"(7) The cause why it is right for the law to be closed for nine days after the calends of winter, and nine days after the feast of St. Bridget to be open: is to avoid closing the law on one day: and the same manner, nine days after the calends of May to be closed, and nine days after August (footnote, the 'Calends of August') to be open: to avoid opening the law on one day likewise.

"(8) Whoever willeth to institute a suit for landed property let him do it when he will, from the ninth of the calends of winter forwards, or from the ninth of May, because those are the times the law is open for landed property."

Anyone conversant with the evidence given in Sir Norman Lockyer's "Stonehenge" as to the May-August-November-February arrangement of the year that once prevailed in this country, and the articles in NATURE by the Rev. John Griffith, of Llangynnwyd, showing that the Gorsedd of the Welsh bards is a May-November stone circle, will not fail to appreciate the confirmatory evidence contained in the above quotations from the Laws of the tenth century. It is conclusive proof, we take it, that the May-November year was the only division of time recognised for legal purposes at the time of Howel Dda. It must be remembered, also, that there is no evidence to show that these Laws were creations of the tenth century, but simply records of customs from time immemorial.

While the Venedotian Code of the Laws gives the May-November division complete, the Demetian and Gwentian Codes, which are of slightly later date, in one or two instances mention solstitial dates as the proper time to "plead." For instance, the Demetian Code has:—"There are two days, that is, the ninth of December and the ninth day of May, whereon it is right to commence proceedings as to the inheritance of land by kin," &c. The bardic literature of the sixteenth century onward, discussed by Prof. J. Morris Jones, mentions only the solstices and equinoxes as the proper times to hold Gorsedd meetings.

Did the bards have access only to the later codes, and therefrom take their Gorseddic instructions? The Rev. John Griffith in NATURE, May 2, 1907, directed attention to the interesting fact that the plan of the May-November Welsh Gorsedd preserved by Iolo Morganwg was accompanied by instructions applicable only to a solstitial Gorsedd. The full history of this plan has not yet been found out, but we would suggest that the solstitial instructions became attached to the May-November plan by quarrying in the wrong sections of the Laws. The Venedotian Code contains the instructions proper for holding a May-November Gorsedd; they correspond with the stone-circle plan preserved by the bards, while the bards have failed to preserve a stone circle to correspond with the solstitial instructions.

Sir Norman Lockyer found evidence at Stonehenge that the solstitial replaced the earlier May-November cult, and in Welsh bardic traditions we have to this day evidence of this struggle. We have references to the solstitial and the May-November years. They seem to have got mixed up by the blunderings of the bards. The Gorsedd plan as preserved, and followed this week in London by the Welsh bards, and the corresponding enactments of Howel Dda's Laws, especially the Venedotian Code, represent the older arrangement, while the several references in the Welsh Triads to Stonehenge as one of the mighty deeds of the Cymry, the solstitial instructions about holding a Gorsedd, and the great desire of present-day leading Gorseddites to hold a meeting at Stonehenge, represent the newer arrangement that prevailed until the coming of the Julian year.

While we have no excuse to offer for the present-day ritual of the Gorsedd, we would plead for a re-consideration of the whole question in the light of recent discoveries. The Welsh bards have been "guilty" of saving an obsolete institution from oblivion. The control of bards was, perhaps, only one function belonging to the Gorsedd of ancient times. Long before the fifteenth century all its functions, except the control of the bards, had been taken over by the secular and ecclesiastical administrative courts of England and Wales. In the records of the tenth century there were at least four Gorsedds, suggestive of peculiar administrative power, and on the analogy of the development of institutions in every country it does not require a very great effort of the imagination to see that in the long ago in this country there was but one Gorsedd, from which emanated the directing influence of a whole people.

W. GRIFFITH.

SCIENTIFIC WORK OF THE INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

IN reviewing the general nature of the papers communicated to the seventh International Congress of Applied Chemistry it may be observed that the tendency has been to discuss matters relating to the general improvement in the various chemical industries during recent years rather than to contribute the results of original researches. By far the greatest number of original papers before the congress were read in the section for organic chemistry, but the official order of the sections is here maintained.

In the section for analytical chemistry much stress was laid by various speakers on the general classification of the purity of marketable chemical reagents. Thus Dr. J. T. Baker proposed that all chemicals should be sold with a label stating the percentage of impurity present. The term "chemically pure" was described as liable to lead to confusion, since absolute purity is in all cases impracticable. The General Chemical Company of New York communicated improved methods for the estimation of small amounts of arsenic existing as impurity in sulphur and sulphuric acid. Messrs. Gardner and Hodgson described a method for the rapid estimation of phenols, based upon the action of iodine upon this class of substances. Prof. Chesneau gave an account of his work on the estimation of phosphorus in iron and steel, which indicated that the phosphorus is completely precipitated as ammonium phosphomolybdate only under definite conditions of concentration of the reacting substances, and that this precipitate, which is not a chemical compound, but a definite mixture of ammonium phosphomolybdate and molybdate, should in all cases be washed only with pure water. Papers on the estimation of creatinine were communicated by Mr. F. C. Cook and by Mr. A. C. Chapman. The effect of the creatinine in alkaline solution is to cause reduction of the picric acid to picramic acid, and errors of analysis are liable to be produced by the excessive reduction of the picric acid to colourless tri-amido phenol. A new form of electrode for electrolytic determination of metals was advocated by Mr. J. W. Turrentine. This was composed of graphite which had been impregnated with paraffin wax, and gave results as accurate as those obtained by the use of platinum electrodes.

In the section for inorganic chemistry Dr. Forster Morley read a paper recommending authors to index all communications to scientific journals according to the system employed for the International Catalogue of Scientific Literature. This procedure would considerably lighten the labour of the regional bureaux. Papers on the decomposition of Portland cement by sea-water were read by Prof. Le Chatelier and by M. J. Bied. It was shown that the stability of cements towards sea-water is increased by the addition of puzzuolana. A review of the chemical nature of puzzuolana was contributed by M. R. Feret. Dr. George Harker gave an account of the methods of fire extinction in ships and enclosed spaces by means of flue-gas.

In the section for mining and metallurgy the greater portion of the communications dealt with purely technical points. Mr. C. W. Bannister reviewed the processes for extraction of zinc from its ores, and discussed the losses of this metal during distillation, recommending the employment of carbonaceous filters to prevent the admission of oxygen and to prevent the condensation of lead vapour with the zinc. Prof. R. Schelle described the production of pure tellurium from its ores. The finely powdered ore was fused with soda and sulphur, with formation of the sodium sulphide compound of tellurium. On treatment of the aqueous solution of this compound with sodium sulphite, a grey precipitate of the pure metal was produced. M. C. F. Jarl gave an account of the quarrying

of cryolite, which occurs in quantity only in south-west Greenland. After a rough hand-picking, the mineral is shipped to Copenhagen, where it is purified. It is at present employed as a constituent of a leadless glaze and for the electrolytic production of aluminium. Dr. C. H. Desch read a paper on eutectic alloys, and discussed the suggested method for predicting the position of the eutectic point. Flavitzky's rule was shown to rest upon an insufficient theoretical basis.

In the section for organic chemistry the great majority of the papers read were of importance in their technical bearing, but a certain number dealt with subjects of theoretical interest. On Friday, May 28, all the papers read related to hydrocarbons and their simple derivatives. Dr. M. Z. Jovitchitch communicated the results of his experiments on the action of the silent electric discharge on ethylene and acetylene. The remarkable statement was made that in all cases the analyses of the total resultant products showed a deficiency in carbon, always above 10 per cent. and often so great as 20 per cent. Moreover, when these products were allowed to stand in open vessels the carbon content was observed to rise, sometimes to the extent of 5 per cent. These substances were found to fog photographic plates through the dark-slide, and were therefore considered to be radio-active.

Dr. Gustav Koller gave an account of the chlorohydrocarbons produced by the action of chlorine on acetylene under the influence of ultra-violet light. The utility of these substances as non-inflammable and non-explosive solvents for fat extraction and other purposes was emphasised.

On Saturday, May 29, the communications in the section for organic chemistry dealt with the chemistry of naturally occurring hydrocarbons, such as the terpenes, with cellulose, and with the synthesis of alcohols. With regard to the chemistry of cellulose, Prof. Wichelhaus described the formation of pure phenol during the destructive distillation of cellulose, no other phenols being detected. In reference to the mercerisation of cotton, Dr. Vieweg dealt with the action of cuprammonium solutions on cotton cloth. The mercerising effect was found to decrease with rise of temperature. Dr. Hübner stated that caustic soda lye of specific gravity 45° Twaddell caused the maximum degree of mercerisation. Prof. Knecht gave an account of the action of certain dicarboxylic acids on cellulose. When cellulose is treated with oxalic acid, formyl cellulose is produced by loss of carbonic acid. Similarly, malonic acid and its derivatives yield acetyl cellulose and the corresponding acyl derivatives of cellulose. With succinic and glutaric acids this effect is not produced.

On Monday morning, May 31, the subjects under discussion in the section of organic chemistry were colloids, fatty acids, &c., paints and varnishes. Mr. H. R. Procter discussed the structure of organic jellies, advocating the view that jellies consist of a solid solution of the solvent in a network of colloid molecules. Doubt is cast upon the justice of a distinction between colloidal and "true" solutions, the difference depending merely upon the size of the molecules or molecular aggregates. Prof. Haller, of the Sorbonne, read a paper on the alcoholysis of certain esters. The esters, on being heated with a 1 per cent. solution of hydrochloric acid in methyl alcohol, were quantitatively converted into the corresponding methy esters. This method was found to be especially applicable to the case of fats, glycerine and the methyl ester of the fatty acid being produced. In another paper the same author gave an account of the action of ozone upon the methyl ester of ricinoleic acid. Results somewhat different from those obtained by Harries and Thieme were observed. M. Jean B. Senderens described a new method of pre-

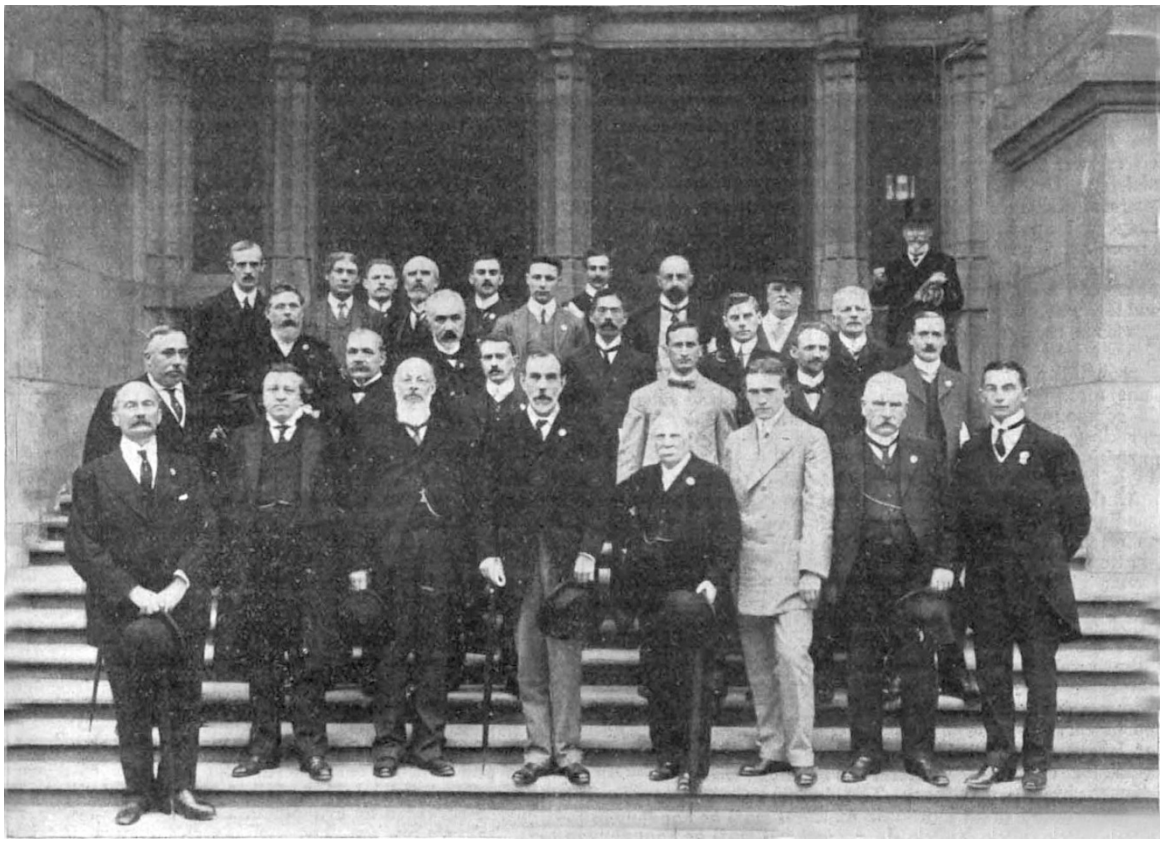

Photo.] [*Dover Street Studios.*

Section I, Analytical Chemistry, of the International Congress of Applied Chemistry.

paring ethyl ether. The vapours of the alcohol were passed through a tube containing gently ignited precipitated alumina at a temperature not exceeding 260° C. Quantitative yields of ethyl ether in a high state of purity were obtained. Above 260° the ether itself was dehydrated, with formation of ethylene. In the case of methyl alcohol, methyl ether was formed even at higher temperatures.

On Monday afternoon a joint meeting of the section of organic chemistry with the section for colouring matters was held for the discussion of fluorescence and colour in relation to chemical constitution. Dr. Kauffmann advocated an extension of the "auxochrome" theory to account for fluorescence. Analogous terms, such as "fluorogen," "fluorophore," "luminophore," "luminogen," were suggested. Contributions to this theory were adduced by Dr. Ley. A theory of selective absorption as conditioned by conjugate linkage was advanced by Dr. Hewitt. This theory is founded on considerations of the atomic attractions produced by changes in dynamic conditions. With increase in the number of conjugated double linkages in a chain the oscillation frequency is diminished, although the atomic forces involved in the dynamic change are not increased in proportion to the number of double linkages. Other contributions to the theory of colour were introduced by Prof. Green, Dr. Morgan, and Dr. Mascarelli.

On Tuesday morning, June 1, papers on miscellaneous subjects were communicated to the section of organic chemistry. Dr. E. Biilmann stated that only two stereoisomers of cinnamic acid were known, namely, the ordinary variety and an iso-acid, which, however, is trimorphous. The ordinary variety was shown to be fumaroid, while the iso-acid was the maleinoid form. Description of the refractometric determination of the solubility of ethyl ether in water was given by Mr. Y. Osaka, and the existence of gaseous compounds of carbon and nitrogen other than cyanogen was discussed by M. A. P. Lidoff, who asserted the probability of the existence of a gas "oxan," CNO. In the afternoon of the same day the contributions dealt with compounds of therapeutic interest. Dr. Power gave a striking account of his exhaustive researches on the composition of jalap, and showed that the products obtained from jalap resin are all mixtures of indefinite constitution. M. A. Guyot described several new syntheses of vanillin, depending on the condensation of aromatic compounds with esters of ketonic acids, such as mesoxalic acid, with formation of the corresponding carbinols. The relations between physiological action and constitution of certain series of compounds were discussed by Dr. Jowett, who pointed out the uncertainty of predictions as to the effect on the human organism. M. F. Garelli gave an account of the production of soaps by the interaction of fats, sodium chloride, and ammonia, which, if practicable on a commercial scale, may prove to be of great industrial importance.

A large number of papers were contributed to the section for colouring matters, and many were discussed at length by the meetings. The dyeing effect of dyes in aqueous solution upon inorganic matters, such as sand, was described by Mr. Dreaper. It was shown that basic dyes were absorbed to a greater extent than acid dyes, while the addition of salt caused a considerable increase in the dyeing action. The decolorising action of various forms of charcoal was discussed by Prof. Knecht, who pointed out that the absorptive power depended entirely upon the amount of organic impurity present in the charcoal, and that the purer the sample the less absorbent action is observed. The same author, in a joint paper with Mr. Batey, adduced evidence, based upon conductivity and ebullioscopic determinations, to prove that certain dyestuffs do not behave as colloids in aqueous solution. M. L. Vignon gave an account of his experiments in relation to the theory of dyeing. The conclusions drawn were that the fabric behaves as a porous body endowed with chemical properties; that the ionised dyes are fixed in the fabric by chemical action; while the insoluble dyestuffs in water behave as colloids, and are fixed by molecular attraction. A description of the various and important uses of formaldehyde sodium bisulphite in the dyeing industry was furnished by MM. Baumann and Thesmar. M. T. Valette discussed the influence of the various bleaching and fat-removing agents upon the dyeing properties of wool, and stated that of all such agents lime gave the most satisfactory results, while chlorine gave good results, but weakened the fabric. An account of the chemistry of aniline black was given by Prof. Green, in which he described his process of oxidation of aniline by atmospheric oxygen by the catalytic influence of a paradiamine associated with a copper salt. An explanation of the formation of hydrocyanic acid during the oxidation of aromatic nitro-compounds by ammonium persulphate was communicated by MM. Seyewitz and Poizat. Dr. Cain described a method of acetylation of diamines of the benzidine type in cold alcoholic solution, by which monoacetyl derivatives could be prepared in good yield. The same author described new dyestuffs of the methylene-blue type derived from paranitrosomethylethylaniline. Mr. G. A. Prochazka stated that the recent legislation in the United States permitting the use of duty-free alcohol for the manufacture of coal-tar dyes has been rendered valueless owing to the unreasonable regulations of the Inland Revenue.

In the section for physiological chemistry the sectional meetings were held on Saturday, May 29, at University College, for the purpose of demonstrations. Two papers on colloids were included in this section, both of which were of considerable importance, namely, that of Dr. W. B. Hardy, who discussed the source of the electric charge on colloidal particles, and that of Dr. W. M. Bayliss, who dealt with the general properties of colloids as exhibited by certain dyestuffs. Dr. H. Bechold also considered the nature of colloids from a physiological point of view. The part played by adsorption in the mechanisms of the animal organism was described by Prof. H. Freundlich. Prof. Hans Meyer discussed the pharmacological action of the lipoids.

The use of a 15 per cent. to 25 per cent. solution of hydrofluoric acid at 100° C. was recommended by Dr. L. Hugounenq for the hydrolysis of proteins. Less oxidation and humic decomposition was observed in the employment of this reagent than in the hydrolysis by means of 25 per cent. sulphuric or hydrochloric acid. Moreover, by this method certain natural polypeptides of considerable importance were detected among the products of hydrolysis. A monograph on nucleic acid was contributed by Dr. H. Steudel.

In the section for agricultural chemistry the chief subject of discussion was the employment of artificial nitrogenous manures. A paper on the employment of cultures of leguminous bacteria was communicated by Dr. H. von Feilitzen, of the Swedish Society for the Cultivation of Peat Land. It was stated that cultures such as "nitragin" and "nitro-bacterine" produced absolutely no effect, and that the only certain method is inoculation with naturally favourable soils. M. M. A. Vivien showed that the loss of nitrogen from dung-hills is accelerated by the presence of inorganic substances such as sodium nitrate and calcium carbonate. The reactions of dicyandiamide were stated by Prof. Prianichnikow to indicate that it may be regarded as cyanoguanidine.

In the section for hygiene several papers upon the sterilisation of drinking-water were communicated. The majority of these dealt with the action of ozone, which appears to have a considerable germicidal action, and can be utilised at no great expense. Papers on the purification of sewage were contributed by Dr. W. E. Adeney, Mr. J. H. Johnston, and M. J. Begault. In reference to lead poisoning, a communication from Mr. K. Goadby and Dr. F. W. Goodbody proved that by far the greater portion of the lead present in the system of operatives suffering from lead poisoning enters by the lungs. The condition of the patient is considerably aggravated by the inclusion of alcohol in the diet. The experiments described in the paper were carried out on cats.

In the section for physical and electrochemistry the most striking event was a lecture and demonstration by Prof. Bernthsen on the oxidation of atmospheric nitrogen by the flaming electric arc, with formation of nitrogen peroxide, followed by an account of the process for the manufacture of calcium cyanamide by Prof. Caro. Since the formation of calcium cyanamide is an exothermic reaction, much less power is required than for the oxidation of nitrogen. From this substance ammonia can be produced, which can

then be converted into nitric acid by Ostwald's electrolytic process. A *résumé* of the recent work on the electrometallurgy of iron and steel was given by Mr. F. A. Fitzgerald. Prof. Taussig read important papers on large electric furnaces, and on the electrolysis of sodium chloride, in which the recent developments in the Castner-Kellner process were reviewed. A recommendation for national and international conservation of water-power was introduced by Mr. E. R. Taylor, in which the author deprecated the failure to employ the waste power of rivers and streams. The combination of nitric oxide and oxygen was shown by Dr. M. Bodenstein to consist of a trimolecular reaction. M. A. Coppadoro described a process for the simultaneous production of hydrochloric and sulphuric acids, in which electrolytic chlorine was caused to interact with sulphurous acid. The question of the amount of chemical work produced by light was discussed by Dr. F. Weigert, who by examination of the photochemical change of anthracene into dianthracene concluded that nearly 5 per cent. of the total amount of absorbed light was converted into work. M. Malfitano, in a paper on the constitution of colloids, described the use of celluloid membranes, which permit the passage of electrolytes, but remain impermeable to colloids. The mechanism of the absorption of hydrogen by carbon at low temperatures was shown by Dr. J. W. McBain to depend entirely upon condensation of the hydrogen upon the surface of the carbon.

THE SUPPLY OF SECONDARY EDUCATION IN ENGLAND AND ELSEWHERE.

IN their report, published in 1895, the Secondary Education Commissioners, when discussing the amount of secondary education required for the whole country, stated :—

"After the most careful consideration we have been forced to the conclusion that the problem contains so many indeterminate elements that any attempt at a solution applicable to the whole country would necessarily be misleading."

The Schools Inquiry Commissioners of 1868, however, had no such hesitation, and light-heartedly estimated requirements at 16 per 1000 of the population for boys in towns, of whom one-half would be third-grade pupils.

Circumstances have changed since 1895. A new Education Act has been in operation for six years; a list of recognised schools has been prepared and issued; surveys of their districts have been instituted by many educational authorities. These facts give warrant for making an approximation to the result. Any such approximation must be subject to errors; in some cases it is well-nigh impossible to obtain information, and the difficulty of standardisation is ever present.

Presuming that the reader is acquainted with, and can make allowance for, disturbing influences, we will place before him material which will enable him to answer three questions, and will throw light incidentally on others. These three questions are :—

(1) How many of our population receive a secondary education?

(2) What proportion continue their education after the age of sixteen as all-day scholars?

(3) How do we compare in these respects with the foreigner?

The latest returns concerning higher elementary education in England give the number of pupils as :—

Boys	8035	... Girls ...	6178
Average attendance	94·3 per cent.	...	92·4 per cent.

These pupils correspond to Bürgerschüler, and represent those who, under more favourable conditions, would receive secondary education. In Germany the Bürgerschule exists in many places on sufferance; the local authority wishes to have the whole elementary education under its control, and maintains a Bürgerschule as a means of checking the establishment of private schools. In Great Britain we have encouraged the private school, and have thus only this small pittance of higher elementary pupils to put forward. We shall discover our missing Bürgerschüler later.

The number of pupil-teachers and pupils in classes preparing for pupil-teachership, or its equivalent, was given in 1906–7 as :—

	Boys	Girls
Preparatory classes	1,077	5,473
Pupil-teachers (*a*)	2,771	10,735
Pupil-teachers (*b*)	2,468	8,550
Total	5,239	19,285
Training college students ...	2,663	5,645

In this same year the secondary schools under the Board account for 62,712 boys and 50,877 girls, *i.e.* five boys to four girls nearly, classed as follows :—

	Boys	Girls
Preparatory classes ...	18,214	... 13.993
Age 12–13	12,521 (4,011) ...	10,505 (1,433)
Age 13–14	9,812 (3,179) ...	9,180 (1,445)
Age 14–15	5,248 (3,377) ...	6,673 (1,276)
Age 15–16	2,551 (1,806) ...	3,052 (637)
Over 16	1,993 ...	2,683

where the numbers in brackets refer to those taking special courses.

If, for the moment, we class pupil-teachers as secondary scholars, these figures show that secondary education for a girl too frequently means preparation for the teaching profession. If we analyse our table we find that for every

100 boys	100 girls	age 12–13
there were		
78·5	89·0	age 13–14
52·2	66·6	age 14–15
26·3	30·9	age 15–16
12·0	22·5	over 16

who were taking an approved course. That is, only about one boy in four who begins a course of secondary education ever remains to finish it. Our national view of secondary education is that it is simply a veneer of respectability which has no bearing on the capacity of the individual or the future of the nation. This statement of the national conception of education is unjust to some local areas. Let us consider London, the State-aided schools of Scotland, and Wales. The corresponding figures read :—

	London		Scotland		Wales	
Age	Boys	Girls	Boys	Girls	Boys	Girls
12–13 ...	100 ...	100 ...	100 ...	100 ...	100 ...	100
13–14 ...	123 ...	125 ...	149·6 ...	148·5 ...	71·5 ...	77·3
14–15 ...	114 ...	117 ...	184·3 ...	186·7 ...	47·9 ...	54·6
15–16 ...	69·5 ...	75·6 ...	163·4 ..	174·2 ...	29·2 ...	26·1
16–17 ...	35·2 ...	45 ...	106·6 ...	135·4 ...	14·7 ...	13·6
17–18 ...	16 ...	26 ...	48 ...	90 ...	— ...	—
18–19 ...	6·4 ...	7·5 ...	17·7 ...	46·8 ...	— ...	—

After her sacrifices for education, no one will accuse Wales of indifference. Yet her standard is still far from satisfactory. London is showing that she appreciates the value of a course of secondary education. What about Scotland? Explain that the Scotch parent is satisfied with the primary school, and keeps his children there until thirteen or fourteen years of age, and you give deserved praise to the elementary school. Explain that the lower age of entrance to the Scotch universities induces a parent to give his son a full secondary education so that he may see, if he does not gather, the prizes that lie beyond, and you compliment the foresight of the nation. Allege that the Scot does not succeed in life and you will be laughed to scorn. Protest that his success is not due to superior insight or fertile imagination or sporting enterprise, and you only accentuate the value of steady, disciplined intelligence. The German has this virtue, and so has the Scot. If you wish to know where the Scot gained it, remember the traditions of the country and study closely the middle column.

The list of secondary schools recognised as efficient for 1907 (Cd. 4374) accounts for 132,849 children, classed thus :—