jacket surrounding the exhaust pipe. To ensure rapid cooling, the exhaust gases are led through Serve tubes. The water jacket is formed by the space between the Serve tube and an external tube of slightly greater diameter; the annular space is kept small in order to obtain a high velocity of flow in the circulating water. Thermometers are inserted in suitably packed pockets. The whole apparatus is exceedingly simple and inexpensive to construct, being built up of standard pipe fittings, and should prove a useful addition to the testing appliances of an engineering laboratory or of a works' test plate; the otherwise troublesome operation of determining the heat wasted in the exhaust gases may be easily performed by its use.

We learn from *The Engineer* for June 7 that rapid progress is being made with the leviathan dock at Liverpool, and that it is hoped to complete the work in the summer of 1913. This dock is 1020 ft. long —nearly 140 ft. longer than the *Olympic*—and has an entrance 120 ft. wide. The structure of the dock is to be such that it will be available when required as a graving dock for overhauling and repairing the largest steamers likely to be met with for some years. The entrance will be provided with a sliding caisson having a clapping face on each side, so as to maintain the water in the dock or exclude it therefrom according to the duty required. The caisson is 134 ft. in width. The dock walls are 60 ft. high, and are practically complete. For emptying the dock, five sets of centrifugal pumps with Diesel engines will be installed. These will be capable of emptying the contents of the dock, amounting to about seven million cubic feet of water, in two and a half hours.

Several new editions of scientific works have been received recently. These include a second edition of Prof. A. G. Webster's "The Dynamics of Particles and of Rigid, Elastic, and Fluid Bodies," published by Mr. B. G. Teubner, of Leipzig, and Messrs. Williams and Norgate, in London, at the price of 14*s*. net. This edition is substantially identical with the first, except that a few errors have been corrected. —A second edition of Prof. E. C. C. Baly's "Spectroscopy" has been issued by Messrs. Longmans, Green and Co., at the price of 12*s*. 6*d*. In it Prof. Baly has given a *résumé* of the salient points of the more modern work, and has provided useful lists of references.—Messrs. Hazell, Watson and Viney, Ltd., have issued a ninth edition of "The Dictionary of Photography," by Mr. E. J. Wall, which has been edited by Mr. F. J. Mortimer. The book has been completely revised and brought up to date, and nearly a hundred pages of new matter have been added. The price of the new edition is 7*s*. 6*d*. net.—A sixth edition of Miss M. N. Oxford's "Handbook of Nursing" has been published by Messrs. Methuen and Co., Ltd., at the price of 3*s*. 6*d*. net. This work has been entirely revised, and in the work of revision the author has had considerable expert assistance.—From the same publishers we have received a copy of the ninth edition of Sir Oliver Lodge's "Man and the Universe," which can now be obtained at 1*s*. net.

OUR ASTRONOMICAL COLUMN.

Nova Geminorum No. 2.—The more salient features of two series of spectrograms taken at the Pulkowa Observatory (March 15–18 and March 25 and 26) are described by Dr. Tikhoff in No. 2, vol. v., of the *Mitteilungen* of that observatory. The scale was small, 6·3 mm. from Hβ to Hε, but the negatives clearly disclose the extraordinary changes which took place in the spectrum of the nova. By employing different plates and filters, Dr. Tikhoff secured negatives giving the whole spectrum from Hα to Hη, and he states that on March 15 the characteristic feature was a series of intense absorption lines, both broad and narrow, the bright lines being but little brighter than the intense continuous spectrum. He classifies the spectrum as lying between types F and G. On March 16 the continuous spectrum generally had diminished considerably in brightness, except in the ultra-violet, where it was brighter and extended to about λ3600; the absorption bands of hydrogen were scarcely visible on this date, although H and K were very strong and the bright bands of hydrogen very intense. The striking features on March 25 were the reappearance of the absorption bands and the strong continuous spectrum.

During the two periods of observation two analogous series of changes occurred in the spectrum, such as might be produced, Dr. Tikhoff imagines, by the shattering of successive absorbing envelopes by fresh outbreaks of incandescent gases from the central mass.

Prof. Belopolsky, in the same *Mitteilungen*, gives, in great detail, the measures of the structure of the various H, Ca, He, and N (?) lines, from which he deduces the radial velocities and possible physical conditions of the emitting masses.

The Minor Planet 1911 MT.—From a note in *The Observatory* (No. 449, p. 243) we learn that the elements for the orbit of the exceedingly interesting asteroid 1911 MT., calculated by Messrs Haynes and Pitman, are, as shown by the observations, fairly accurate. The planet has a period of about 2·6 years, while its perihelion distance is about the same, 1·15, as that of Eros, but the eccentricity of the orbit is nearly twice as great. The next opposition will take place in March, 1913, but the planet's magnitude will then be 17 or 18; most of the oppositions take place when the planet is near aphelion, and are therefore unfavourable for observation. According to amended elements published by Prof. Franz, in No. 4575 of the *Astronomische Nachrichten*, the orbit is like that of Eros, but the planet approaches even nearer the earth than does the famous object discovered by de Witt.

The Spectrum of P Cygni.—Discovered by Janson in 1600 and observed as a third-magnitude star, by Cassini, for a short period in 1655, the star P Cygni has for more than 230 years remained at nearly constant magnitude, 5·0, and its spectrum still requires adequate explanation. Prof. Frost, dealing with it in a paper published in No. 4, vol. xxxv., of *The Astrophysical Journal*, offers some interesting points for consideration.

Among other things he finds that in recent years the spectrum has remained practically constant, that the apparently large displacements of the dark companions to the bright lines are spurious, being produced by the obscuration of their less refrangible portions by the bright lines, and that there is a difference of 70 kms. between the radial velocities of the dark- and bright-line systems. The lines of H, He, O, and N are represented both as emission and absorption, while Ca and Si present dark lines only;

there are numerous bright and dark lines as yet unidentified. The spectrum somewhat resembles those of novæ in the early stages, but the lines are narrower, and the enhanced lines, such a prominent feature in what has been called the "typical" nova spectrum, are comparatively few. From the dark silicon lines Prof. Frost finds a practically constant radial velocity of −82 kms., which is, however, not shared by the narrow, dark calcium line at K. Mr. Merrill has found bright companions to the silicon lines on spectrograms taken at the Lick Observatory, so that Prof. Frost's value of −82 kms. may prove to be too large. If hydrogen and helium radiations behave under pressure like those of metallic vapours, the observed displacements would indicate a pressure of something like 200 atmospheres in the emitting mass, with normal pressures in the absorbing layers.

SECONDARY OSCILLATIONS IN RADIAL-VELOCITY CURVES.—In quite a number of cases the velocity curves derived from the spectroscopic examination of binary systems have shown a secondary oscillation suggesting a departure of the orbit from the true elliptical form, such as might be caused by the presence of a third body, but some doubt has always remained as to the objective reality of such departures.

In an attempt to settle this question, Dr. Schlesinger studied the spectrograms of 30 H Ursæ Majoris, especially taken on fine-grained plates; this star has provided a typical example of the secondary oscillation. He found that the sharp K line did not exhibit this peculiarity, and concludes that the secondary oscillation is only apparent. Possibly the inherent difficulty of measuring the broader hydrogen lines introduces a systematic error which has been insufficiently reckoned for when apportioning the weights to the various measures (Publications of the Allegheny Observatory, Nos. 15 and 16, vol. ii.).

CONGRESS OF UNIVERSITIES OF THE EMPIRE.

IT is surprising to learn that the Empire boasts, at the present moment, fifty-four seats of higher education entitled by Charter or by Act of a Colonial Legislature to the style of university. Advisedly we write, at the present moment. Last summer Queensland and Hong Kong added two to the list; the University of Western Australia came into being on January 1; those of Calgary and British Columbia are still younger. It is the age of universities. When the Victorian Universities of Manchester, Birmingham, Liverpool, and Leeds made their appearance they were viewed with considerable misgiving from Oxford and Cambridge. The older universities feared lest they should suffer severely from the competition. The number of their students and their efficiency have increased as rapidly as their rivals'.

British universities, whether at home or overseas, have developed in every case along natural lines. None has been planted in a community by the State or by a wealthy benefactor, fully equipped and staffed. Each has commenced its embryonic life as a college—the beginnings of the ancient universities can be but dimly discerned—and has passed through a larval stage as a university college before it received its degree-giving powers. In its adult form it has adapted itself with remarkable ingenuity to its particular environment. As compared with those of the Continent and of America, British universities are characterised by their idiosyncrasies. Very justly, they are extremely jealous of State interference with its inevitable tendency towards uniformity of pattern.

If this capacity of adaptation be the genius of our universities, if each must work out its own constitution, define its aims, devise methods proper to its sphere of work, "Why," it may be asked, "summon the universities in parliament?" This question may be answered, if on no higher ground, by assuming that the discussions of their delegates will make for economy of time and labour. Underlying their diversities, there is much that is common to all seats of learning. Conference and comparison of experience will clear the mind of many misapprehensions, and, focussing attention upon matters of immediate importance, will reveal the way in which difficulties have been or may be dealt with. Every teacher who takes an active share in academic life groans under the intolerable burden of "university business." Time and thought which might be devoted to research are absorbed on a lavish scale in the drudgery of keeping the university machine up to date, mending and modifying, not driving it. If a man-hour be taken as the unit, fifty units of intellectual energy wasted daily is a moderate estimate for one of the larger universities. It may be predicted that during the four days' session of the congress some progress will be made towards settling policies which would take a longer time to formulate if considered by each university as a problem peculiar to itself.

There are many forms of academic activity which, for their effective promotion, demand cooperation. For some the discovery of a common path is needed; others require that the several universities agree to diverge. The ever-present question of a satisfactory test of fitness for admission is an illustration of the former class of problems. At what stage of training should a lad be allowed to follow special studies? How are we to ascertain whether the gymnastic of the school has rendered his mind sufficiently strong and agile? When may he cross the frontier which separates school from university? The congress will endeavour to delimit the adjoining provinces, and incidentally to introduce a scientific boundary line—to agree upon a parallel which may be crossed at any point. Schoolmasters will be very grateful if it simplifies their task, reducing in some degree the complexity of the arrangements necessary for the teaching of their higher forms. Their work is confused at present by the bewildering variety of entrance tests for the different universities, the professions, and the public services.

As an illustration of the subjects of the second category proposed for discussion, we may cite "specialisation among universities." It is impossible, nowadays, to make adequate provision for advanced work in all subjects at any single institution. Some tendency to specialise is the characteristic mark of every vigorous university. Uniform distribution of effort is proof of mediocrity. It is unmistakable evidence of the absence of any teacher whose fame attracts students, whose learning fits him to be leader of a School. Universities which have teachers of renown concentrate, almost unconsciously, upon the branches of study which they represent. Local surroundings also point the way to specialisation. It is eminently desirable that universities should foster the sciences upon which depend the industries of the districts which they serve. Specialisation at once raises a further question. It is in the interests of scholarship that a senior student should find his way made easy to a university of high repute in the subject of his choice. Every inducement should be held out to him to seek a famous School. Free trade in students ought to be a governing principle of the Empire. Yet many artificial barriers still remain. However undesirable it may be that undergraduate