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STANDARDS OF WEIGHTS AND MEASURES IN INDIA.

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There is no uniformity in the measures of length, weight, volume and area that are now in vogue in India and there is no doubt that a reform is necessary. Standards of length and weight have been fixed by legislation. Act II of 1889 has laid down that the Imperial standard yard is the legal standard measure of length in India, and Act IX of 1939 has fixed the standard Seer of 80 tolas, equivalent to 14,400 standard grains, as one of the standards of weight. But it is common knowledge that the seer may be anything from 60 tolas to 120 tolas or more in different parts of the country. Land measures, which are measures of area derived from standards of length, are the Kotha, Pukka Bigha and Katcha Bigha. These are extremely diverse in magnitude and vary not only from district to district but even from village to village. The Bigha ranges from 1,600 sq. yds. to 4,000 sq. yds. The capacity measure in India is also the seer, and the magnitude naturally varies considerably giving scope to malpractices penalising not only the illiterate villager but also the cautious merchant in towns. These facts prove that fixing standards by statute is not enough, the units and multiples must have a simple relationship between each other which must be understandable and enforceable.

The English standards of weights and measures were recommended for adoption in India as legal standards "on the ground that such weights and measures would best afford facilities of English trade" as reported by a Committee appointed in 1867 by the Government of India. That Committee further pointed out that "the English system was more likely to meet approval from English officials who would therefore be more willing to further its introduction."

Let us now discuss the merits and demerits of the English System. It may be said in support that division into halves, quarters, eighths and so on, is natural and easy to most people by reason of symmetry and the notion of balance. It may also be said that for pliable materials such as paper, leather and cloth, these can be folded into two and three to give accurate and convenient divisions. But when the English measures in current use are examined, it is found that this principle, simple though it appears to be, breaks down badly; for instance, there are 2 pints to the quart, 3 ft. to the yard, 4 quarts to the gallon, 5½ yds. to the rod, pole or perch, 6 ft. to the fathom, 12 inches to the foot, 14 pounds to the stone, 16 ozs. to the pound, 20 hundred-weights to the ton etc.; the most ridiculous figure of the lot being 32°F. for the melting point of the ice and 212° for the boiling point of water. India has also her quota of jumble figures, but only a few are now in current use such as 40 seers to the maund, 80 tolas to the seer and 180 grains to the tola etc. (That makes the seer equivalent to 2.05714 lbs.).

It must be remembered, however, that although England has an old civilization, the civilization of India is incomparably older, and that weights and measures of this kind have evolved through the ages with no set plan of any kind except topical convenience. Now therefore is the time to consider replacing these out-worn figures by a new set which have been well thought out and planned.

There is no absolute certainty that the bronze standard yard in the custody of the British Board of Trade we have to depend upon, would remain constant in length owing to the possibility of secular changes of dimensions inherent in all material standards. In fact, there is reliable evidence for believing that the Imperial Standard yard decreased in length by 0.0002 in. during the first few years after its legalisation in 1856. The platinum-irridium of the international prototype metre held by the Bureau International has, on the other hand, proved to be extremely stable as regards secular change. In Great Britain the ratio, 1 metre = 39,370113 inches has received legal sanction, whereas in the United States, an Act of Congress in 1866 legalised the use of the conversion factor 1 metre = 39.370000 inches, which shews that the American Yard is slightly different from the Imperial Yard. No individual bar has ever been declared the legal standard in America and it is the present practice of the Bureau of Standards at Washington to take this ratio as defining the American Yard in terms of the international metre.

The decimal metric system satisfies two supremely important conditions. (1) All the units bear the simplest possible relation to one another and to the system of numbers that we all use, and (2) it is used throughout the World including Britain and the United States who have remained permissive, so that metric units may be used wholly or partly at will. The gradual development and unification of standards in course of time is a natural and unavoidable process which should not be resisted on grounds of mere conservatism. It is not merely on account of advances in industry and commerce that standards should change, they should also be made more rational to satisfy human intelligence.

The metre may not be the exact ten-millionth part of the meridian quadrant. The gramme may have incorporated the error in thermometric measurements. But the simple relation between the centimetre and the gramme is not without its practical value, whatever may be the uncertainty about the last decimal place. In future it may be possible to supersede the present definitions of the fundamental standards of length, based on the distances between lines engraved on certain metal bars, by a definition in terms of the natural standard provided by the wave-length of a monochromatic light. At present the red radiation of cadmium is the approved standard for all measurements in wave length of light, but it is not considered to be quite as ideally mono-chromatic as desirable for an universal standard of length. Perhaps a single isotope of mercury or uranium could be isolated and caused to emit radiation from a discharge lamp and it might prove to be an ideal source. The machinery for maintaining the metric system and making, by international agreement, such decisions as are necessary, already exists in the General Conference of Weights and

Measures which meets once in six years and instructs the International Committee controlling the Bureau International.

It is interesting to note that the decimal systems have been evolved and enforced during and after periods of revolution in different countries. Its history starts with the French revolution when there was an utter confusion of arbitrary and hostile administrations of several provinces with various weights and measures. The metric system was devised for an uniformity, and in 1801 the legally defined metre, the litre and the gramme became compulsory throughout France. Bismark's Germany after a victorious War in 1871 standardised the various pound weights giving all Germany one Pound equal to half a kilogramme. The Czecho-Slovak republic in 1922 also adopted the metric system. The latest important country to fall in line is Soviet Russia who joined in 1927. Although the United States still uses the English system of weights and measures while permitting the metric system, the American revolutionaries in 1786 to 1792 led the world with a decimal coinage.

In India, one of the greatest objections to introducing the decimal coinage was that the weights and measures were not in the decimal system. Now that we are going ahead with a decimal coinage in the country and also undergoing a vast change economically and industrially, this is the opportunity for evolving and establishing standards which have a solid foundation. Much can be done if action is taken quickly while the effects of the war and the upheaval after attaining independence are still present. A rapid change is likely to cause less disturbance in the long run. Prudent acceptance of established and rational standards are powerful aids to progress and efficiency. They should not be hampered by short-sighted economics.

Dr. L. C. Verman in a paper published in the January 1949 number of the Indian Standards Institution Bulletin, has suggested that we should retain the indigenous names of the Guz and the Sair but alter the actual values to the nearest ones in the metric system, i.e. the Metre and the Kilogramme. He has also proposed that we should use the words Varguz and Lita to denote the units of area and volume respectively which should be equivalent to the Sq. Metre and Litre in the metric system. These proposals are highly commendable. But it is felt that the internationally recognised names of the metric units and multiples should not give place to any other names when expressed in English or other foreign languages. In the literature published in any of the Indian languages the units could be the Guz, Sair, Varguz and Lita in Indian scripts only, but should remain as the Metre, Killogramme, Sq. Metre and Litre in English, which language will certainly be used in this country for maintaining international contacts.

It is considered superfluous to design words to fit in as the Indian translations of the deci, centi and milli or the multiples. Das, Sau and Hazar are good enough as complete words used as a suffix. For example, centimetre would be Guz-Sau and millimetre Guz-Hazar. Using the words Das, Sau and Hazar as a prefix would denote the multiples of the units and would cause no difficulty, such as Sau Sair to mean 100 Kilogramme.

It has been advocated earlier in this paper that a rapid change should be effected. Indian industry has not yet attained the magnitude of that existing in the U.K. or U.S.A. to resist the change as strongly. But to present the case of the Army in India, consideration of the target date by which the new units should come into force, throws up the enormity of the difficulty it will have to face. The Indian Army has been built upon arms, equipment and defence literature which originated in Britain. The existing equipment and supplies are still dependent on specifications published by the British War Office. Some ordnance stores of American origin have been copied in Britain during the last war, but specifying both the inch and the millimetre dimensions wherever necessary. Wherever the British units can be used, they have been preferred. No doubt, we shall have our own defence literature, which should eventually be based on metric units only. The greatest difficulty would lie wherever the British form of screw thread is involved. But then, there is the British Association screw thread system, which although metric, has flourished in a non-metric environment. This fact will settle some doubts. The recent English-Canadian-American Agreement on the unification of screw thread systems was signed in Washington on 18 Nov. 1948 and a provisional specification on the unified system has been published by the British Standards Institution. It is not yet known how this agreement will affect the Army in India, if India established the metric system.

Our criterion being the engineer's idea of efficiency, what would be gained by a change, and what would it cost to make the change, it is considered that the Indian Army should try to conserve as much of the current equipment as possible. Admittedly a lot of equipment would become obsolete, as inter-changeability of components is not of greater importance in any other field of human endeavour, if there is a switch-over on a fixed date line. An estimate of the period necessary for a gradual change-over is bound to be very wide, but it is thought that it would not be less than ten years. The Indian Army would retain the two systems concurrently, with a bias to the metric, all new manufacture being to metric dimensions as soon as modification of production equipments would permit. The Indian industry and commerce can, however, get on with the change during the period, as the confusion of having legal standards of more than one type will certainly be less in the Army, which is so much used to regimentation.