

tangentially to the gear blank in the intervals of the reciprocations of the cutter across the face of the blank. This is the principle adopted in the Sunderland generating spur-gear planer, manufactured by Messrs. J. Parkinson, of Shipley, and the article cited contains a fully illustrated description of this machine.

OUR ASTRONOMICAL COLUMN.

COMETS.—*Popular Astronomy* for November contains particulars of the appearance of Wolf's comet during the autumn. On October 15 it was readily visible in a 5-in. finder, with a small central non-stellar condensation of the 12th magnitude.

Prof. V. M. Slipher photographed its spectrum at Flagstaff on August 25 and 26. The spectrum was chiefly continuous, even the strongest cometary emissions being faint; traces were seen of the cyanogen band at 3883, and of the hydrocarbon band at 4737. The spectrum was too narrow and faint to show the solar lines, but it was evident that the comet was shining almost entirely by reflected sunlight. This is not surprising, considering its great distance from the sun.

Mr. Viljev has made the unexpected discovery that the object photographed in September, 1916, which was announced as Encke's comet near aphelion, was not really that comet; there are thus at least three occasions (January, 1908, September, 1916, September, 1917) when a faint object was detected, nearly in the right position for the comet, and with nearly the right motion, and yet proving to have no connection with it. It brings forcibly before us what a large number of unknown faint objects (comets or minor planets) exist in the solar system. Mr. Viljev has taken over the computations relating to this comet that were formerly in Prof. Backlund's hands.

The following ephemeris has been calculated from Mr. Viljev's approximate elements. Perihelion passage will be 1918 March 24.313 G.M.T. E is the eccentric anomaly.

G.M.T. 1918	E	R.A. h. m. s.	Decl. N.	$\log r$	$\log \Delta$
Jan. 1.416	-70	23 0 54	3 24	0.1976	0.2223
6.086	68	23 5 8	3 41	0.1804	0.2221
10.574	66	23 9 44	4 1	0.1627	0.2210
14.880	64	23 14 36	4 23	0.1446	0.2188
19.008	62	23 19 40	4 48	0.1261	0.2156
22.961	60	23 24 55	5 15	0.1070	0.2113
30.357	56	23 35 46	6 11	0.0676	0.2003

UNION OBSERVATORY, JOHANNESBURG.—Circular No. 39 of the Union Observatory includes a series of micrometric measures of Eros made between May 15 and May 28 of the present year, and a discussion of the advantages of ruling star photographs with lines of right ascension and declination, as compared with the rectangular rulings of the Carte du Ciel. Another excellent example of the photographic maps now being issued from this observatory is included with the circular, and it is shown that from these the places of stars can be obtained with an accuracy which will suffice for most purposes. A further list of nearly 200 proper motions found and measured with the blink-microscope is also given; about fifty of them exceed 20" per century, and many of the displacements are towards the solar antapex. Many of the centennial proper motions deduced, and believed to be trustworthy, are under 10", and one is only 3.2".

NEW ZEALAND ASTRONOMICAL TABLES.—For general information, the Government Astronomer of New Zealand has issued a series of astronomical tables calculated for the meridian of the Hector Observatory

(*New Zealand Gazette*, No. 141). They give the sun's apparent right ascension and declination, and the Greenwich mean time at apparent noon, as interpolated from the Nautical Almanac, together with the Greenwich date. With the aid of auxiliary tables previously published, the G.M.T. at apparent noon may readily be deduced for any other meridian in New Zealand, and also the approximate times of sunrise and sunset.

DEVELOPMENT AND USES OF THE STATIC ELECTRICAL MACHINE.

A VERY great advance was made in the earliest form of electricity generator by the late James Wimshurst in the year 1882. At that time several forms of the Holtz and Voss machines were in use, but their behaviour was most erratic, the slightest moisture in the atmosphere rendered them useless, and under most favourable conditions the output of electricity was small indeed.

Wimshurst succeeded in producing a machine that would "excite" with certainty under almost any atmospheric condition, and by combining a number of plates was able greatly to increase the output. Since then many manufacturers of electrical apparatus have attempted to improve upon it and to convert it into a practical and mechanically efficient generator of electricity. The Medical Supply Association has now placed upon the market what appears to be a thoroughly trustworthy and strong British-made machine that will give, at a moment's notice, a continuous and powerful static discharge.

The mechanical construction of the machine is simple and very sound. Special attention has been devoted to the plates, which are of vulcanite. By an ingenious method of construction each plate is formed of three sheets of different qualities; this entirely stops any tendency to warp, and enables the outer surface to be formed of a very good quality brittle vulcanite that in itself would not bear the high speed of rotation. The whole machine is built upon a cast-iron table, and is run by an attached motor or by any other convenient means; it is not covered in any way, as the perfection of construction is such that electricity is generated immediately on rotating the plates even in the dampest weather.

The uses of the machine are very numerous. It has been employed with success in agricultural experiments, where greatly increased plant growth under the influence of the static discharge has been recorded. In electro-therapy its value is fully recognised, and the static discharge is now in constant use in many hospitals. For the production of X-rays the machine has advantages over the induction coil, the current being unidirectional and continuous. For fluoroscopy or screen work this is a great gain, as the image is bright and absolutely free from flicker. Except where very short exposures are necessary, as in the case of instantaneous radiography, it will do the work as well as, or even better than, a coil. The twelve-plate machine is run at 900 revolutions per minute, and gives a good discharge between balls 8 to 10 in. apart; currents from $\frac{3}{4}$ to 1 milliampere can be passed through a suitable tube.

One great convenience of the machine is the complete absence of complicated resistance coils, meters, and other accessories; no electrical knowledge is demanded in its use; it is always ready, and it only needs rotating to produce the current. The cost of running with an electro-motor works out at $\frac{3}{4}$ d. per hour.

The machine can be seen at the rooms of the Medical Supply Association, 228 Gray's Inn Road, London, W.C.1.