other all-important factors governing their production and application.

Engineering for March 5 contains an illustrated description of Lord Chetwynd's electrical steel-purification process, which has been in use for the past eighteen months at the Grimesthorpe Works, Sheffield, belonging to Messrs. Cammell, Laird and Co., Ltd. The steel is manufactured in the ordinary way in the Siemens-Martin furnace, and is then teemed into a special ladle. When teeming steel into a ladle in the ordinary way, a portion of the slag is drawn out with it, and becomes so intermingled with the steel in the ladle that it has no time to separate completely and to rise to the surface before the pouring into the ingot moulds takes place. Lord Chetwynd's process is applied to the steel in the ladle. Two graphite electrodes are made to rest in the layer of slag covering the molten steel in the ladle, and iron electrodes are fitted in the bottom of the ladle. As soon as the graphite electrodes are lowered into the layer of slag an electric current is made to flow through the steel, the effect of which is to raise the temperature of the metal, causing a rotating action throughout the molten mass, with the result that it is freed from the gases and slag particles which it contained in teeming from the furnace. The process lasts about thirty minutes, and the current expenditure is small. Test results show that the process has a marked refining action upon the metal in the ladle.

OUR ASTRONOMICAL COLUMN.

MELLISH'S COMET.—A note in the *Times* of March 10 states that the orbit of this comet obtained by Andersen and Fischer, of Copenhagen, places perihelion passage at about 1 p.m. on July 25 next, the distance being 110 million miles. The comet will remain visible to English observers up to the middle of May, by which time it is likely to be faintly discernible with the naked eye. It now rises about half an hour after midnight, the best time for observation being 5 a.m., when it is a little east of south. Its positions at 5 a.m. on the dates named are as follows:—

	R.A. h.	m.	s.	Decl. °	′
March 12 ...	17	39	26	0	51 N.
16 ...	17	44	16	0	29
20 ...	17	49	5	0	4
24 ...	17	53	50	0	22 S.

THE BRITISH ECLIPSE EXPEDITIONS OF 1914.—The January number (vol. lxxv., No. 3) of the *Monthly Notices of the Royal Astronomical Society* contains the preliminary reports of the various British expeditions which were dispatched last year to observe the total eclipse of the sun on August 21. These reports have now been issued also in a separate pamphlet, and distributed by the secretary of the Joint Permanent Eclipse Committee. Brief accounts of the work of each of these expeditions have already been given in this journal, so attention need only be directed to the handy collective publication mentioned above.

ASTRONOMY IN AMERICA.—With a strong editorial board the National Academy of Sciences of the United States of America has begun a publication of monthly proceedings. These proceedings will be official, and are intended to serve as a medium for prompt publication of brief original papers. It is intended that the papers will be shorter and less detailed than those published in journals devoted to special branches of science, and that they shall, if possible, include an introductory statement of the general aspects of the research, and of its relation to previous knowledge in the same field, so that its significance may be appreciated by those engaged in other branches of science. In the first number (January 15, vol. i., No. 1) astronomy is well represented by the following communications:—The radial velocities of nebulæ, by W. W. Campbell; Preliminary note on nebular proper motions, by H. D. Curtis; Discovery of the ninth satellite of Jupiter, by S. B. Nicholson; Spherical aberration in astronomical objectives due to changes of temperature, by F. Schlesinger; The relations between the proper motions and the radial velocities of the stars of the spectral types F, G, K, and M, by J. C. Kapteyn and W. S. Adams; and, finally, a critique of the hypothesis of anomalous dispersion in certain solar phenomena, by C. E. St. John.

GRUNDSPECTRA OF ALKALI AND ALKALINE EARTH METALS.—A research interesting to spectroscopists is that communicated to the *Astrophysical Journal* for January (vol. xli., No. 1, p. 16), by Mr. Edgar H. Nelthorpe. The work was carried out in the astrophysical laboratory of the Imperial College of Science and Technology, and deals with the observations of the *grundspectra* of alkali and alkaline earth metals. The term *grundspectra* refers to spectra obtained by Goldstein, who used a method by which line spectra of some elements were obtained which were totally different from their arc spectra and could not be arranged in series of the ordinary type. As Goldstein's method appeared in some cases completely to isolate enhanced lines (spark) from the arc lines occurring under the ordinary arc or spark conditions, the author of the present paper has repeated and extended this research, embodying some of the spectra of elements which are represented in stellar spectra. The elements here dealt with are sodium, potassium, rubidium, calcium, strontium, and barium. Mr. Nelthorpe describes the apparatus he employed, and gives the results of each element separately, accompanying them with a series of excellent photographic comparison spectra. The chief conclusion drawn is that the *grundspectra* obtained by Goldstein's method consist essentially of lines which are specially developed in the ordinary spark spectrum. In the case of potassium and rubidium the spectra consist entirely of enhanced lines, but with the calcium group the arc spectrum is not entirely absent.

ELECTRONS IN THE SUN'S ATMOSPHERE.—In a paper communicated to the Tokio Mathematico-physical Society in October, 1914, Prof. H. Nagaoka directs attention to the important part which may be played by calcium in the production of electrons in the sun's atmosphere. In the flocculi so abundant in the photosphere it exists probably as calcium oxide, and the electronic emission of lime when incandescent is frequently utilised in laboratory work. At the pressure of one-tenth of an atmosphere which prevails in the calcium layer about a sun-spot, the electrical conductivity will not be too great to allow of considerable potential gradients which, according to their direction, will establish outward or inward electronic currents of considerable magnitudes. If, as seems most likely, the electric field is directed inwards, the electronic emission will be outwards and the regions of emission will be surrounded by electronic vortices with counter-clockwise rotation. Within the vortices magnetic fields will be produced, and the whole region will possess the properties found to exist in sun-spots. Comparisons of some of the consequences of this theory with observations are, it is hoped, to be carried out by the author and his pupils.