It may be useful to put down a number of the coldest of these days (reckoned by maxima). Here are 12:

	Max.	Min.	Diff.
	°	°	
1. Jan. 5, '94 ...	19·0 ...	12·8 ...	6·2
2. Jan. 4, '67 ...	21·2 ...	7·7 ...	13·5
3. Dec. 21, '55 ...	23·2 ...	17·0 ...	6·2
4. Dec. 22, '90 ...	23·7 ...	13·4 ...	10·3
5. Dec. 22, '55 ...	24·2 ...	16·9 ...	7·3
6. Jan. 10, '91 ...	24·4 ...	12·0 ...	12·4
7. Dec. 31, '74 ...	24·5 ...	18·5 ...	6·0
8. Jan. 7, '94 ...	24·5 ...	18·1 ...	6·4
9. Jan. 16, '81 ...	24·6 ...	17·7 ...	6.9
10. Jan. 15, '81 ...	24·8 ...	14·0 ...	10·8
11. Mar. 13, '45 ...	24·8 ...	13·1 ...	11·7
12. Jan. 14, '67 ...	24·9 ...	13·9 ...	11·0

These minima, it will be seen, range from 7°·7 to 18°·5. I do not enter on the question as to the coldest days measured by minima; but from a table by Mr. Charles Harding, giving the minimum at Greenwich in each winter, 1841–89 (*Quart. Journ. of R. Met. S.* vol. xvi. p. 165), extended to '93, I take the following cases (adding the maxima since '44):

	Min.	Max.	Diff.
	°	°	°
(Jan. 9, '41 ...	4·0)		
1. Jan. 5, '67 ...	6·6 ...	32·5 ...	25·9
2. Feb. 12, '45 ...	7·7 ...	29·3 ...	21·6
3. Dec. 25, '60 ...	8·0 ...	30·0 ...	22·0
4. Dec. 25, '70 ...	9·8 ...	28·2 ...	18·4
5. Feb. 19, '55 ...	11·1 ...	33·4 ...	22·3
6. Feb. 12, '47 ...	11·2 ...	39·6 ...	28·4

The lowest (4°·0) was in '41, and so beyond our fifty years' limit. It will be observed that those six maxima are all higher than any in our first list, exhibiting a wide range in the temperature of the very cold days thus measured.

In the present remarkable season, there have been, up to February 27, 17 of our "very cold" days, viz. 6 in January, and 11 in February (an unprecedented case). The lowest maximum is 27°·0, occurring on February 6, 7, and 9; the respective minima, 15°·1, 9°·6, and 10°·2.

A. B. M.

Hesper and Phosphor.

IN his "History of the Inductive Sciences" (vol. i. p. 149, London, 1847), Whewell says:—"Pythagoras is said to have maintained that the evening and morning stars are the same body, which certainly must have been one of the earliest discoveries on this subject; and indeed, we can hardly conceive men noticing the stars for a year or two without coming to this conclusion" (*cf.* "The Planet Venus," by W. J. L., in NATURE, vol. xlix. p. 413). Now, what Whewell deemed so hardly conceivable appears to have actually occurred in old China. Wang Chung, the philosopher (*circa* 27–97 A.D.), in his work, renowned for its total repudiation of the then current errors, writes as follows:—"In the 'Book of Poems' it is said, '*Ki-ming* (Phosphor) exists in the east, and *Chang-kang* (Hesper) in the west.' In fact, however, they are but the phases of Jupiter and Venus, which, appearing now in the east, now in the west, received such distinct names from the ignorant bards" ("Lun-hang," Miura's edition, Kyôto, 1748, tom. xvii. pp. 12–13). Two facts are manifested in this passage. First, it shows that, celebrated for their astronomical acquirements in very archaic ages, as they are, the fact that the evening and morning stars are the same body, was not known to the Chinese of the eighth century B.C., when the poem entitled "Ta-tung" was composed, comprising the above-quoted line. Secondly, it shows that, even after the identity was established of the evening and morning stars, some Chinese, so well learned as Wang Chung, were ignorant of their own error: affirming that Jupiter as well as Venus appears now as Phosphor, now as Hesper, they have admitted the existence of two distinct Phosphori and two distinct Hesperi, and of a Phosphor essentially different from a Hesper. It is probable that some later scholars have tried to evade this intricacy by arbitrarily apportioning the two phases between the two planets; thus, Minamoto-no-Shita-zau, the Japanese poet and glossarist (909–983 A.D.), referring to a Chinese work "Kien-ming-yuen," which is perhaps lost now, identifies Jupiter (in Chinese: Sui-sing) with Phosphor (in Japanese: Aka-boshi), and Venus (in Chinese: Tai-peh) with Hesper (in Japanese: Yûtsutsu) ("Wamyô Ruijushô," Nawa's edition, Kyôto, 1667, tom. i. p. 1).

February 22. KUMAGUSU MINAKATA.

The Recent Storm in the United States.

THE storm of February 4–9 in the United States was notable for its extent and severity, recalling the memorable blizzard of March 1888. The Government Weather Bureau gives the following comparison of the two:—

	1888.	1895.
Snow	2 feet	5½ inches
Wind	50 miles	60 miles
Temperature at New York	4·8 above	3 below
Area	400 miles radius	1600 miles radius

It will be seen that the recent storm was more severe in everything except the amount of snow, and far more extensive. The entire southern portion of the country experienced severe cold, destroying fruits and vegetables to the value of 15,000,000 dols. in Florida alone. The zero line extended below the middle of Arkansas, and well down into Texas.

The storm reached New York on Thursday, February 7. On the previous afternoon, at about four o'clock, I observed at Brooklyn the unusual phenomenon of a double rainbow.

Brooklyn, February 11. WM. H. HALE.

SOME SUGGESTIONS ON THE ORIGIN AND EVOLUTION OF WEB-SPINNING IN SPIDERS.

IT cannot be reasonably doubted that one of the most interesting features connected with the natural history of spiders, is their habit of gaining a livelihood by spreading nets for the capture of prey. It may be that the large share of the attention of naturalists that this habit has attracted, is to be attributed to the fact that it appears to be confined in the animal world to spiders and men. This circumstance is of itself sufficiently remarkable to call for special comment; but its interest is not a little enhanced by the reflection, that since spiders made their appearance in the history of animal life vast ages before man came upon the scene, none of us can justly claim that any member of our own kind was the first in the field in the invention of the art of netting. Possibly, indeed, the oft-repeated and unavoidable observation of the efficacy of a spider's web for the purpose of catching otherwise unobtainable prey, may have roused in the brain of some intelligent hunter amongst our ancestors, the idea of the practical utility of a similar instrument for the capture of fish or other eatable forms of life. But if this be so, civilised man has long forgotten the debt of gratitude he owes to spiders. For, to the average individual amongst us, a spider is a thing to be looked upon and spoken of with fear and dislike amounting to loathing, and to be ruthlessly destroyed when a safe chance of destruction is afforded.

It is, perhaps, on account of this widespread repugnance that the science of arachnology has claimed within the last century far fewer students than many another less instructive branch of zoology. Moreover, such attention as it has received, is no doubt largely due, as suggested above, to the wonderful web-building powers that spiders possess. But those who have devoted their time to the study of webs, have, for the most part, contented themselves with observing and recording the structure and method of formation of the various types of nests and snares, and in claiming or disputing their value as a basis for a natural classification of the animals that make them. This has resulted, if in nothing else, at least in the accumulation of an array of facts sufficiently vast to make it possible to attempt to weave them into a coherent and intelligible whole, by trying to trace the origin and evolution of the habit of net-spinning. It is strange that but a small number of students seem to have occupied themselves with this most attractive aspect of the subject. With the exception, indeed, of a few authors who have here and there thrown out stray suggestions upon particular points, no one appears to have seriously set himself to the elucidation of the whole problem. It is true that in the second volume of his work upon the American orb-weaving spiders, Dr. McCook devotes a chapter to the "genesis of snares"; but since he does not appear to be able to attach great importance to the evidence in favour of evolution, his treatise on the subject practically resolves itself into a demonstration of the fact that, by starting at any point you please, in what is called "aranead spinning work," a series of gradations may be traced from one modification of architecture to another, from the simplest to the most complex, or from the most complex to the simplest. He thus succeeds in leaving his readers completely in doubt as to whether or not he intends one or all of his attempts at tracing the "genesis" of snares to represent what has actually occurred in the course of nature; and one closes the chapter without satisfactorily ascertaining if its writer has any definite views respecting a primitive form of spinning work. Yet, at the same time, it must be admitted, an impression remains that the suggestions that are put forward, based as they are upon an extensive knowledge of the subject, point in more than one instance to the true lines along which the web-spinning habits have been evolved.

In attempting to arrive at an understanding of the origin of any structure or instinct in an animal, one nowadays naturally refers for an explanation to what is hypothetically its ancestor, or, failing this, its ancestor's nearest ally. If this method of research be adopted in connection with the spinning powers of spiders, it is found that silken threads are fabricated by two allied groups of animals, both of which are believed by some students to stand, in many respects, nearer than spiders do to the ancestor of the class to which spiders, scorpions, mites, &c., belong. In one of these—the Chelifers, or book-scorpions—the presence of silk glands has long been known. In the other—the *Phrynidæ*—their existence is now, for the first time, I believe, pointed out. The function of the silk in the Chelifer is cocoon-spinning; and that it is materially the same in the *Phrynidæ* is shown by the easily verified fact, that the egg-case of the mother is secured to the lower surface of her abdomen by fine silk-like threads. One of the chief interests of this discovery lies in the circumstance, that of existing animals the *Phrynidæ* appear to be most nearly allied to the immediate ancestor of the spiders. We are, therefore, justified in concluding that originally the silk in spiders was utilised for the purpose of making a case for the eggs.

If, however, we consider the question from the standpoint of spiders alone, it seems to me that we should naturally arrive at the same result. For it is, *à priori*, probable that the primitive form of spinning industry was that particular kind which is now common to all groups. But when we pass in review the spinning work of the various tribes of spiders, we find that the habits of utilising the silk for constructing a snare, or drag-lines, for enswathing captured prey, or for purposes of locomotion, do not occur, by any means, invariably throughout the class. In fact, we cannot say of any one of them that it is characteristic of spiders. Not so, however, is it with cocoon-spinning. For, however different from each other in structure spiders may be, and however dissimilar in habits and mode of life, we yet find that the instinct of the mother to spin a cocoon for the protection of her eggs is never wanting.

Granting, then, the possession of silk-glands inherited from an ancestor, we may conclude that the first step in the development of web-spinning was the formation of the cocoon. What was the second? We know that a spider's care for her eggs does not, as a rule, cease with the completion of the cocoon: some species carry it about with them; others mount guard in its vicinity. Possibly the former was the original method of disposing of it. But if so, since such a habit must more or less impair the mother's activity and must render her a conspicuous object of attack, we can understand why it has been abandoned for the latter method by the great majority of spiders, and is now almost confined to those species in which the nomadic mode of life reaches its highest development. If, on the other hand, as seems more likely, the primitive habit was that of watching by the cocoon, we can understand that during the temporary period of quiescence thus enforced, the mother would naturally seek concealment and protection for herself; and since she possessed the instinct and material for constructing a receptacle for her eggs, it is possible to see how a slight modification of intelligence might have led her to extend the same protection to herself by weaving a covering over and around the retreat in which she had sought refuge. Then if an aperture for ingress and egress, for purposes of feeding, were left at any spot in the wall of such a protective domicile, there would arise, in a rudimentary form, what is known as the tubular nest or web. And the next simple but important step would doubtless be the adoption of the silken tube as a permanent abode for the mother after the dispersal of the young to shift for themselves.

As a matter of fact, some spiders have advanced no further than this stage. The females of some *Drassidæ*, for instance, spin a temporary retreat for themselves and their young at the breeding season; while others utilise the retreat as a permanent dwelling-place. Lastly, the view that the formation of a tubular retreat was in reality the second stage in the evolution of web-spinning, seems supported by the circumstance that the tube, whether accompanied or not by accessory developments, is, with the exception of the cocoon, the most constant feature in the spinning industry of spiders.

Adopting then, for these reasons, the conclusion that a simple tube was the primitive form of nest, it seems that the evolution of web-spinning has been carried out along two main lines. Along one there is a gradual elaboration of the tube until it culminates, so far as structural complexity is concerned, in the trap-door nest with which everyone is familiar; along the other, the tubular nest either ultimately disappears, or, retaining its primitive simplicity, it is to a greater or less extent superseded by the formation of a new structure—namely, the net for ensnaring prey.

It will not here be necessary to enter upon a discussion concerning the various forms of tubular nests that are constructed; but a few words respecting the probable origin of the door-making habit may prove of interest.

In the first place, it is important to note that the remarkable instinct to close the aperture of a tubular nest with a movable lid is possessed by spiders belonging to two groups. These are the *Lycosidæ*, or wolf-spiders, of which the South European *Tarantula* is a historical example, and the gigantic *Aviculariidæ*, which have won such a bad name for their alleged bird-catching propensities. But although there is no direct genetic affinity between the species composing these two families, it is nevertheless highly interesting to note that they present a close parallelism in nest architecture. In both there are species which form no nest, others which construct a simple silken tube, and others which close the aperture of the tube with a hinged-door. Yet it is certain that the last-named instinct has been independently acquired in the two cases. Moreover, it is probable, as will presently be explained, that in both cases it has been brought to its present state of perfection under stress of the same adverse conditions of life. As is well known, Mr. Moggridge long ago suggested that the instinct to construct the door may have arisen from the habit of closing the aperture of the tube in the winter and opening it again in the spring. This idea, in substance, has been adopted and further developed by Dr. McCook, who states, upon the authority of Mrs. Treat, that a North American species of wolf-spider (*Lycosa tigrina*) has acquired the instinct of sealing up the aperture of her nest during the breeding season of the Mason-wasps; for at this period these insects scour the country for spiders, in order that they may lay up a store of food for their young. When the wasps have disappeared with the close of their hunting and breeding season, the spiders venture again to remove the covering of their nests; but Mrs. Treat has made the further important observation, that some examples leave the covering attached at one point. Thus a genuine, though roughly-formed, trap-door nest is produced. In view of this circumstance, there cannot be much doubt that the permanent and highly-finished trap-door nest of the Russian *Lycosa opifex* has been similarly brought about, as M. Wagner, the discoverer of the species, has suggested, under the stress of the dire persecution from wasps to which spiders in general are subjected.

Being thus able to trace with some degree of certainty the steps by which the trap-door nest has been evolved in one group of spiders, namely, the *Lycosidæ*, we are justified in concluding, at all events until evidence to the contrary is forthcoming, that it has been evolved in the same way in the case of the *Aviculariidæ*—the trap-door spiders *par excellence*.

The primary influence, then, that has been at work in guiding the evolution of the architecture of the tunnel-making species, has apparently been that great necessity for the preservation of life, the avoidance of enemies. But if we turn to the other line, along which the web-building instinct has been developed, we find that the primary guiding influence has been that second great vital necessity, the acquisition of food.

As has been already stated, the origin of the webs which function as snares seems to be referable to a simple silken tent or tube, similar to that from which all the more or less complicated forms of tubular nests appear to have been developed. Perhaps the most rudimentary form of snare arose, as Dr. McCook has suggested, from the chance spinning of a few stray threads about the mouth of the tubular retreat; or, perhaps, an irregular network of threads spun around the aperture to interfere with the entry of such enemies as wasps, was the first step in the evolution of net-spinning; or even lines anchoring the tube securely in its site might have first served the purpose of catching prey. But, however this may be, it is clear, as Dr. Romanes[1] has pointed out, that "there is much potential service to which the power [of net-spinning] may be put with reference to the voracious habits of the animal." Taking this into consideration with the variation in structure presented by different species of spiders, it is not surprising that there are many modifications of the net. Sometimes it is a thick, closely-woven horizontal sheet, which is continuous at one extremity with a tubular retreat, as in the case of one of our commonest house-spiders, *Tegenaria*; or, as in the equally common *Amaurobius*, the net is less regular in shape and less thickly woven, but is still continuous, with a silk-lined hole, in which the spider lurks; or again, the web, as in *Pholcus* or *Theridium*, may be composed of an irregular mesh-work of interlacing threads, without any such tubular retreat as that constructed by *Tegenaria* or *Amaurobius*; or, lastly, it may be composed of radiating and concentric lines, like that of our garden spider, *Epeira*: and it seems to be generally admitted that this orbicular web of *Epeira* manifests the greatest perfection of instinct, and is therefore to be regarded as the highest form of this kind of spinning-work. Consequently, the question concerning the possible steps by which such a structure has been evolved cannot fail to be of interest.

[1] "Animal Intelligence," p. 208.

In the first place, if all snares are traceable back to a common tubular origin, it may be taken for granted that those that are still associated with a tubular retreat are, *cæteris paribus*, of a more primitive type than those in which the tube has been abandoned. Furthermore, it may be confidently assumed that the habit of weaving the lines of the snare radially and concentrically in a definite and elaborate pattern, was preceded by the habit of arranging them irregularly and without order. Looked at from this point of view, the web of a *Tegenaria* or *Amaurobius* is a much less specialised structure than that of an *Epeira*. It may consequently be concluded that the complete orbicular snare of the latter animal, and of orb-weavers in general, has been derived from one which, like that of the tunnel-weavers, was composed of irregularly crossing threads, and was continuous at one extremity with a tubular domicile. Having arrived at this conclusion, we naturally appeal to nature for corroboration, and search for connecting links. Nor need we look far. For, taking first the tunnel-weavers, we find that a species of *Dictyna*, a spider nearly allied to our common *Amaurobius*, constructs a snare of which the threads are arranged radially and concentrically, but so roughly that the resemblance to the finished structure with which we are familiar in our garden-spiders is only remote. Nevertheless, one cannot avoid the conclusion that it represents an initial stage in the development of the perfect orb.

Turning, in the next place, to the orb-weavers, we naturally look out for snares constructed upon a more primitive plan than that which is typical of our English species of *Epeira*. But if there be any such in existence, we should reasonably expect, in accordance with our hypothesis, to find these simpler kinds associated with a tubular retreat. And our expectation would be justified by facts. For the large and handsome tropical genus *Nephilengys* spins a web which is structurally intermediate in character between that of *Epeira diademata* (our garden-spider) and that of the tunnel-weaver, *Dictyna*.[1] This web resembles that of *Tegenaria* and *Dictyna*, in consisting of a long silken tube, with an expanded funnel-shaped mouth opening directly upon an extended network of threads. But the latter, instead of being fashioned like that of the majority of tunnel-weavers, consists of a scanty mesh-work of lines arranged radially and concentrically with respect to the mouth of the funnel. In this particular it is similar to the net of our garden-spider, *Epeira*; but its area, instead of forming a complete circle, extends over only about one-third of this figure. The importance, however, of this distinction breaks down when the webs of other species of orb-weavers are taken into consideraton. For it is found that those of the Malaysian *Epeira beccarii*, as figured by Mr. Workman, and of the North American *Epeira labyrinthea* of Hentz, are completely circular, and yet the radial threads at the centre of the web spring from the mouth of a long silk tube, in which the spider lurks.

To all intents and purposes, therefore, there are not many links missing in the chain which starts with the web of a tunnel-weaver, like our house-spider *Tegenaria*, and terminates with that of our garden-spider *Epeira*. Furthermore, from the web of *Tegenaria* gradations may be traced backwards to the simple tubular retreat

[1] I have to thank my friend Mr. H. A. Spencer for sketches of the web of a species of this spider, and also for a living example of the animal which he kindly brought to me from Durban, while acting as medical officer on board the s.s. *Mexican*. I was fortunate enough to keep this spider alive for several months, and was thus enabled by personal observation to satisfy myself of the accuracy of Mr. Spencer's representation of the web.

of some of the tunnel-weavers belonging to the family *Drassidæ*, which merely construct a web to serve as a nest during the breeding season.

But to strengthen the probability that such an evolution of webs has ever occurred, it is necessary to be able to show in what respects a snare composed of radiating and concentric lines may excel in efficacy the sheet-like web of a *Tegenaria* or the tangled mass of threads of a *Phalcus*.

Firstly, it seems clear that threads which radiate directly from the spot where the spider is stationed, must more rapidly and more certainly inform her of the position of a struggling insect than irregularly crossing threads, which must spread the vibration indiscriminately in all directions; and the advantage of there being as little delay as possible on the spider's part, between her perception of the vibration and her arrival at the spot, where it originates, will be readily understood by those who have observed powerful insects break loose from the web before being seized by the spider. Secondly, the object of the concentric lines is evidently to support the radii and to fill up the spaces between them. It may perhaps be urged, however, that these two ends would be apparently more satisfactorily attained if the inter-radial areas were filled in by a complete sheeting of web, or, at all events, by a larger number of threads than is used by an *Epeira* for this purpose. But it must be remembered, in the first place, that in proportion as the mesh of the web becomes closer, the whole structure is rendered more and more liable to be beaten down by the rain, or blown into shreds by the wind, unless its supports are correspondingly multiplied; and in the second place, that every thread of white silk that is added to the web, tends to make it more and more conspicuous, and so to convert it into a visible object, which will serve as a warning to wary flies, and as an attraction to marauding wasps. And these are the two ends which it is particularly the spider's interest to avoid, inasmuch as they are alike detrimental to its chances of life.

It is legitimate, therefore, to conclude that the principal, if not the sole factor that has guided the evolution of the orb-web, has been the advantage gained by a delicacy of construction, involving comparative invisibility. But the making for invisibility has been kept in check, and has not been permitted to go to the length of interfering with the efficacy of the web as a net, for which a closeness of mesh and strength of thread sufficient to intercept and hold insects is a vital necessity for the spider.

Seeing, then, the advantage of the radiating threads as rapid and sure transmitters of vibration, and the necessity for a net as inconspicuous and delicate, and yet as strong as possible, we are led to inquire if the method of filling up the inter-radial spaces with concentric lines is not calculated to afford the greatest possible support to the radii. This inquiry must, I think, be answered in the affirmative. For if, as is the case here, the threads be drawn from points on one radius to points on another, so as to make the two interior angles on either side of them equal, these threads are the shortest that can be made; and the shorter the threads, the less their elasticity, and the greater the support they supply to the radii. This fact alone has been, one would think, of sufficient importance to bring about the concentric arrangement of the supporting lines. But more than all this, it is also to be borne in mind that the shortest threads utilise the smallest quantity of silk, and take the shortest time to spin. So that, in constructing a net of radiating and concentric threads, it appears to me that an *Epeira* economises both time and silk, and in addition renders her snare as strong and as serviceable, and yet as delicate and invisible, as possible.

R. I. POCOCK.

NEW METRIC STANDARDS.

THE President of the Royal Society, with Sir John Evans, and the following members of the Council—Dr. A. A. Common, Mr. W. Crookes, Dr. A. R. Forsyth, Prof. H. Lamb, Prof. J. H. Poynting—visited the Standards Department of the Board of Trade on Thursday, the 21st inst., for the purpose of inspecting the new metric standards which have been recently deposited with the Department. The President and Council were received by Sir Courtenay Boyle, K.C.B., the Secretary of the Board of Trade, and Mr. H. J. Chaney, Superintendent.

Two new metric standards, of length and mass respectively (*des prototopes nationaux*), were delivered to the Board of Trade by the International Committee of Weights and Measures at Paris on September 28, 1889, and the third and final standard was received from the Committee in December last. All three standards are deposited at the Standards Office, 7, Old Palace Yard, Westminster, and are available for use in the verification of metric standards for the purposes of science.

The two standards received in 1889 include a "line" standard metre measure (*mètre-à-traits*) and a kilogramme weight. The standard received last year is an "end" standard metre (*mètre-à-bouts*). These three standards, together with other similar standards supplied to twenty-one different States, are, *inter alia*, the outcome of the results of the labours of the International Committee for more than twenty years; and Great Britain is the first country which has received all three of such standards.

The standards were verified at the Bureau International des Poids et Mesure (*Pavillon de Breteuil*, *Sèvres*, *près Paris*), which bureau was established under a Metric Convention, dated May 20, 1875, signed by twenty different High Contracting States, exclusive of Great Britain, who finally joined the Convention in September 1884. The Committee is a self-elected body, and is founded and maintained by common contribution from all countries who are parties to the Convention of 1875. The bureau of the Committee is required to be near Paris, and has been declared to be internationally neuter. The Committee was charged in 1875 with the construction, restoration, and verification of new metric standards (*des prototypes internationaux*) to replace the ancient standards of France (*mètre et kilogramme des archives*), and with the verification of copies of the new standards for all the contracting States. By such means the international accuracy of metric standards is now assured throughout the world.

The Committee, which includes thirteen members, undertakes also the verification of standards for scientific authorities or persons.

The Mètre.

The two metric standards above referred to are made of iridio-platinum, or an alloy of 90 per cent. of platinum and 10 per cent. of iridium. The metres are in transverse sections, nearly of the form of the letter X, known as the Tresca form, and selected as being not merely as the most economical (iridio-platinum being a costly metal), but as being less affected by heat, practically non-oxidisable, and well adapted for receiving finely engraved lines. This alloy appears to be of all substances the least likely to be affected by time or circumstance, and has been preferred for standards purposes to rock-crystal, gold, &c. The lines on the *mètre-à-traits* are fine, and are barely visible to the naked eye.

The actual relation of our prototype metre No. 16 is as follows:—

At 0° C.

$$\text{No. } 16 = 1 \text{ metre} - 0{\cdot}6\,\mu \pm 0{\cdot}1\,\mu \text{ at } 0^\circ \text{ C.}$$

Here μ means one micron, or one-thousandth of a millimetre (or nearly 0·00004 inch), so that metre 16 may