

21 inches, in diameter, the stroke being 30 inches. Each cylinder is fitted at each end with separate steam and exhaust valves of the drop-piston type. A steam engine uses considerably more steam than is shown by the indicator to be present in the cylinder at any part of the stroke. This loss has been generally attributed to initial condensation, but more recently the belief has been held that valve leakage is responsible for much of the extra steam used. It is hoped that the trials upon this engine may be used to supplement the work done in other laboratories in elucidating this point. Thus the Armstrong College engine has slide valves; the Manchester Municipal School of Technology engines have permitted of work being done upon Corliss, double-beat drop, and slide valves; the drop-piston valves fitted to the new Glasgow engine should therefore afford opportunities of making useful comparisons.

#### OUR ASTRONOMICAL COLUMN.

COMETARY ORBITS.—Messrs. Crawford and Meyer give new elements for Halley's comet in Bulletin No. 179 of the Lick Observatory, based on observations made on September 17 and December 16, 1909, and February 28, 1910. The perturbations due to Mars in January were found to be ineffective, and the time for perihelion is finally given as April 19.67760 G.M.T.

When it became known that other computers found great difficulty in computing an orbit for comet 1910a, Miss Levy and Mr. Meyer, of the Berkeley Astronomical Department, decided to test a method devised by Prof. Leuschner. For this purpose photographic observations secured by Dr. Curtis, with the Crossley reflector, on February 1, 2, and 5, were selected, and a very satisfactory result obtained from the direct solution for an approximate orbit. Other observations were then considered, covering the period January 18 to March 13, and final parabolic elements calculated by the same method. These are given, with an ephemeris, in Bulletin No. 179, and the ephemeris indicates that the comet is still a little west of the Great Square, and is very faint. Observations by Dr. Aitken on April 13 gave corrections of  $-0.9s.$  and  $-4''$ . Elliptic elements for Daniel's comet, 1909e, published by Sturla Einarsson and R. Young in the same Bulletin, give a period of 6.48 years.

Recently published elliptic elements for comet 1910a give periods of 202.6 and 41 years respectively.

MEASURES OF DOUBLE STARS.—No. 175 of the Lick Observatory Bulletin contains the measures of 136 double stars made by Mr. Olivier with the 12-inch and 36-inch refractors of the Lick Observatory. Generally, the stars measured are neglected pairs in the southern hemisphere, such as can be observed from lat.  $38^{\circ}$  N., or pairs which show signs of motion. Eleven new doubles are included, and of the 136 stars observed, 15 are separated by less than  $1''$ , 56 between  $1''$  and  $2''$ , and 30 between  $2''$  and  $3''$ . It is interesting to note that the 12-inch refractor was generally employed, and leaves nothing to be desired as regards definition; a power of either 500 or 625 was always used, and doubles down to  $0.6''$  in distance could be readily measured.

MAXIMUM OF MIRA, 1909.—*Astronomische Nachrichten* No. 4403 contains two notes on the most recent maximum of Mira. The first is by Herr May, of the Kasan Observatory, who finds that the maximum took place on September 9, 1909, the magnitude being 3.14. The second is by Herr Landwehr, Münster, and gives September 4.7 and 3.15 respectively. According to Guthnick's ephemeris, the epoch of maximum was September 6.9, and the magnitude should have been 3.27.

PARALLAX OF THE PLANETARY NEBULA G.C. 4373.—From a photographic determination, Dr. Bohlin finds that the parallax of the planetary nebula G.C. 4373 (H. iv. 37) is  $-0.170'' \pm 0.042''$ , and the correction for the aberration constant is  $-0.043'' \pm 0.042''$  (*Astronomische Nachrichten*, No. 4406, p. 232).

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#### HALLEY'S COMET AND METEOROLOGY.

*Proposed Meteorological Observations during Progress through the Tail of Halley's Comet.*

THE International Commission for Scientific Aeronautics had arranged a series of ascents of kites and *ballons-sondes* for May 11-13, but seeing that it is possible that the earth may pass through the tail of Halley's comet on May 19, the members of the commission have agreed to postpone the ascents to May 18-20. A circular from Prof. Hergesell, the president of the commission, gives particulars of the proposed ascents, the times mentioned being as follows:—May 18, 7 a.m. and 10 p.m.; May 19, 2.30 a.m. and 7 a.m.; and May 20, 7 a.m. Observations should be made at the earth's surface, and *ballons-sondes* should be sent up about half an hour before these times, so that the balloon for the principal ascent should reach its greatest height about the time when the earth passes through the tail of the comet; one ascent should also precede, and one should follow, the principal ascent by precisely similar intervals of time.

Messrs. Assmann and Teisserenc de Bort suggest that it might be possible to carry out ascents of manned balloons as well as of *ballons-sondes*, and it is suggested that the aero clubs of different countries should cooperate in the observations. A letter has also been sent out by M. Teisserenc de Bort describing the apparatus he has designed and used for several years for collecting samples of air from great heights. The use of Aitken's dust counter is recommended in connection with the ascents of manned balloons, and similar observations should be made at the earth's surface. Though it is unlikely that the passage of the earth through the tail of a comet will cause any measurable change of temperature in the upper air, yet it is felt by those engaged in the investigation of this subject that such a rare occurrence should not be allowed to pass without some notice.

#### *Meteors from Halley's Comet.*

Mr. Denning writes:—

"During the first week in May the weather was unsettled and stormy, and Halley's comet could not be well observed, nor could its supposed meteoric shower from Aquarius be suitably watched. Several meteors were seen, however, at places where the sky was clear or partially so, and they were directed from the radiant point of the comet, though no brilliant display of these phenomena seems to have been witnessed in England.

"There is a probability of an abundant display of meteors on the morning of May 19, when the earth may encounter the comet's tail, but this is doubtful. The sky should be carefully watched, however, on the morning named with the view of observing any meteors or peculiar auroral effects that may be visible.

"A rich display of meteors is reported to have been witnessed at Cape Town on the morning of May 7 between 2 and 5 a.m. There was no very active shower seen in England on the date mentioned, and further particulars will be awaited with interest.

"A fireball, presumably connected with Halley's comet, was noticed at Guernsey and other places on the morning of May 3 at about 2.50 a.m. As viewed from the Channel Islands, it had a long path ascending from just under  $\beta$  Pegasi to under  $\beta$  Cassiopeiae, with a duration of four seconds.

"The real path of the meteor was from sixty-seven to forty-six miles in height, and its position over the English Channel from near Dieppe to south-west of the Isle of Wight, and its course, of some 137 miles, was traversed at a velocity of about thirty-four miles per second. This is a slower rate of speed than calculation implies to the Aquarids, but atmospheric resistance evidently moderated the meteor's native velocity. From the south coast of England—especially Sussex and Hampshire—the object must have been a splendidly luminous one, presenting a very long and graceful flight along the southern sky, but I have not hitherto received any observations from this particular part of the country.