different speeds by means of an electromotor. The principal conclusions are as follows:—(a) Piston-valve leakage is not responsible for any appreciable amount of the "missing quantity," or the leakage of a well-fitted piston valve is practically negligible. (b) The leakage does not follow the law $K=CP/L$. (c) The leakage diminishes proportionally to the increase of temperature until 500° F. is reached, after which the distortion of the rings causes it to increase. From these results it appears that the piston valve has advantages over the flat slide valve other than those due to the fact that the piston form is balanced. It is probable, and indeed is almost proved by Callendar and Nicholson's experiments, that the great difference in leakage of the two types is owing to the fact that slide valves warp, and thus lift off the face. Warping is eliminated in piston valves, except at high temperatures, and hence the leakage is very small.

MR. FRANK FIELDEN deals with a few problems in bituminous suction-gas plants in *Engineering* for February 9. An examination of the specifications issued by suction-gas plant makers shows that in most cases a good average quality of dry anthracite coal of a certain size is expected to be used, to fulfil the guarantees as to fuel consumption and quality of gas to be produced. There are, however, strong incentives to the engineer to construct a suitable suction-gas generator for the satisfactory gasification of native coals, which have hitherto been unemployable for the purpose. Mr. Fielder summarises the ideal suction plant as follows:—It will consume all the volatile matter contained in the coal in addition to the solid carbon; to effect this, some mechanical feeding of the fuel at a regular rate to suit the load on the engine would seem desirable. Caking coal will be so treated as to prevent arching over, and consequent obstruction to an equable air and vapour supply in the main fuel column of the generator. Suitable facilities will be provided for the effectual removal of ash and clinker without interfering with the quality of gas produced; this is essential for all coal used on extended periods of running. It is, of course, assumed that the ordinary factors will also be considered, such as amount of space occupied, simplicity of construction, minimum amount of attention, and reasonable first cost.

OUR ASTRONOMICAL COLUMN.

THE CHANGES ON SATURN'S RINGS.—From the current number of *The Observatory* we learn that Prof. Todd claims an alternative translation for his telegram (which was in Latin) concerning the changes on, and probable "dissipation" of, Saturn's rings. It is suggested that the term "dissipation" did not refer to the actual rings.

EPHEMERIS FOR BORRELLY'S COMET, 1911E.—In No. 4552 of the *Astronomische Nachrichten* M. Fayet gives a bi-daily ephemeris for comet 1911E extending to May 13. The comet is at present in Perseus (R.A.=3h. 54.8m., $\delta=+45^{\circ} 57'$), and is travelling towards Auriga in a direction slightly north of east; it is, however, very faint, and is receding from both the earth and the sun.

NO. 2207, VOL. 88]

STELLAR SPECTRA IN THE VISUAL REGION.—Although the photographic spectra of many stars have been more or less exhaustively studied in the region more refrangible than H β , the study of the less refrangible region has been restricted, except for a few of the brighter stars, by the lack of sensitiveness of photographic plates in that region. An attempt to remedy the omission appears in No. 4552 of the *Astronomische Nachrichten*, where Dr. Hnatek publishes reductions of the spectra of γ Andromedæ, α Cassiopeiæ, α and γ Cygni, and α Persei in regions less refrangible than λ 4861. The spectra were taken in 1907, for another purpose, by Herren Eberhard and Ludendorff with Spectrograph V. of the Potsdam Observatory; pinacyanol-bathed plates, by Wratten and Wainwright, were employed, but the spectra are still under-exposed.

The reductions are not very exhaustive; for example, Dr. Hnatek gets nine lines in the spectrum of α Cygni between λ 4861 and λ 5316.85, whereas the South Kensington published reduction gives twenty-eight. Further, he gives, generally, Rowland's origins and intensities, which in an "enhanced-line" star do not represent the facts; only occasionally does he refer to the enhanced lines published by Lockyer, and thus at times misinterprets the significance of an origin, or an exceptional intensity, of a line. For each star he has deduced from his measures the radial velocities at certain epochs, which he tabulates at the end of the paper.

STELLAR PARALLAXES.—A second series of stellar parallaxes, determined from meridian transits at the Washburn Observatory, Wisconsin, is published by Mr. A. S. Flint in No. 631 of *The Astronomical Journal*. The observing list consisted primarily of stars between magnitudes 1.5 and 2.5, but some fainter stars were added, and in the final list are given the parallaxes of 124 stars. Among the brighter stars the following large positive parallaxes are given:— β Persei, $+0.130''$; α Persei, $+0.109''$; β Canis Maj., $+0.163''$; α Geminorum (pair), $+0.174''$; γ Leonis, $+0.105''$; β Ursæ Maj., $+0.136''$; α Serpentis, $+0.151''$; and α Ophiuchi, $+0.127''$; while the 3.7-magnitude star ϵ Eridani has a parallax of $+0.379''$ in Mr. Flint's list. A general average of the probable errors of the final parallaxes is $\pm 0.031''$, and after discussing the data in a number of different ways Mr. Flint concludes that the parallaxes given are sensibly free from systematic error.

THE SPECTRA OF COMETS.—The February number of *L'Astronomie* contains an interesting paper in which Comte A. de la Baume Pluvinel discusses the spectra of comets, more especially as revealed by the researches of the past few years.

After briefly summarising the earlier observations, he describes at length the spectrum of the Morehouse comet, and reproduces an excellent comparison showing the close identity of the doublets in that spectrum with doublets occurring in Prof. Fowler's spectrum of carbon monoxide at low pressure.

In conclusion, he points out that to answer the question, "What are comets made of?" would have been comparatively simple, say, a dozen years ago, but to-day the photographic method has revealed so much that was then unknown that the answer is not so easy. The composition of comets is complex, and all comets do not display the same composition. As our knowledge extends still further it may become necessary to classify comets in spectral classes; in fact, this has already been done in a simple fashion. Some comets are essentially gaseous and blue, e.g. Morehouse; others, like the great comet 1910a, are yellow, and contain much solid matter.

THE PARALLAX AND PROPER MOTION OF MIRA.—In No. 44 of the *Mitteilungen der Nikolai-Hauptsternwarte zu Pulkowa* Herr S. Kostinsky discusses at length the parallax observations of Mira made by him during the period 1903-7. The main discussion is printed in Russian, but there is a *résumé* in German, in which the principal stages and results are described.

Among other results, the author finds that the yearly parallax of Mira is probably zero, and in any case does not exceed $+0.05''$. The yearly proper motion in R.A. is extremely small, and in declination is about $-0.235''$.