

vapour, and a cyclic process was traced. The water vapour attacked the heated filament, producing a volatile oxide of tungsten and atomic hydrogen; the oxide which became deposited on the bulb, was again reduced by the hydrogen, leaving metallic tungsten and forming water vapour, which again attacked the filament. Even when practically every trace of water vapour was removed, however, a certain blackening of the bulb still occurred, and this was eventually found to be occasioned by evaporation of the metal. To overcome this, nitrogen or some other inert gas is introduced into the bulb at about atmospheric pressure, and this is one of the features of the new lamp.

This, however, introduced another effect. The filament is more rapidly cooled by the convection currents induced in the gas, and in consequence more energy is required to maintain the temperature. With filaments of large diameter this is of less relative importance, but with filaments of the usual size the loss was found actually to reduce the efficiency in spite of the higher temperature, as the small filaments are cooled relatively more rapidly by the convection currents. As a result the high-temperature half-watt lamps are only made in large sizes—from 600 c.p. upwards—and in order to diminish this cooling effect the filaments are constructed in the form of a helix of very small pitch. Last week's issue (January 15) of *Electrical Engineering* is devoted largely to the new lamp, and the opinions of leading central station engineers in various parts of the country upon it are quoted.

THE ASSOCIATION OF PUBLIC SCHOOL SCIENCE MASTERS.

THE annual meeting of the Association of Public School Science Masters was held at the Imperial College of Science and Technology on January 13-14. The president, Prof. H. B. Baker, F.R.S., in his address, extracts from which are given separately in this issue, regretted that so few science masters were engaged in research, and suggested that the interest of boys would be stimulated by the thought that such work was being carried out in the laboratory attached to their own school. Mr. C. E. Ashford (Dartmouth), in seconding a vote of thanks, disagreed with this view, and, speaking as a headmaster, maintained that it was of greater importance for a schoolmaster to spend his spare time in the playing fields getting to know his boys than it was for him to be undertaking research in the laboratory.

On the afternoon of the first day an interesting demonstration of the application of the gyroscope to mono-rail traction was given by his Excellency Monsieur Pierre Schilowsky, who exhibited a model of a new and improved form of the appliance he has recently invented. Mr. H. O. Hale (Oundle) read a paper upon agricultural experiments in public schools; he urged that agricultural research was well within the capacity of the average boy, and was more real than most of the "mock research" carried out in the chemical laboratories. The idea is excellent, and many of the results obtained were of considerable interest; it was, however, rather disappointing to find during the course of the subsequent discussion that much of the work, and even of the observations, were made for, instead of by, the boys themselves: the impression left being that, although the "experiments" afforded the foundation of a useful future hobby, they did not, under the conditions which prevail at present, provide a basis for a scientific education.

Wednesday morning was occupied by a discussion upon the "Present Condition of Science Teaching in Public Schools," which was opened by Dr. E. H. Tripp (Bedford) and Mr. J. R. Eccles

(Holt). Dr. Tripp deplored that the pamphlet published by the Board of Education in 1906 referred to a few only of the public schools, and that its aim was to state facts rather than to make suggestions; he urged the need of a fresh report which should not only state the conditions under which science was taught in all schools represented by the Headmasters' Conference, but should contain expressions of opinion from external authorities, e.g. university teachers and employers of ex-public school boys engaged in scientific occupations. He maintained that the chief drawbacks to progress in science teaching were (a) the undue preponderance of literary headmasters; (b) the conservative influence of the older universities; and (c) the evils of the present examination system. The address was chiefly of a destructive nature, and the subsequent discussion, although well maintained, was less fruitful in producing constructive proposals than in pointing out the defects of the existing system.

The discussion opened by Mr. D. Rintoul (Clifton) upon the "Place of Acoustics in a School Course of Physics," fell rather flat, owing, probably, to the unanimity of the members in considering that, whilst acoustics afforded a valuable introduction to the study of the wave theory, the difficulty in devising suitable laboratory exercises made it educationally the least valuable branch of physics. The most useful suggestion was that made by Mr. G. F. Daniell, that the determination of the velocity of sound in various gases might be introduced into the ordinary work of the chemical laboratory; he urged that if this were done something would have been accomplished towards breaking down the watertight compartment which too often separated chemistry from physics.

Mr. H. A. Wootton (Westminster) read a paper upon the "Relative Educational Value of Physics, Chemistry, and Biology," maintaining that chemistry, when properly taught, was the most useful subject. During the discussion which followed the paper it was pointed out that it was impossible to teach chemistry without also giving considerable instruction in physics, and several speakers urged that organic chemistry should be commenced at an earlier age than is at present the practice.

At the business meeting, Sir William Osler, F.R.S., Regius professor of medicine at Oxford, was elected president of the association for 1915.

SCIENCE IN THE PUBLIC SCHOOLS.¹

ONE of the chief difficulties which besets a science master is that few of his colleagues will have sympathy with his work. There are some, but I am afraid not very many, classical scholars who have some knowledge of studies which are so different from their own, but, too often, there is actual hostility on their part to science subjects, and since the first years of a boy's life are usually under the charge of a classical master, there is often instilled into his mind a contempt for the subjects which may be useful to him in his after life.

In most schools which I know, there is a system of selection of the boys by which those of the best ability are induced to continue on the classical side. It is, with comparatively few exceptions, only the weaker boys, or those whose ability has escaped notice, who are allowed to make science their chief study. But, in spite of this fact, which is known to most schoolmasters, how often is it triumphantly declared that a boy who has been educated on the classical side of a school is superior to one brought up on the science side? I wish, for just one year, that the science

¹ From the presidential address delivered to the Association of Public School Science Masters on January 13 by Prof. H. B. Baker, F.R.S.