A CASE FOR THE ADOPTION OF THE METRIC SYSTEM (AND DECIMAL COINAGE) BY GREAT BRITAIN.

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I. THE METRIC SYSTEM.

(*a*) ***Origin of the system.***—In view of some of the stock hypercriticisms that are produced against the metric system it may be well to clear the issue by a few preliminary notes in an attempt to distinguish between what the system *was* and what it *is*.

The idea really originated with our own James Watt, who, in a letter to a friend in 1783, suggested the introduction of an international system of weights and measures. Rather less than 120 years ago the French, who had previously formed an International Committee upon the subject, developed this idea into a very complete system—the more thorough because the Revolutionists were quite prepared to break away from everything pre-existing. They were even prepared entirely to disregard the original idea of internationalism. In such circumstances they proposed a 10-day week, a 10-hour day, a 100-minute hour, and a 100-second minute. In like manner they would divide the right angle into 100 degrees. As a practical matter these extreme proposals are of no value; and now only militant anti-decimalists ever suggest the idea of decimalization of time. That will become practical politics when we have induced the earth to revolve on its own axis exactly 100 (or 1,000) times while it goes once round the sun; when the moon agrees to go once round the earth during 10 (or 100) diurnal revolutions of the earth; when the inclination of the earth to its orbit has been corrected to an angle of 25/100 instead of its present 23½/90 of a right angle; and when various other physical phenomena have adjusted themselves to a due relationship to the number of toes on a man's feet. In the meantime practical people will not favour the pressing of a theory beyond the limits of measurable benefit. Hence the metric system as it is, is simpler and more practical than the metric system as originally proposed. A hundred years of other people's experience naturally enables us to start with a clear idea of the working requirements.

(*b*) *Basis of the system.*—The whole system is based upon the *metre*—the measure. This title is given to the unit of *length*. It was intended that the length adopted should be one ten-millionth part of a quadrant of the earth's circumference—the quadrant was to be 100 degrees, the degree 100 minutes, the minute 100 seconds, and the *metre* was to be one-tenth of a second of arc. It really matters not at all that the scientists of those days bungled the calculation, because now the metre is the distance between two marks on a certain rod of platinum inserted in a concrete block in Paris, and on certain copies of this which have been distributed over the world.

The unit of weight — the kilogram — is derived theoretically from the metre as being the weight of one cubic decimetre of pure water at its maximum density. In practice the kilogram is represented physically by a certain piece of platinum which is accepted as one kilogram when weighed at a certain temperature under a certain barometric pressure.

The unit of capacity is the *litre*, which is the content of one cubic decimetre.

The primary units adopted are the metre, the gramme. and the litre. Sub and multiple units are derived by ratios of 10—the sub-units being designated by uniform

Latin and the multiple units by uniform Greek prefixes. The prefixes and the values defined in relation to the units are

milli	centi	deci		deka	hecto	kilo
$\frac{1}{1000}$	$\frac{1}{100}$	$\frac{1}{10}$	unit	10	100	1,000

In practice, quantities are expressed in one unit. For example we do not write

3 kg., 1 hg., 2 dag., 3 grm.,

but	3·123 kg.
or	3,123 grm.
or even	312,300 cg.

Also, in retail transactions it is often convenient to revert to fractions; and we should buy $1\frac{1}{2}$ kilos or $\frac{1}{4}$ kilo just as we do in pounds, except that as a kilo is larger than a pound we might more often take a fraction.

(*c*) *Comparison with English weights and measures.*—In the attached table I have set out in simple form our principal tables of length, weight, capacity, and square measure. It will be seen that for 26 items there are 17 different ratios, 2, 3, 4, $4\frac{1}{2}$, $5\frac{1}{2}$, 8, 9, 10, 12, 16, 20, 27 11/32, 28, $30\frac{1}{4}$, 40, 144, 1,000, whereas under the metric system the only ratio is 10—that of the ordinary notation.

Length.

English.	Metric.
mil × 1,000 =	millimetre (mm.) × 10 =
inch × 12 =	centimetre (cm.) × 10 =
foot × 3 =	decimetre (dm.) × 10 =
yard × $5\frac{1}{2}$ =	METRE (m.) × 10 =
rod, pole, or perch × 4 =	dekametre (dam.) × 10 =
	hectometre (hm.) × 10 =
chain × 10 =	KILOMETRE = 1,000 metres.
furlong × 8 =	
mile × 3 =	
league = 5,280 yards.	

Weight.

English.	Metric.
grain × $27\frac{11}{32}$ =	milligramme (mg.) × 10 =
dram × 16 =	centigramme (cg.) × 10 =
oz. × 16 =	decigramme (dg.) × 10 =
lb. × 28 =	GRAMME (grm.) × 10 =
qr. × 4 =	dekagramme (dag.) × 10 =
cwt. × 20 =	hectogramme (hg.) × 10 =
ton = 2,240 lb.	KILOGRAM (kg.) × 1,000 =
	TONNE.

Capacity.

English.	Metric.
gill × 4 =	millilitre (ml.) × 10 =
pint × 2 =	centilitre (cl.) × 10 =
quart × 4 =	decilitre (dl.) × 10 =
gallon × 2 =	LITRE (lit.) × 10 =
peck × 4 =	dekalitre (dal.) × 10 =
bushel × 8 =	hectolitre (hl.) × 10 =
quarter × $4\frac{1}{2}$ =	KILOLITRE (kl.) = 1,000 litres.
chaldron.	

Area.

English.	Metric.
sq. inch × 12^2 =	sq. metre (sq. m.) × 10^2 =
sq. foot × 3^2 =	ARE (a.) × 10^2 =
sq. yard × $5\frac{1}{2}^2$ =	hectare (ha.) × 10^2 =
sq. rod or sq. perch × 40 =	SQ. KILOMETRE (sq. km.).
rood × 2^2 =	
acre = 4,840 sq. yards = $69{\cdot}58^2$.	

But the multiplicity of ratios is not the only objection to the chaos which we call our system.

Amongst the weights left out of my tables is the "stone." If one buys a "stone" of meat one gets 8 lb.; if one buys a "stone" of potatoes one gets 14 lb.

An attempt to decimalize the English weights has been made in the United States; so that, although when one buys a hundredweight of potatoes in England one gets 112 lb., the same order in America will bring only 100 lb.

In the weights we have the natural ratio of 4 "quarters" to the next higher unit (the cwt.), but in measures of capacity $4\frac{1}{2}$ quarters go to make the next unit—the chaldron.

Perhaps the most astounding condition in a community under the control of Weights and Measures Acts is that which obtains in regard to bartering in corn.

Corn is sold by weight, but reckoned in bushels. The standard weights of a bushel for various kinds of grain are:—

38, 39, 40, 50, 52, $52\frac{1}{2}$, 60, 62 lb.

but it is said that there are about 200 sizes of bushel in use.

Amongst other anomalies may be mentioned that while the lb. troy is less than the lb. avoirdupois, the oz. troy is greater than the oz. avoirdupois. This anomaly, however, has recently been abolished by the expedient of making the ounce the only troy weight unit. The ounce troy weighs 480 grains, but ounces and decimals are now the only legal standard. This reform has therefore practically swept away the only vestige of connection between troy and avoirdupois weights.

One other example of the system of chaos may be taken from our land measure. If one wants to set out a square of exactly one acre one can do so by making the side of the square the convenient length of rather less than 69·58 yards. Of course in the metric measures the length of the side of a square hectare is a hectometre and of a square kilometre is a kilometre, just as with us the length of side of a square yard is a yard.

II. ALTERNATIVE SYSTEMS.

Those who object to the adoption of the metric system often refer to alternatives. They admit the need of a change from the British weights and measures, but they say we can do better than adopt the metric system.

Now, I submit that there are only two possible courses open to the British people in this 20th century.

We can retain the British tables or we can adopt the metric tables. To talk about a duodecimal system, for instance, is only to waste words. Its introduction by universal agreement would create chaos, its introduction by a single nation could only be undertaken by a nation of madmen. If the human race had been gifted with five fingers and a thumb on each hand we should doubtless have had a duodecimal system of notation; but the basis of our notation for all time is our 10 digits, and duodecimal measures worked by a decimal notation have not the remotest chance of securing the adhesion of mankind. Neither is there a possibility of persuading non-users of the British measures to take up such a burden as adopting them, even though their trade may be largely with English-speaking nations and even though we "decimalize" some of the tables.

It is admitted on all hands that reform is necessary and pressing; I submit that the only practical way of mending our present system is to end it—so long as bushels may be used those 200 different measures will survive. I submit too that for practical purposes the only possible efficient substitute is the metric system.

III. Advantages of the Metric System.

(*a*) *Scientific basis.*—The benefit of the metric system being on a scientific basis is likely in itself to appeal to electrical engineers, who know the extreme advantage accruing from such a condition in connection with their own special units.

By universal consent all relations of weight are based upon the weight of a unit mass of pure water at its maximum density. Thus, for example, the specific gravity of water is taken as unity and all other materials are related to it by reference to the weight of equal mass. As a cubic foot of water weighs 62·288 lb. the weight of a cubic foot of any other material may be ascertained by multiplying its known specific gravity by 62·288 lb. Under the metric system as 1 cubic decimetre of pure water weighs 1 kilogram the weight in kilograms of any other material is represented by its specific gravity without calculation.

So with other ratios of everyday use:—

1 lb. per square inch pressure (of water) is given by a head of 2·31 ft., while
1 kilogram per square decimetre pressure is given by a head of 1 decimetre.
1 cubic yard of water weighs 15 cwt. 0 qr. 1·776 lb., but
1 cubic metre of water weighs 1 tonne.
1 imp. gallon contains 277·274 cubic inches, and
1 U.S. gallon contains 231 cubic inches, but
1 litre measures 1 cubic decimetre.

(*b*) *Simplification of calculations.*—The foregoing section indicated that the scientific basis conduces to conciseness of conception, but the simplification of all ordinary calculations is almost beyond expression—"simply marvellous" as Sir Benjamin Baker said. To a man who has been used all his life to writing down 77 as a result of multiplying 11 by 7 whatever the denomination, how insane it must seem to be told that

11 articles at 7d. cost 6s. 5d.
11 „ 7s. „ £3 17s. 0d.
11 pounds at £7 per cwt. cost 13s. 9d
7 „ £11 „ „ 13s. 3¾d.
11 pints at 7d. per quart cost 3s. 2½d.
11 quarts at 7d. per gallon cost 1s. 7¼d.

and what must he think of the process by which such wonderful results are secured.

In a paper on the "Steam Path of the Turbine" read by Dr. C. P. Steinmetz before the American Society of Mechanical Engineers * it was stated that where an investigation extends over several branches of science the "incongruous mixture of heterogeneous units called the English system" is so cumbrous that it is far simpler to translate the premises into the metric system and to carry out the work in the metric system, even if the results have to be expressed in English measures.

Under the head of simplification I think it is fair to put engineering drawings. What a mixture of dimensions we get now. Even where restricted to English measures we get feet, inches, and quarters, eighths, sixteenths, thirty-seconds, sixty-fourths, and mils.

1 3/16″ is liable to be misread for 13/16″,
1′ 1¼″ to be mistaken for 11¼″ or even 111¼″,

whereas under the metric system every dimension large or small can be expressed in millimetres and automatically translated when the higher unit needs to be expressed.

(*c*) *Mechanical calculator.*—Perhaps, however, we must look for the most enthusiastic appreciation of the metric system a few weeks after its adoption from the ordinary clerk and accountant when he finds that whatever his business may be and whatever the nature of his calculations the ordinary decimal calculator, or even the slide rule, will give him all the results he wants.

What developments in the use of mechanical calculators may be expected when the same simple and inexpensive machine will serve for every kind of business and every kind of merchandise.

(*d*) *Education.*—It has been stated that of 221 head masters who reported upon the subject in 1903, 212 expressed unreserved support of the metric system, as its introduction was estimated greatly to economize school life,

161	masters estimated the time at			1 year
30	„	„	„	2 years
6	„	„	„	3 „

(*e*) *Internationalization.*—The inconvenience of want of uniformity of international measures has been im-

* *Proceedings of the American Society of Mechanical Engineers*, 1908, vol. 30, p. 273.

pressed even upon the "man in the street" during the war, when he has been constantly faced with the difficulty of knowing whether the advance was on a 10-mile or a 10-kilometre front, whether we went forward a mile or a kilometre, and what the difference was..

This inconvenience is enormous to engineers and others who have constantly to deal with works of foreign and of American authorship and to make comparison of results recorded in different denominations.

The difficulty applies even in English measures alone, as, for instance, when, in two articles upon the same subject printed in *Engineering* the results were expressed respectively in cwt. per sq. inch and in tons per sq. inch.

Similarly with almost every kind of ironwork, some dimensions are expressed in feet and some in inches, or even in special gauge numbers.

Scientists, whose work is international, are practically compelled to express their results in international terms, even if they also use the English measures.

IV. Disadvantages of a Change of System.

(*a*) *General.*

(1) *English measures well known.*—That there are appreciable advantages presented by continuance of the present procedure cannot be questioned. As a nation of shopkeepers our measures have come to be known by merchants of all nations and in many cases our practice has become practically international. Somebody showed that the sizes of men's hats in Paris were ruled by the English practice, and explained that in order to keep within the law the nomenclature of the sizes had been revised so that hats of British sizes 6", 6⅛", 6¼", 6⅜", etc., become sizes numbers 1, 1½, 2, 2½, etc. If it is a matter of practical importance that the sizes of hats shall be based upon gradations of ⅛ in. there will certainly, in any law made here, be nothing to prevent that standard being maintained, nor even against the actual dimensions being used to denote the size. True, under compulsory adoption it might be technically illegal for the hatter to sell a hat at so much per inch.

(2) Again, the unit of capacity of a ship is the ton-register, equal to 100 English cubic feet, although the ton measurement of cargo is only 40 cubic feet. Yet this typically British rule-of-thumb unit is still of world-wide acceptance, even by the metric countries.

All such convenient conventions would, or could if desired, be retained, although it might be found convenient to express the 100 cubic feet in metrical measure. In the same way no doubt we should continue to use foolscap; but the dimensions which are now 13½ in. × 8½ in. would later on be expressed as 343 mm. × 216 mm.

Whatever advantages, however, may be admitted in the British measures, their continued use shuts us off from any advantages that may be presented by a truly international system.

(*b*) *Cost.*

(1) *General.*—The objection to the change that has to be taken most seriously is perhaps the matter of cost. Every opponent refers vaguely to the enormous cost involved in making the change. There can be no doubt that the cost to the community in the aggregate will be very great indeed, but this should be kept in its right perspective. The cost would not be a charge in bulk. It would be borne in relatively small sums by businesses according to the turnover. The small business would have to disburse once for all a few shillings for a set of new weights. Progressive retailers during the last few years have "scrapped" not only their weights but their scales in favour of direct-reading balances. Those balances could be corrected to the new weights for a relatively very small sum. The same would apply to butchers' steelyards which, without any revolutionary change, a few years ago replaced other machines scrapped as a result of a Board of Trade Order.

(2) *Engineering work.*—Similarly with a big engineering firm, the cost of the change for templates, gauges, meters, dies, etc., will for the most part only precipitate normal renewal, and will be a mere decimal point of the regular expenditure under many overhead charges, such as postage.

Probably even in regard to a large proportion of specially expensive measuring instruments the makers will be able to devise methods of altering rather than scrapping, while in other cases there will be little objection to or inconvenience in use of conversion tables. In fact the rule for capable people applies here, that difficulties are made to be overcome—raised by the fearful, razed by the cheerful.

(3) *Estimates. Taring of railway trucks.*—As an example of groundless fear, many of us were present at a meeting where a great railway engineer showed how the comparatively simple process of re-taring all the railway trucks would cost about £400,000. But I understand that railway trucks are re-tared normally (where facilities exist) when they come into the shops for repair, and the general manager of one great railway advised me that it would appear to be quite a minor matter; while another gave me the works history of three representative trucks built in 1908, 1909, and 1910 respectively, which were each re-tared twice within five years of building.

Shipbuilding.—In 1895 the President of the North-East Coast Institution of Engineers and Shipbuilders, when advising the then Prime Minister (Mr. Balfour) that his members were unanimously in favour of the change, stated that at his own works with a wages bill of £2,500 a week the cost of the change would be little over £100.

(4) *Effects on existing plant.*—Another aspect of the change gives great and groundless scope for the fearful. There would not be the slightest need to alter the dimensions of machines—toolmakers might even continue for years to make 3½-in. lathes if they wished, and no one would be "one penny the worse."

It must not be understood, however, that generally using the present measurements and giving them metric nomenclature is adoption of the metric system. We should ultimately use round figures in the metric system as we do in the English and should, for example, not stock 1-in. rod and call it 25·4 mm. but should have 25-mm. rod as the standard item.

This scrapping idea is really fanciful in many cases. In regard to meters, for instance, people who can read a gas meter in cubic feet and check the account at x per 1,000 cubic ft. would not seriously object to having to convert their reading into the corresponding metric measure. It would be no worse than a certain water company whose meters registered cubic feet while the charge was per 1,000 gallons.

(*c*) *Loss of mental and manual facility* (*Habit*).—One aspect of the change that perhaps more even than the cost will be felt to bear hardly upon the individual is the loss of expertness and facility that is bound up with the existing practice. Here more than anywhere breadth of vision and generosity of purpose are most needed. People often speak as if the idea was to think and work in feet and inches but to speak and calculate in centimetres. What we really have to visualize is the difference between on the one hand the existing conditions, with every English-speaking person using to some extent the English measures and all who have foreign businesses using in addition another system; and, on the other hand, the metric system alone being used by all for thought and word and work, the present tables being of interest only to the historian and the statistician. Which of these two conditions is the better? And how much the better? When I contend that the all-metric condition would be greatly superior, and when I prove, or even only claim, that the change would be worth effecting I have to recognize, and do so sympathetically, that there must be an intermediate period during which the conditions will undoubtedly be complicated for a vast number of people.

Most people, however, will readily adapt themselves to the new conditions, and for those who cannot, facilities will exist. For instance, (i) Housewives who know well the present price of sugar per lb. will at first only know that 66 mils per kilogram is a fair price, by seeing on the table that it is about the same as 6½d. per lb.; and such tables showing equivalents will be on exhibition in every shop. Or (ii) the head of a firm might continue to think and speak of ½-in. bolts long after such things had ceased to be used; and his subordinates would only explain to the juniors that he meant 12-mm. (or even 10-mm.) bolts.

(*d*) *Dual stocks*.—Of course in commerce during the transition stage the two things themselves would actually exist: at first the stock of ½-in. bolts would predominate, and at last only the 12-mm. bolts would be obtainable except as a special order. For many a long day we should continue to think of distances in miles, but when we had to pay in kilometres we should gradually get to think in kilometres.

(*e*) *Difficulty of working in decimals*.—It is a little perplexing to know how best to counter this objection, because so many opponents of the metric system contend that it would be better to decimalize the English weights and measures. But really the difficulty has already been overcome. The English mechanic is quite used to working to mils, i.e. 0·001 in., and occasionally carries the division to the fourth place as 0·0001 in.

(*f*) *Correction of drawings*.—For the most part there need be no corrections. At present in works and drawing offices where a few drawings to metric scales are handled no confusion results. How much less would drawings to the familiar scales need special treatment in the transition stage. But really the references to old drawings are not very considerable. I had a return taken which indicated that of a certain group of about 7,000 dimensioned drawings fewer than 300 were referred to in a year, and of these only 100 were more than four years old. That is, allowing for duplicate references, not 1 in 100 of the older drawings is ever needed.

(*g*) Again, with ordnance maps, etc., we already use eight standard scales, including one for the Land Valuation Department. Practically all measurements from them must be taken by map measurers, which are very inexpensive instruments; and it would be a very simple matter to have them adjusted to read kilometres instead of miles to the same scale. The proper scale for an ordnance map, however, is what is called the "natural scale"; that is, a scale which, as in an ordinary drawing, is a fraction of full size. Three of our eight standard sizes are to natural scale: 1 : 1,000,000 (0·06336 inch to mile), 1 : 2,500 (25·344 inches to mile), and 1 : 1,250 (50·688 inches to mile).

I have set out the present standards side by side with an alternative natural-scale metric series. The vast improvement presented by the latter to the user 10 years after adoption, when few of the former would exist, is I think self-evident.

Present Scale and Denomination	Ratio	Proposed Denomination	Ratio	Equivalent
Miles to inch	1 to	mm. to km.	1 to	Inches to mile
15·782	1,000,000	1	1,000,000	0·06336
10	633,600	2	500,000	0·12672
4	253,440	4	250,000	0·25344
2	126,720			
		10	100,000	0·6336
Inches to mile		20	50,000	1·2672
1	63,360	40	25,000	2·5344
6	10,560			
25·344	2,500	100	10,000	6·336
50·688	1,250	200	5,000	12·672
		400	2,500	25·344
		1,000	1,000	63·363

V. Conditions of Introduction.

There can be no doubt that some appreciable inconvenience will have to be faced by the community when the transition from English to metric measures begins. It would appear that this inconvenience would be less in the immediate future than at any later time, because our ordinary standards have been so rudely assailed by the war and we can effect the change virtually in process of getting back to normal. For example, if we ever get nearly back to the pre-war letter rate of a penny for 4 oz., the change might make it 4 mils per hectogramme.

Further, great masses of our men who will be returning from France will be to a limited extent familiarized with the French coins and minor measures.

In fact, it is at least as easy to magnify as it is to minify the inconvenience. If as a matter of fact no difficulty is experienced in workshops where both systems are in use, why need we shrink from the simple process of making the complete change.

A few approximations between the two systems would be very useful if memorized :—

e.g.	1 kilometre	= about 5/8 mile,
	1 metre	= $1\frac{1}{10}$ yards,
	1 centimetre	= about 2/5 inch,
	1 millimetre	= 1/25 inch,
also	1 sq. metre	= about $1\frac{1}{5}$ yards,
	1 litre	= $1\frac{3}{4}$ pints,
and	1 ton	= about 1,000 kilograms,
	1 cwt.	= ,, 50 ,,

VI. Compulsory Adoption.

Mr. Ingalls, President of the American Institute of Weights and Measures—which is merely the United States Anti-Decimal Association—says he argues " not against the metric system but rather against the propaganda for the *compulsory* adoption of it." Precisely, that is all that the most virulent opponent need ask for, because on that principle in these modern days he can safely depend that no reform that touches the individual pocket or the convenience of vast numbers of the community can be secured. " Let people who want to get up an hour earlier in summer-time do so, but don't make it compulsory " was the broad-minded argument, agreement to which would have robbed us absolutely and infallibly of a priceless boon. So these opponents know that the London and North-Western Railway Company cannot carry goods on a metric basis while any other railway company in the country does not; that a metric letter post is unthinkable while the confectioner sells sweets by the ounce and the grocer sugar by the pound; and that, so long as the Post Office measures parcels by the inch, the draper cannot sell linen by the metre. We, who in these days are used to compulsory limitation of the coals we may buy, need not break our hearts if we should be compelled to buy it by the metric tonne. We have been " free " to use the metric system voluntarily for 20 years. With legislators, bankers, men of science, engineers, schoolmasters, shipbuilders, chambers of commerce, and trade protection societies advocating its use, it is surely time that we made up our minds that the general interests of the community demand settlement of the matter.

VII. Decimal Coinage.

(*a*) *British bankers' system.*—Although the subject of coinage is very closely associated with that of weights and measures the two are really quite distinct and are capable of separate treatment. This is well illustrated by the facts that, while the writer of an article in *Nature* deplored that the *Electrical Review* by associating advocacy of a change of the monetary system with the claim for standardization of units had thereby jeopardized the success of the effort to secure the metric system, the Institute of Bankers recommend the adoption of decimal coinage as a first step towards the introduction of the metric system.

The Institute of Bankers this year adopted the report of a committee appointed to consider the whole subject, which recommended the introduction of a decimal system based upon the present gold standard with one pound as the unit. This was subsequently agreed to by the Association of Chambers of Commerce of the United Kingdom and by the Decimal Association. The pound would be divided into 1,000 mils, the whole scheme being as follows :—

		£	Mils
Gold or Notes	Sovereign	1·000 =	1,000
	Half-sovereign	0·500 =	500
Silver	Double florin (4s.) ..	0·200 =	200
	Florin (2s.)	0·100 =	100
	Half-florin (1s.) ..	0·050 =	50
	Quarter-florin (6d.) ..	0·025 =	25
Nickel (scalloped)	Ten mil piece	0·010 =	10
	Five mil piece.. ..	0·005 =	5
Bronze	Four mil (about 1d.) ..	0·004 =	4
	Three mil (,, ¾d.)..	0·003 =	3
	Two mil (,, ½d.)..	0·002 =	2
	Mil (,, ¼d.)..	0·001 =	1

This scheme presents the advantage of giving a clean-cut series of coins that cannot well be confused with any other system. It involves no break with the fundamental basis of British finance, maintains both gold and silver coins at existing values, necessitates only a 4 per cent variation in the value of the bronze coins, and gives an improved range of low-value coins without increasing the total number of different coins issued.

(*b*) Internationalization of coinage is in most respects not very desirable. If, however, it were possible to secure uniformity of coinage throughout the British Empire, perhaps with silver and bronze coins legal tender only in the country of issue, but with only one pattern of gold coins current everywhere. Those coins would be an expression in gold of the unity of the Empire, and I suggest that " Imperial " would be an admirable name for this new symbol of Empire.

I have sought to place before members " a case " for the adoption of the metric system. Limits of space, apart from want of ability and of authority, would prevent me from putting " the case," but I have endeavoured as briefly as I could to present some advantages, and to state fairly and meet squarely the main objections. On the assumption that, apart altogether from my effort, the case has been made, it remains to me finally to suggest as to:

VIII. " When ? "

Replacing standard weights of retail traders would be a fairly considerable matter. It might be better to let local authorities decide within a time limit the date of introduction in their several districts—the only restriction being that in every shop during the transition period there should be only one system of measures used, and that the actual system in use should be prominently notified. For example, if the Act provided that on and after (e.g.) 1st January, 1919, all transactions should be carried through on the metric system, on and after that date in every shop there would be exhibited, besides suitable conversion tables, a notice that " Scales, Weights, and Measures used are Old Style " or " Scales, Weights, and Measures used are Metric."

Therefore the local authority would notify that on and after (say) 31st March, 1919, all scales, weights, and measures used in dealing with the public must be on the metric system. This would spread the demands upon scale makers over a longer period and thus facilitate the change.

All printed matter should be supplied by the State —another job for the Post Office.

When I was a schoolboy, I was told it would be " soon." Generations of schoolboys have come and gone since then, and millions of years of schoolboy time have been paid for by the parents and wasted on learning the great British muddle of measures. In that time not foot-rules and scales and weighbridges and templates and jigs, but factories and works and stores and railway stations have been rebuilt and re-equipped at vast expense, and we are still squandering millions of days every year at the beginning of life in order to save possibly the same time (certainly not more) in later life of the earlier generation once for all.

Opponents quite frequently recognize that the metric system is bound to come.

There can be no doubt that every year that we delay adopting it the difficulty and the expense of introducing the system are increased. Therefore the logical and reasonable procedure, with proviso that due time be allowed for the necessary preparations, is DO IT NOW.

APPENDIX.

CHRONOLOGY.

(Abridged from the *Electrical Review.*)

1824. On discussion of decimal coinage in the House of Commons a " pound and mil " system was recommended.

1841. After the destruction by fire of the Houses of Parliament, the Commission for the Restoration of the Standards of Weights and Measures reported in favour of the decimal system.

1843. 1853. Further favourable reports.

1859. A Select Committee of the House reported against a change in the coinage pending reform of the weights and measures.

1862. A Select Committee reported in favour of the adoption of the metric system.

1892. The Conference of the Chambers of Commerce of the Empire resolved that introduction of the decimal system was urgently needed. (Similar resolutions were passed also in 1900, 1903, and 1912.)

1893. Trades Union Congress advocated the reform.

1897. Metric system made legal, but the enactment did not provide for any compulsion.

1902. Sixty municipalities petitioned for the adoption of the metric system throughout the Empire. 292 Members of Parliament expressed their approval. Adoption was urged by the Imperial Conference.

1902. 1903. 1904. The Associated Chambers of Commerce and the Association of Trade Protection Societies advocated compulsory introduction of the metric system and of decimal coinage.

1903. The Council of the Institute of Chartered Accountants passed a Resolution in a similar sense.

1904. The General Medical Council resolved that the metric system should be the only legal system for use in dispensing drugs. The Chambers of Commerce of Australia urged that the British Government should adopt the metric system.

Second reading of a Bill for the purpose passed the House of Lords.

1907. The House of Commons rejected, by the narrow majority of 32, a Bill providing for the compulsory introduction of the metric system.

1910. The Australian House of Representatives, by 35 votes for and 2 against, resolved that the metric system be adopted as soon as it became compulsory in Great Britain.

1914. The metric carat became the only legal standard for the weighing of gems, etc.

Barometer readings recorded in units of pressure founded on the metre-gramme-second system. Rainfall recorded in millimetres.

In the new edition of the " British Pharmacopœia " weights and measures are given in the metric system " in the expectation that in the near future the system will be generally adopted by British prescribers."