A NEW Diesel marine engine, built by Messrs. Doxford and Sons, of Sunderland, is described in the *Engineer* for December 25. In this engine the complicated cylinder cover casting with its valve arrangements is got rid of by having two pistons in the cylinder working in opposite directions. The upper piston is attached by a piston rod to a compensating arm, which is connected by two rods, one on each side of the cylinder, to two cranks placed at 180° to a central crank; the lower piston is connected in the usual manner to the central crank. The various operations in the cycle take place between the two pistons. The exhaust escapes through ports in the top end of the cylinder; these are uncovered by the upper piston when near the top of its travel. Scavenging air is admitted through corresponding ports at the bottom end of the cylinder; these are uncovered by the lower piston, and ensure a capital flow of scavenging air throughout the whole cylinder. The admission valves are placed at the middle zone of the cylinder. Cooling water is supplied to the lower piston through a rocker arm, and to the upper piston through a telescopic tube; the latter arrangement is open to some criticism on account of the difficulty of preventing leakage.

THE issue of "Hazell's Annual for 1915" is now ready. This is the thirtieth year in which this useful "record of the movements of the time" has been published. Some idea of the number of topics dealt with may be formed from the fact that the index to the volume contains close upon 20,000 entries. As is natural, great prominence is given to facts in connection with the war, but this engrossing subject is not allowed to overwhelm the other matters of importance dealt with in previous issues. A section entitled "The March of Science," runs to about thirty-four pages, and includes a summary of the proceedings at the British Association meeting in Australia, and a *résumé* of progress in scientific research during 1914. We are glad of the opportunity to extend the praise offered in these columns to the trustworthiness and completeness of previous editions of the annual to the present issue, the price of which is 3*s*. 6*d*.

MR. C. BAKER, 244 High Holborn, London, has issued his January list of second-hand scientific instruments which he has on sale or for hire. Particulars are given of more than 1500 pieces of apparatus, prominent among which are numerous microscopes and telescopes and their accessories. Every instrument is guaranteed to be in adjustment, and arrangements can be made for workers in the country to have pieces of apparatus on approval.

OUR ASTRONOMICAL COLUMN.

A REMARKABLE METEOR.—On Tuesday, December 15, at 6h. 25m. p.m., an extremely slow-moving meteor was seen by Mr. W. F. Denning at Bristol, and by Mrs. Wilson at Bexley Heath. It had rather a long flight, and was much brighter than a first magnitude star. The meteor was curious as belonging to a radiant point in Aquarius at about 336°–12°, and at the same position as the July Aquarids. No meteors have hitherto been recorded, so far as is known, from this radiant so late in the year. The object of December 15 last had a height of from sixty-seven to forty miles, its luminous course extended more than seventy miles, and its velocity was fourteen miles per second. The meteor must have been observed by many persons, the night being very clear and the object a very conspicuous one with an extensive trajectory. At the middle of December a well-defined shower of slow meteors from between α and β Persei at $48° + 44°$ was prominently active. This same radiant has been observed at many other times of the year, but never before on December 15 and 16.

PARABOLIC ORBITS OF METEOR SWARMS.—In the Publications of the Leander McCormick Observatory (vol. ii., part 4) a paper on 126 parabolic orbits of meteor swarms is published by Mr. Charles P. Olivier, these deductions being made by him from more than 2800 observations of meteors, the combined work of the American Meteor Society. Mr. Olivier directs particular attention to the excellent work carried on by this society in spite of its youth, and hopes for more ideal methods of work in the future. It may be remembered that the author previously (1911) published a paper entitled "175 Parabolic Orbits and other Results Deduced from over 6200 Meteors," which appeared in the Transactions of the American Philosophical Society, N.S. (vol. xxii., part 1), and the present contribution may be considered practically a continuation of the above, the first radiant here numbered, namely, 177, following serially the radiants given in the 1911 publication.

One of the chief problems of meteoric astronomy is that of stationary radiants, and in many quarters it is considered that many of them exist, while other workers on theoretical grounds look upon them as mathematically impossible except in a few cases. Mr. Olivier attacks the problem by inquiring into the method of the reduction of the radiant points, and concludes that the usual process of combining observations of many successive dates, and radiants which lie sometimes as much as 10° from one another, etc., tend to influence greatly the result. His results, reduced separately for each date, "show almost no evidence of stationary radiation, and so far as they go may be considered to disprove its existence." Numerous interesting tables accompany this paper, among which may be mentioned that containing the 126 parabolic orbits; elements based on eight radiants suggesting these meteors were originally intimately connected with Halley's comet; ten orbits belonging to the main Perseid stream, confirming their connection with comet 1862 III., or Tuttle's comet, and other tables giving the magnitudes of the meteors seen, percentages of meteors of a given magnitude to the totals seen, and their colour and duration.

THE SPECTRUM OF 10 LACERTÆ.—The star 10 Lacertæ (R.A. 22h. 35m., declination $+38° 32'$, magnitude 5·0) displays a spectrum which is conspicuous for the sharpness of the important line at wave-length 4686 and of the other lines of hydrogen and helium. This star is therefore not only suitable for a good determination of its radial velocity, but affords an opportunity of obtaining an accurate measure of the stellar wave-length of the line at 4686 and other lines. Both these objects have been investigated by Messrs. E. B. Frost and Francis Lowater, and the results are described in the *Astrophysical Journal* for October (vol. xl., No. 3, 1914, p. 268). The line 4686 is now generally regarded as a line in the principal series of helium, and the laboratory work of Prof. Fowler has consigned to it the wave-length 4685·90. The line is recorded in the spectrum of the chromo-

sphere with the following wave-lengths:—Lockyer λ 4685·90, Dyson λ 4685·86, and Mitchell λ 4686·00. The wave-lengths which the authors have now deduced from fifteen plates of the star are as follows:—

Frost: 4685·897 ± 0·016 (15 plates).
Lowater: 4685·903 ± 0·018 (15 plates).
Mean: 4685·90.

Other important lines, the stellar wave-lengths of which are here deduced, are λλ 4116·33, 4097·55, and 4089·12, closely approximating to the wave-lengths given by Lockyer in ε Orionis, namely, 4116·54, 4097·59, and 4089·14. With regard to the radial motion of the star, the motion of the system is given as probably −12 km., almost wholly due to the solar motion. From one plate they give the velocities of the two components, but state that the data are insufficient for indicating the period of the star, but "there seems to be little to suggest a period of less than several days."

THE ORBITS OF δ ORIONIS, R.Z. CASSIOPEIÆ AND R.X. HERCULIS.—Nos. 15 and 16 of vol. iii. of the Publications of the Allegheny Observatory describe the researches by Mr. Frank C. Jordan on the orbits of δ Orionis and R.Z. Cassiopeiæ. In the case of the former, thirty-six spectrograms of the star were secured with the Mellon spectrograph during the period 1908 to 1912, and these were used for the determination of the orbit and at the same time to rediscuss Hartmann's results. A comparison of the elements derived shows that the shape and size of the two orbits are practically identical. The radial velocity of the system has different values in the two derived orbits, but this difference is stated to be apparent rather than real. If, however, it should be proved to exist, the author states that "it would imply a third body, making the system similar to that of Algol." R.Z. Cassiopeiæ exhibits a light variation of an Algol-type star, and Mr. Jordan summarises the various values of the period derived by previous workers. The earliest spectrographic observations of the star were made in 1906 by Hartmann, and while he found a velocity range from +33 to −112 kilometres, this agrees well with the range of the definitive curve here given, namely +28 to −111 kilometres. For the present discussion seventy-one plates were employed, taken during the years 1910 to 1913, and tables are given showing the velocities deduced from each plate, the wave-lengths and origins of the line employed, etc.

Mr. Harold Shapley, in the *Astrophysical Journal* for November (vol. xl., No. 4, p. 399) contributes a paper entitled "The Spectroscopic Orbit of R.X. Herculis Determined from Three Plates with a New Photometric Orbit and Absolute Dimensions." He shows that the solution for the elements of the spectroscopic orbit of a faint star is possible when only a few measures of the radial velocity have been determined, provided that the system is an eclipsing binary and that the period, epoch of minimum, eccentricity, and longitude of periastron have been derived from the light curve. In his summary he states that the new photometric orbit of R.X. Herculis has been computed from unpublished observations obtained at Harvard and Princeton. The alternate minima are found to differ in depth by nearly a tenth of a magnitude. The stars are nearly equal in size, and are sensibly spherical. Their surfaces are separated by three times the radius of the larger star. From measures of lines on three plates it has been possible to derive very satisfactory spectroscopic orbits of both components. The combination of elements from the photometric and spectroscopic orbits gives the actual dimensions of the stars. The parallax of the system is found to be 0·006″.

AGRICULTURE AND THE WAR.

AT the half-yearly meeting of the Agricultural Education Association, just held in London, a discussion was held upon "Agricultural Products Deflected by the War." The chairman of the association, Prof. Somerville (Oxford University), presided, and there was present a large gathering of members, including Sir Patrick Wright (Board of Agriculture for Scotland), Mr. J. F. Blackshaw (Board of Agriculture), Prof. Barker (Bristol University), Profs. Seton and Crowther (Leeds University), Prof. Gilchrist (Armstrong College, Newcastle-on-Tyne), Dr. Goodwin (Midland Agricultural College), Drs. Russell and Hutchinson (Rothamsted), Prof. Hendrick (Aberdeen University), Prof. Bryner Jones (Aberstwyth), the hon. secretary, Mr. P. Hedworth Foulkes (Harper Adams Agricultural College), and others.

We give a summary of the remarks made by Dr. Russell, director of the Rothamsted Experimental Station, in opening the discussion:—

The object of to-day's discussion is to see how agriculturists are likely to be affected by the dislocation caused by the war, and what line we, as expert advisers to the farmer, ought to take. There can be no doubt about the main duty of the farmer in the present crisis. He must by all means in his power increase the saleable output from his farm, particularly of those things which the community needs most—a need which is expressed by an increase in price. In framing this advice it must be remembered that the ordinary unit of time for the farmer is the length of the rotation, but in these special circumstances the unit might well be altered to the duration of the war. Thus a scheme which would usually be condemned as bad husbandry from the ordinary rotation point of view might nevertheless be advantageous in the new conditions.

Roughly speaking we may classify the agricultural products affected by the war into two groups: those which are permanently affected, and those which are only temporarily affected. Correspondingly there must be two methods of ascertaining their value to the farmer: careful investigations for permanent purposes, and more rapid and necessarily less accurate trials for temporary purposes.

Palm nuts are fortunate in coming within the purview of the West African Committee, under the guidance of Sir Owen Phillips, and thanks to their enterprise all of us here have been duly informed of the character of this product, while a number of experiments have been put in hand to test its possibilities for British agriculture. For permanent purposes a full investigation is required, and will, of course, be given. Continental experience has shown that the material is good; at the same time we know that it has been put on the market before, and it did not take permanent hold. Apparently no serious fault was found with it, yet it never became part of our regular concentrated food for stock. There must be a reason for this, and the object of the investigation will be to ascertain what it is.

Other products of like nature are no doubt available or will become so—and will probably form the subjects for investigation. But there is an emergency problem that is quite different in nature and wants altogether different treatment. We have seen during the last five months a marked rise in the price of cereals. This is an expression of the fact that the community wants these particular goods, and the farmer must do his best to supply them. Now many farmers do not grow their winter oats entirely for sale. Part—often the greater part—of the stock is kept back for their own horses. Much food also is produced for stock. The important emergency