

POSITION OF THE METRIC SYSTEM.

IT may now be said that the metric system of weights and measures is preferred by every Government in the world outside the British Empire, and that in this advance there has been no retreat.

Its opponents say that though foreign Governments may prefer the reform, it is fairly practised only in a few countries. The truth about this alleged discrepancy between law and popular usage is to be found in two parliamentary papers (Cd. 258 of 1900 and Cd. 435 of 1901), also partly in the records (Paris: Gauthier-Villars, 1907) of the last International Metric Conference, where England had two representatives.

Let us consider, first, the nations which have made least progress. The United States of America have not gone far—far enough, nevertheless, to decide their future, for there is no record of a reverse either in public opinion or practice, except, perhaps, in Turkey, where the Government applied violent coercion to an ignorant populace. Many public Acts of the United States show that their method of progress is to accustom, first their officers and then the public, to the new system before applying it to commerce. Accordingly, it has been introduced with great ease and success into the medical services of the army, navy and public health. There was no trouble, even in the difficulties of war with Spain, when civilian physicians, accustomed only to the old system, were enrolled for service. In some American cities medical prescriptions are by choice almost all metric. Electrical quantities, and to some extent electrical machinery, are metrically described, and metric standards, furnished by the International Bureau at Paris, are alone legal as the ultimate tests of American units. The United States have maintained the metric system in Cuba, Porto Rico, and the Philippines. Russia established it with complete success for all purposes in Finland sixteen years ago, and for the medical services of the Imperial Army and Navy last year. In 1907 it was reported at the International Conference to be spreading "rapidly and without opposition" throughout the Empire under the special direction of Privy Councillor M. Egoroff.

The Chinese Empire may be quoted, like other Governments, as committed to the metric system. After consideration, it has during the past year decided to alter the chief linear unit (*chih*) to 32 centimetres, as a step towards metric reform, and this was done in face of a petition from 100 British merchants in favour of a British unit.

Japan, also, has recently given effective approval to the metric system by legalising it, teaching it in the primary schools, and using it for the medical services of the army and navy, also for scientific work. At the Paris conference of 1907 "legislation for its definite adoption" was announced to be in preparation. Meanwhile, tens of thousands of metric standards were being issued by the Government. British units are also used for engineering and for imported machinery.

On and after April 1 of next year taxes and customs dues in Denmark will be based on the metric system. The system will become general and obligatory on April 1, 1912.

It is thus seen that these five Powers, the slowest to move, have approved, but do not yet largely practise, the metric system. The rest of the world, outside the British Empire, both approves and practises, excepting Turkey, Greece, some of the smaller South American republics, and various savage regions.

Notwithstanding what has been said above, some anti-metricists declare that even in France the system is largely discarded. The answer to this is that old names are sometimes applied to metric units, *e.g.* the half-kilo. is sometimes called the *livre*, just as we call twenty-one shillings a guinea, and, secondly, textile goods of English sizes and marks go largely into foreign countries, and are even made there, just as motor-cars and electric machinery of metric size are found in England. There is no sign of metric failure in this, because in a metric country everything is sold metrically.

Even within the British Empire the self-governing colonies are eager for the reform. Australasia and New Zealand have twice urged it upon England, and New Zealand has recently legislated for the purpose. South

Africa has suggested it, and the Canadian Government has employed a lecturer to popularise it.

In presence of the above-stated facts, there is obvious danger that England may soon be isolated even from her English-speaking kinsfolk in the matter of weights and measures, notwithstanding the vain suggestion of an Anglo-Saxon conference to improve the British system and retain it in concert with America. There is India, of course, on which we could force any system, wise or foolish, for chaos rules there, and the situation is tolerated partly because full-weight silver coins serve as standard weights, and liquids are generally weighed. The kilogram was legalised for official use and railways on the advice of General Sir R. Strachey in 1871, and the death of Lord Mayo alone prevented its introduction. India deserves better treatment, for it is to her that we owe, through the Arabs, not only the ten numeral figures, but probably also the device whereby both the form and position of each fix its meaning.

The cost and trouble of change are the chief real objections, so it is of the highest importance to remember that metricists do not propose to force the reform into factories, industries, or private life, but only into buying and selling. Cloth, yarn, ironwork, and everything could be made of any size or weight, but in the market such size or weight, if stated, would have to be in metric figures. There would be no alteration of count, number, pattern, or mark under which cloth, yarn, screws, &c., are often sold. In private life the glass of beer, the teaspoonful of medicine, &c., would remain.

Shopkeepers and merchants, probably also railways, would be compelled to use new weights and yard sticks, and their example would quickly educate the whole country. No more than this limited compulsion was proposed to Parliament in 1907, but objectors presented estimates of cost based on universal compulsion, and the result was an adverse vote of 150 against 118. The House of Commons had not then before it the evidence afterwards given at the Paris International Conference, that commerce can be metric without impeding industry.

There is, however, a considerable class of people who can never be converted except perhaps by fear of international isolation. Therefore, pending another attempt at legislation, the converted should practise their faith rather than preach it to the deaf. Scientific societies and scientific departments of State could favour metric usage, as the British Medical Association is now doing, and as the Government might do in the medical services of its army, navy, and public health, unless it distrusts the American experience above stated.

In meteorology, geology, and cartography there is much room for advance, excepting the excellent maps with scales of 1/2500 and 1/5000.

There is not space here for the long array of great names which support this reform, and it ought to be needless to state that the system does not embrace angles, time, navigation, thermometry, money, or anything but measures of length, surface, volume, and weight. Nevertheless, it may be mentioned that one of its principles, the counting by tens, which abolishes compound arithmetic, would save here, as in all foreign countries, a vast total of human energy, especially in application to money. It is estimated that in the Custom House alone decimalised money would save 20,000*l.* a year.

BIRD-LIFE.

THE feeding-habits of the dunlin form the subject of a paper—based on close personal observation—contributed by Mr. J. M. Dewar to the January number of the *Zoologist*. In surface-feeding these attractive birds search for small organisms floating in the wash of the sea or carried seawards by the shore-streams, as well as for minute insects and spiders on the sand or mud, although the main objects of their quest are tiny univalve molluscs, with the shells of which their gizzards are always crammed. Dead shells, which form a large proportion of those on most shores, are left alone. Dunlins also probe the sand or mud for bivalve molluscs and worms. Both in the act of tapping and probing the two halves of the

beak appear to be slightly separated; it is also probable that the separation increases with the depth of the probing, although the upper and lower portions remain nearly parallel until they are thrust in to their extreme limit, when the terminal part of the upper one becomes expanded at the moment of contact with the "find."

The already overcrowded list of so-called British birds has been increased by the capture, on Fair Isle in September, 1908, of a specimen of Eversmann's warbler (*Phylloscopus borealis*). This bird, which is really a dark-coloured willow-wren, has been recorded once in Heligoland, in 1854, but its normal summer haunts are Finmark, northern Russia, and Siberia, while in winter it wanders to Burma, Malaya, and China. Fuller details of the capture will be found in the January number of Witherby's *British Birds*.

Captain Stanley Flower and his assistant, Mr. M. J. Nicoll, have drawn up a list of the species of wild birds which have been observed to visit the zoological gardens at Giza during the period between October, 1898, and October, 1908. This list, which has been published by the Egyptian Government, comprises no less than 166 species, eleven of which are, however, not indigenous to the country, and were accordingly, in all probability, represented by imported individuals. The very large number, both as regards species and individuals, which visit the establishment adds considerably to the attractions of the Giza Gardens, and the list has been published in response to inquiries from visitors as to their names. It is a prevalent idea that song-birds are lacking in Egypt, but a visit to the gardens when the nightingale and the rufous and olive warblers are singing will at once dispel this illusion.

In the report of the vertebrate section of the Yorkshire Naturalists' Union for 1908 reference is made to the appearance of a flock of Pallas's sandgrouse on the northern slope of the wolds during the autumn of that year. The great grebes on Hornsea Mere have been reduced to three, and it is believed that the diminution is mainly to be attributed to egg-collectors and other visitors. The peregrine falcons again built on Bempton Cliffs, where they reared a single young one.

The birds of the Barotsi district of the Zambesi form the subject of a paper by Mr. A. Sandberg in vol. vii., part ii., of the Proceedings of the Rhodesia Scientific Association. As an illustration of the teeming bird-life of the great valley, the author writes that "the traveller encounters enormous numbers of geese, ducks, and wading birds in wonderful variety of species, size, and coloration, and the sand-banks of the river, upon which they find a refuge, present an appearance at times which can best be described as kaleidoscopic. Above the almost deafening din of their shrill voices can be distinguished the incessant cry of the fish-eagle, for ever on the alert for prey."

PREHISTORIC ARGENTINA.¹

THE pottery described in the first of the papers mentioned below was mainly obtained in the province of Catamarca. The specimens are illustrated by handsome coloured plates drawn from photographs. The earliest type includes bowls and jars, ornamented in white, red, and black in imitation of the woven patterns of basket-work. Similar ornamentation is found in the baskets, cloth, and pottery of New Mexico and California. Another type, with red and black colouring, shows either geometrical designs or outlines of animals, especially frogs and snakes, usually conventional in character. Among the objects depicted are the anura, *Ceratophys ornata* and *Leptodactylus ocellatus*, and the ophidia *Elaps frontalis* and *Lachesis alternatus*, as well as the rhea and puma and a fern, a species of Hymenophyllum. There are also crude representations of human beings.

The second article describes two human faces in terra-

¹ (1) Alfarerías del Noroeste Argentino (Anales del Museo de La Plata, series ii., vol. i.). Pp. 5 to 40.

(2) Sobre el Hallazgo de Alfarerías Mexicanas en la Provincia de Buenos Aires (Revista del Museo de La Plata, v.l. xv., series ii., vol. ii.). Pp. 284 to 293.

(3) Arqueología de San Blas (Anales del Museo Nacional de Buenos Aires, vol. xvi. (series iii., vol. ix.)). Pp. 249 to 275. All by Señor F. Outes.

cotta, and part of the head of an animal supposed to be the coyote (*Canis cagottis*), in the same material. These were found in a high bank in the Laguna de Lobos, in the province of Buenos Aires. They are so closely similar to the earthenware "masks" found in such numbers in the ancient ruins at San Juan de Teotihuacan, in Mexico, that the author believes that they were manufactured there, but he declines to advance any theory to explain their presence in the Argentine.

The third paper deals with implements and fragments of pottery collected by Señor Carlos Ameghino on the site of a prehistoric settlement in the extreme south of the province of Buenos Aires, and distant 5 kilometres from the sea-shore. They were found on the surface at the foot of unconsolidated sand-dunes, and include flakes, scrapers, chisels, knives, arrow-heads, and grinding stones, all primitive in character. These appear to have been manufactured from ellipsoidal beach-stones, mainly jasper, though phonolite, chert, porphyritic breccia, and other materials were also employed. The grinding stones are of hard grit ("asperón").

The pottery was moulded of a sandy clay, and imperfectly baked. It was ornamented with grooves and pits made with the nail or a fragment of wood.

The collection indicates, we are told, a culture similar to that which still characterises the middle and lower parts of the basin of the Rio Negro, certain localities in the government of the Pampa, and the southern plains of the province of Mendoza. It presents many points of resemblance to that met with in the southern part of the government of the Rio Negro and in the governments of the Chubut and Santa Cruz, but differs completely from that of the rivers Salado, San Borombón and Luján, and generally the eastern portion of the province of Buenos Aires.

J. W. E.

THE INCREASED EXPANSION OF STEAM ATTAINABLE IN STEAM TURBINES.¹

I FIND it difficult to add anything to the words of the many illustrious men who have addressed this society on previous anniversaries of the birth of James Watt, to the words of Sir Humphry Davy, Lord Aberdeen, and Lord Jeffrey, and in later years to those of Joule, Scott-Russell, Preece, and Kelvin. This evening I should prefer to recall to your memories the fundamental principles of steam discovered by James Watt, and to endeavour to trace their application in the engines constructed by him and by the firm of Bolton and Watt, then in the more highly developed forms of compound, triple, and quadruple reciprocating engines, and, lastly, in steam turbines on land and sea.

The laws of steam which James Watt discovered are simply these, that the latent heat is nearly constant for different pressures within the ranges used in steam engines, and that, consequently, the greater the steam pressure and the greater the range of expansion the greater will be the work obtained from a given amount of steam, and, secondly, as may be seen to us now as obvious, that steam from its expansive force will rush into a vacuum.

Having regard to the state of knowledge at the time, his conclusions appear to have been the result of close and patient reasoning by a mind endowed with extraordinary powers of insight into physical questions, and with the faculty of drawing sound practical conclusions from numerous experiments devised to throw light on the subject under investigation. His resource, courage, and devotion were extraordinary, and drew to his side a coterie of kindred spirits, with whom he discussed freely his theories and his hopes, and the results of his experiments.

In commencing his investigations on the steam engine, he soon discovered that there was a tremendous loss in the Newcomen engine which he thought might be remedied—the loss caused by condensation of the steam on the cold metal walls of the cylinder. He first commenced by lining the walls with wood, a material of low thermal conductivity. Though this improved matters, he was not satisfied; his intuition doubtless told him that there should

¹ The James Watt lecture delivered at Greenock by the Hon. C. A. Parsons, F.R.S.