THE STANDARDISATION OF SCREWS.

THE question of standardising screw threads and limit gauges has long received the careful attention of engineers, and in Great Britain considerable advantage has accrued from the publication of an interim report (No. 20, April, 1905) of the Engineering Standards Committee, dealing with the form and pitches of screw-threads most suitable for general engineering purposes. Having regard to the fact that the Whitworth thread is in general use throughout the country, the committee does not recommend any departure from this form of thread. The existing Whitworth series of pitches for screws from ¼ inch to 6 inches in diameter does not, however, satisfy all requirements, and the committee has drawn up tables of standard sizes which will doubtless meet with general adoption. For all sizes of screw threads below ¼ inch in diameter the committee recommends the adoption of the pitches, sizes, and form of thread proposed by the British Association Small Screw Gauge Committee in 1884.

In France an influential committee of the Société d'Encouragement pour l'Industrie nationale, consisting of General Sebert and Messrs. Carpentier, Sauvage, Masson, Sartiaux, and Zetter, has devoted attention to the subject, and has published in the current issue of the Bulletin of the society a scheme for extending the international system to screws of less than 6 millimetres in diameter. The committee recommends the adoption, between the diameters of 1 millimetre and 5·5 millimetres inclusive, of twelve screws as shown in the following table:—

Diameter mm.	Pitch mm.	Diameter mm.	Pitch mm.
1·0, 1·25	0·25	3·0, 3·5	0·60
1·5, 1·75	0·35	4·0, 4·5	0·75
2·0, 2·5	0·45	5·0, 5·5	0·90

The six largest screws of this series are those first proposed by the second committee of the Chambre syndicale des Industries électriques. The screws of 2 millimetres and of 2·5 millimetres for which the pitch is 0·5 millimetre having proved too coarse, have received the pitch of 0·45 millimetre. The 1 millimetre screw has received the pitch of 0·25 millimetre in order to bring the new series into accord with the Thury series, which is used for very small screws. The scheme appears likely to be favourably received by the Swiss and German industries.

The initial accuracy of a helical surface, as distinct from the sectional form of the thread, is dependent upon the accuracy of the leading screw of the machine upon which it is cut, and thus the leading screw becomes a generating master-gauge which instead of being used solely for gauging is called upon to do work involving wear. The importance of maintaining the accuracy of these leading screws in connection with the production of the interchangeable parts of modern guns and gun mountings led to the appointment in November, 1900, of a committee consisting of Mr. H. F. Donaldson, chief superintendent of the Royal Ordnance Factories, president, Mr. R. Matthews, Lieutenant A. T. Dawson, R.N., Mr. H. J. Chaney, Dr. R. T. Glazebrook, F.R.S., and Colonel H. C. L. Holden, R.A., F.R.S., to consider the provision of standard leading screws for screw-cutting lathes, and its report to the secretary of the Army Council has just been published. The committee finds that the only practical way to obviate the difficulty found in securing absolute interchangeability, even on short lengths of large screws, is to provide centrally special machinery for the supply of large screws of certified accuracy. Approval of funds for this purpose was accordingly sought and obtained. The machine, which was made by Messrs. Armstrong, Whitworth and Co., of Manchester, was designed to secure accuracy over 3 feet length of screw. Measurements made after the machine was installed in the special chamber erected for it at the National Physical Laboratory showed that the movement of the tool carriage did not vary from that produced by a true screw of the same reputed length by more than 0·0002 inch in its full length, and after insertion of a correcting cam by more than 0·0001 inch at any one point, and that corrected microscopic scale readings and independent end-measure readings did not differ by more than 0·0001 inch at any point. The committee recommends that all accurate screws required for Government engineering work be supplied in future from screws originated from or corrected by the standard leading-screw adjusting machine at the National Physical Laboratory, and that facilities be given to private firms to correct heavy screws of ½-inch pitch by this machine. The house in which the machine is installed at the National Physical Laboratory presents many points of interest, as the greatest possible precautions have been taken to maintain uniformity of temperature and freedom from vibration.

THE STERILISATION OF WATER IN THE FIELD.

IT is well known that disease is more fatal to the soldier in a campaign than the bullets of the enemy. Thus in the South African campaign the total deaths from disease were almost exactly double those due to wounds in battle. The diseases which persistently dog the track of an army are typhoid or enteric fever, dysentery, and, in certain countries, cholera, and to these the principal mortality is due.

As regards their incidence, much necessarily depends on the climatic and physical conditions of the country in which the war is being carried on. Both in the Spanish-American war and in the South African war typhoid fever proved a terrible scourge.

These diseases are usually largely water-borne, but it must be recognised are not exclusively so, and, therefore, attention to the water supply alone will not wholly prevent them. In the Spanish-American war, for instance, the commission which investigated the typhoid fever epidemics of the United States Army reported that infected water was not an important factor in its spread. The other agents concerned in the dissemination of this disease are dust and flies, blowing or carrying infection from infected latrines, and gastro-intestinal disturbance, the result of heat, fatigue, and bad food rendering the troops more vulnerable. It cannot be doubted, however, that a pure water supply would do much to lessen the incidence of typhoid fever and dysentery, and probably quite prevent cholera.

A pure water supply can partially be secured by three methods; (1) by a careful selection of the camping grounds and protection of the water supply from pollution; (2) by deep-driven artesian wells; and (3) by the sterilisation of the water; or a combination of these methods may in many instances be adopted. But whatever method is applied it must be remembered that soldiers parched with thirst *will* drink any water that comes in their way. As regards the first method, the selection of the camping grounds, &c., it is reported that it has been adopted with considerable success by the Japanese in the present campaign; a corps of medical officers is sent on ahead to select the camping ground and survey the water supply;

sources which seem to be polluted can thus be largely excluded, and by judicious arrangement of the latrines and by posting guards to prevent individual pollution and the drinking of suspicious supplies much may be done to ensure pure water for drinking. As regards artesian wells, surface wells and streams are the main source of danger, but by driving deep artesian wells a pure water is obtained. This, however, would be possible only under special conditions in certain districts and for comparatively small contingents.

There remains the method of sterilisation, which, if it could be universally applied, would necessarily prevent water-borne disease.

The three methods applicable for the sterilisation of water are:—(1) filtration through a porous porcelain filter such as the Pasteur-Chamberland; (2) heat; and (3) chemical germicides.

Filtration through a porcelain filter, if it can be applied, would be efficient, but it necessitates a good deal of apparatus, and the filter candles are fragile. It is a good method under efficient supervision, but is more applicable for small contingents than a large army.

Heat has been adopted by many inventors, and Mr. Arnold-Forster, M.P., recently inspected a number of devices based on this principle. In most, *e.g.* the Lawrence, Forbes, Mallock, and Tuckfield and Garland machines, the water is heated to the boiling point, but in the Griffiths machine it is assumed (from experimental evidence) that heating to about 170° F. suffices, which results in a considerable economy in fuel. In all the machines the out-going hot water warms the in-going cold water, and is itself cooled thereby. Important considerations are weight and fuel, and these have received much attention from the respective inventors.

The Mallock machine, which, including pump and cases, weighed 153 lb., with a consumption of one pint of kerosine gave 50 gallons of water an hour at a temperature of 88° or 90°, the temperature of the in-going water being 74°. The Tuckfield and Garland machine, of which the steriliser weighed 198 lb. and the heating apparatus 126½ lb., gave 40 to 50 gallons at a temperature of between 104° and 110°, the temperature of the in-going water being 78°; its inventors state that it requires 20 lb. or 30 lb. of kerosine for 1000 gallons of water, and in it the water to be sterilised is heated by steam generated in a separate boiler. The Griffiths machine, weighing 120 lb. and using 1½ pint of kerosine an hour, yielded 26½ gallons of water an hour at a temperature of 92°, 45 gallons an hour at a temperature of 103° to 106°, and 72 gallons an hour at a temperature of 105°, the temperature of the supply being in all cases 67°. The Lawrence apparatus, weighing, with water-tank and case, 168 lb., and working with supply water at 74°, had a temperature of delivery of 88° to 90°, but it used two pints of kerosine an hour and the quantity of water delivered was only 30 gallons an hour. Finally, the Forbes machine, weighing 130 lb., delivered 15 gallons of water an hour, with an oil consumption of one pint, the temperature of supply being 74°, and of delivery from 86° to 90°.

Lastly, there remain the chemical germicides. Obviously these must have no deleterious action on man in the quantities employed; they should not be corrosive to metal vessels, they should be portable and act rapidly. Alum has long been employed for purifying water, but its action is to *clarify* a turbid water, and it cannot be relied on to *sterilise*. Potassium permanganate may be used, but is not very efficient or trustworthy, and both it and alum necessitate the water being left for some hours. Some three or four years ago Parkes and Rideal introduced bisulphate of soda for the purpose. It may be put up in tablets, and in quantities of 15 grains to the pint or thereabouts destroys the typhoid bacillus in water within half an hour, imparts little or no taste to the water, and is quite harmless. Lastly, there is the method introduced lately by Lieut. Nesfield, I.M.S., in which chlorine is the sterilising agent, and this, after acting, is "killed" by the addition of sulphite of soda. For small quantities of water, iodine may be similarly used. This last method was recently described in NATURE (July 27, p. 307), and has much to commend it.

R. T. HEWLETT.

PROF. JULES OPPERT.

ON August 21 died Prof. Jules Oppert, the last of the band of great scholars who were the pioneers of cuneiform decipherment. His name will go down to posterity with those of Rawlinson, Hincks, de Saulcy, and Fox Talbot, with whom he helped to lay the foundations of the flourishing science of Assyriology. Like them, too, he has now laid down the pen for ever.

Born of Jewish parents in Hamburg on July 9, 1825, Jules Oppert began the study of Sanskrit and Arabic under Lassen and Freytag at Bonn, afterwards devoting himself to Zend and Old Persian at Berlin and Kiel. In 1847 he published his first work, entiled "Das Lautsystem des Altpersischen," in which he discovered that *m* and *n* had to be supplied before a following consonant in Old Persian, and thereby supplementing the alphabet. At that time the German law did not permit Jews to hold professorial posts, so in the same year he moved to France, where he was appointed professor of German at Laval, and afterwards, in 1850, at Rheims. The favourable reception accorded to his work on the Achæmenian inscriptions obtained for him, in 1851, a post on the staff of the scientific mission dispatched to Mesopotamia by the French Government, under MM. Fresnel and Thomas.

On his return in 1854, Oppert devoted himself entirely to the study of Assyrian and Babylonian, and between 1857 and 1863 the several volumes of his great work "Expédition scientifique en Mésopotamie" saw the light. While the linguistic value of this has always been of the greatest importance, the topography is less fortunate, the late author having been led into the mistake that the ruins of ancient Babylon were much larger than they really are. In 1855 he visited the British Museum and the museums of Germany to report on the progress made in cuneiform studies, and on his return in the following year he was decorated with the Cross of the Legion of Honour, and obtained the post of professor of Sanskrit and comparative philology at the school of languages attached to the Imperial Library at Paris. Two years previously he had become a naturalised Frenchman. In 1859 he published a Sanskrit grammar, closely followed by "Éléments de la Grammaire assyrienne." In 1865 there appeared from his pen a short history of Babylonia and Assyria. In 1881 he succeeded the late M. Mariette as a member of the Institute of France, being elected president of the same society ten years later—perhaps the highest honour a French *savant* can receive.

The versatility of the late Prof. Oppert was extraordinary. His papers, published in various scientific journals, cover an astonishing range of subjects. Not the least interesting are his contributions to astronomical chronology, in which subject he took a deep interest. In "La Chronologie biblique fixée par les Éclipses des Inscriptions cunéiforme" (*Rev. Archeol.*, 1868) he attempted to reconcile the dates