THE CROWN JEWELS OF THE NATIONS

ARE THEIR

MEASURES.

האהל והוא
1656 3515
—*Genesis* xviii: 10.

TO THE MEMORY OF

JOHN A. PARKER.

BY J. RALSTON SKINNER.

CINCINNATI:
ROBERT CLARKE & CO.
1877.

Cincinnati
Jany 23 1879

Dear Sir

I thank you for your very kind & courteous note, appreciating highly the delicacy of the compliment of placing the pamphlet for reading even though not accepting its results.

I am fully aware of the exceeding great difficulty of moving the mind from the settled effect of the curriculum in early days. The saying of the Catholics: "Let us bend the mind of the boy, you may have the man" applies with us all as to early training. It was not until upon very much reflection, and long continued, that I broke through the enamel of early conversation. When I halted for a moment on the idea of question as to the rectification of the curve! I pinched myself to see whether I was I. Had I become fou? It was not until I came to the full apprecia-tion of the fact that the system of higher mathematics especially as to geometrical matters stood upon an arbitrary system of DEFINITION, that I commenced seeing mental daylight. In considering warped surfaces it is a necessity that the tangent line must strike through two points of the curve a natural impossibility but a scientific necessity. The whole system of developed mathematics (Geometrical) is rigidly true as built up on its definitions, but those definitions as to at least one, are of themselves only an endeavor to imitate nature, and of themselves only approxi-mation to nature. Nature knows no line, she arranges particles and taking a direction of arrangement we call it a line and so on. As to the great mental difficulties attending the basic defining we can consult the fathers of geometry & find that they were by them held to be even questionable & by no means infallible.

Let a be the disc of a perfect circle, the circumference having a certain number of particles composing it .. 1 .0000, the diameter of this as seen must have an integral number of these parts (by integral we may mean a vulgar fraction or a determinate decimal) because we see that the lines straight and curved are determined or closed the one with relation to the other. Let it be otherwise as in B. Then ex vi termini the diameter

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1 6 5 6 3 5 1 5

—*Genesis* xviii: 10.

SEC. I. Geometry.

II. The Measures of the Nations and their origin.

III. Architectural details and specifications of the Great Pyramid of Egypt, as derived from these measures.

IV. Demonstration of *essential error* in the Legendre or Playfair method of the rectification of the curve of the circle.

Appendix.

TO THE MEMORY OF

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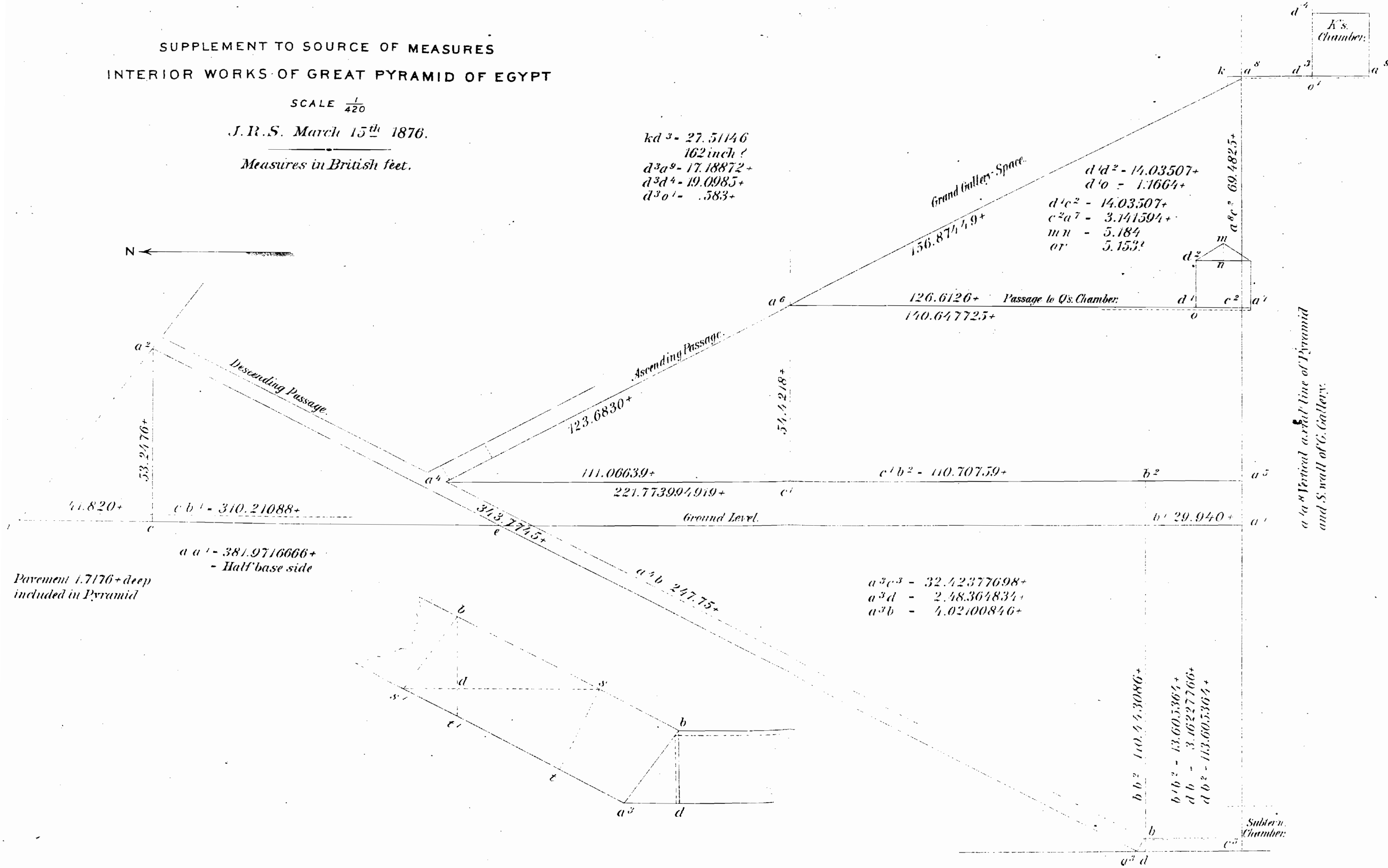
SUPPLEMENT TO SOURCE OF MEASURES

INTERIOR WORKS OF GREAT PYRAMID OF EGYPT

SCALE $\frac{1}{420}$

J. R. S. March 15th 1876.

Measures in British feet.



CORRECTIONS.

Page 14 (c)—34.35$\frac{2}{6}$ feet should be stated as 412.24+ inches, or 20 Turin cubits, or *twice* the breadth of the Queen's chamber.

Page 31, fifteenth line from top—For *some* read *same*.

Page 35—The detail "(1 mile, 403 paces, 1 foot)" should be attached to the "Eastern mile," not to the "Parasang."

Page 41, seventeenth line from top—A parenthesis,), has been omitted after the word *Earth*.

Page 65, third line from top—Reference "§ 63" should be "§ 61."

PREFACE.

THE author feels that he can now offer for reading and study the development of *Numbers as answering to Geometrical analyses of Shapes*, to an extent of exhibition that proves the source of these number relations to exist in nature, and the issuances therefrom (as shown) to be the development of a Natural Creative System; or, in better and more reverential words, of A Divine Creative System. It is true that the sum total of this work is, at best, but the first simple steps toward development; but to the extent of its present compass *it is exact*, and ample enough to indicate a system. More, even; for these simple steps are in truth *the first ones*, the continuous development out of which promises to be infinite in extent and richness.

The author has heretofore, because of the inextricable interweaving of Biblical matters with this system in his conception, commingled these two subjects-matter; but now, because able so to do, he prefers to make this a separate work, as a First Part, which includes: Geometry, the application thereto of these peculiar number relations; The Measures of the Nations; The Construction of the Great Pyramid of Egypt; with, finally, some matters germane to the subject in Appendices. He feels that, as regards these topics, he can safely finish his labors in this little work. As to *Biblical application of these topics*, he believes he has a sufficient amount of discovered material, which, if carefully arranged, will prove this Biblical application in as conclusive a manner as this work establishes the system claimed for it. Of this Biblical application, moreover, he can say, that so far from detracting in any manner from the idea of the Divine attached to the Bible at present by *faith* (which idea, though to a reflecting mind necessary, arises from an intricate volume of processes of proof and of thought, impossible to be set forth and demonstrated as a matter of science is), it serves to show a positive, real, material, scientific connection between creative intelligence and man, *as the very base on which the Bible itself was framed.* The germs of such a showing are contained in a book called "Source of Measures."

The author issued a private circular to this book, "Source of Measures," from which the following quotations will prove interesting as giving a partial history of this entire labor, its progress, and conclusions arising from it:

"This book is remarkable in one respect, for it exhibits a series of results developed from an inquiry commenced without any definite ground of reasoning, and necessarily without any definite end, as objective. Fortuitous circumstances, both of events and of thought, as causes, gradually, through a series of years, developed into this work, so far completed as it is. Some years ago the author was giving special attention to two studies, viz: (1) the attempt to work out satisfactory evidences of the interference of an unseen Intelligence in the fabrication of the frame-work of the Holy Bible, and (2) an effort at inquiry into the operation of natural forces as to cosmical effects, having in view their reference back to a primary unit source. At the time, there was no thought whatever of any connecting link between the two studies, or that the Bible contained any possession of the bases of what are called exact natural sciences. The effort under (2) ended in the publication of a work entitled 'Force in Nature.' Being curious as to what had been, or was being published in this specialty of thought, the author was led to the knowledge of some published addresses of the late John A. Parker, of the city of New York. In these he found mention of a work by Mr. Parker on a *quadrature value of the circle.* About this time, also, he obtained a work by Piazzi Smyth, entitled 'Our Inheritance in the Great Pyramid.' He became interested in this last work, especially in a result of the Rev. Mr. Taylor—viz., that the height of the pyramid was to twice the base side as diameter to circumference of a circle; and, also, in his assertion continually reiterated by Prof. Smyth, that the pyramid was of Divine origin—*i. e.*, built by that same kind of inspiration which prompted the literal composition of the Bible. The author became exceedingly interested in the contemplation of the possible teachings of an unseen Intelligence, as regards geometry and astronomy, substantially set forth in the huge mass, and finally conceived this idea, viz: That if the work was of such an origin, then, on the principle of the existence of a primary unit source, from whence radiated *all construction*, the pyramid, and every part thereof, to the least detail of its works, had reference to some elemental source, so that any detail was but a definite and harmonic change on some and every other; and thus, if two or more finished parts remained intact, from these the whole could be reconstructed—very much after the method of Cuvier as to animal forms. Impressed with this idea, the author commenced dealing in proportions of shapes, and with what possibly might be done with a pyramidal shape of the proportions given by the Rev. Mr. Taylor. After a great number of ineffectual efforts, at last it occurred to place the entire structure in a sphere, to see what relation the vertical axial line of the mass would bear to the center of such a sphere. From this point, a reluctant and tardy success commenced rewarding his efforts. In his efforts, a unit of measure was desirable, setting forth *numerically* geometrical relations, and it occurred to him to make use of the data of Mr. Parker, showing integral relations between the diameter and circumference of a circle, in the form

$$6561 : 20612.$$

It then occurred to him to make use of this formula in an effort at reconstruction of the interior works of the pyramid, with relation to the mass, always noting the *part* of a *diameter* and *circumference* made use of. It was not a great while (about a year) before he found that the use of this circumference value was *reproducing* the pyramid measures in the terms of the *British measures* thereof, as set forth by Prof. Smyth, in his tables of measures ('Life and Works'), although everywhere a proportionate shade of difference was observable. This shade of difference exhibiting itself as proportional in so many different places, convinced the author that one of two things had to be recognized, viz: Either that he had the veritable measure, and the unit measure of Prof. Smyth was different or changed by lapse of time, or else that on, and as to the author's measure there was some principle of working a change, by which Prof. Smyth's British measure being correct, the proper principle of enlargement could be obtained. At last, to his great gratification, he discovered such a principle of change from a hint given in 'Hindu Astronomy,' by its author, Mr. John Bentley. He was certain that there was a relation between the numbers he was using, in their *practical* application as a measure, and the British inch, from a special fact of discovery. The circumference value of Mr. Parker being 20612, to obtain a co-ordinating unit of measure for *linear*, *surface*, and *solid measure*, there being 12 *edges to a cube*, the division of this 20612 by 12 would carry this circular measure on to the 12 edges of a cube, which would serve as a co-ordinating measure. It would, technically, be a *cubiting*, or cubing, of such a circular value. The result of the division was, numerically, 1717.66666+, and if, *practically*, 20612 was in the terms of *British inches*, this quotient would be a reduction *in feet;* or, by scale, it might be 20.612 inches, and then the quotient would be 1.717666+ British feet. He had, casually, in the Astor Library, noted down the restorations of the ancient cubit value, and had found two restorations of great and most valuable authority, viz: (1.) That of Sir Isaac Newton (Prof. Smyth), derived from a large number of measures, taken from this identical pyramid, and given as 1.717 of the British foot; and (2.) That arising from the admeasurements by the French expedition of '99 of the rooms and passage-ways of

the Catacombs of Osimandya, in Egypt, which gave .523524 of the French *meter*. The meter being 39.37079 inches, English, gave for the cubit value, in English feet, 1.71763+; this last restoration agreeing with the cubiting of the Parker circumference to the $\frac{3}{100000}$ part of a foot, English. Here was this magnificent restoration, from those very elements whose use was restoring the pyramid, in its British measures, to within the very small proportion of variation noted. If there could be discovered a principle of variation which would prove the British standard inch to be correct as now, at present, used, then a consequence of almost incalculable value would ensue, viz: That not only were the *exact values* of these measures found, but, also, that the ancient cubit was derived from the British inch, as a source; and, further, the very elemental source of their origin was thus laid bare, as derived from the elements of Mr. Parker.

"The relation of 6561 : 20612 gives the proportion 6561 : 20612 : 1 : 3.141594269+, and 3.141594269 : 1 : 1 : .31830972249+. Here the *first* term is circumference to a *diameter of one*, while the *last* is diameter to a *circumference of one*. The first term multiplied by 120 = 381.7037037037+, and the last term multiplied by 1200 = 381.9716669+. The author had found 381.7037037+ to be, in English feet, the half base side of the pyramid, to within the small amount stated. *In this change from circumference to diameter value he found the principle of change desired.* By this discovery, no change was found necessary in the *British inch*, while *its* origin was now ascertained as from these Parker elements directly, so that the whole system cohered and harmonized in all its parts."

This discovery contained another not then known to the author, viz., that, whereas, 20.612 inches was what was called the *Turin cubit*, the form 20.612 : 6.561 :: 64.8 : 20.6264700174+ inches, from whence the above measures were derived, disclosed in its last term, viz., 20.62647+ inches, the so-called *Nilometer cubit* of Elephantiné, by Mr. Wilkinson found to be, by his test of actual measure, 20.6250 inches, British, thus showing a difference of less than .001½ of an inch.

"The value of this discovery can hardly be estimated. The recovery of the cubit enabled the author to make its application to the reconstruction of the Temple of Solomon, which discloses itself as being for the same purpose with the pyramid. So, also, the use of this system lays at the base of the books of Genesis, and the construction of the Tabernacle. The narratives of the Bible contain this whole system, with its application to astronomical and abstract geometrical uses. A confirmatory use of a calendar system in the Bible can be here shown *in its exactitude*, which had not been discovered by the author at the time of the publication of the work. The ostensible integral relation used in the Bible, behind which the Parker forms rest, is diameter 113 to circumference 355; and this is a modification, as a symmetrical change, upon the numerical building of the Parker forms. This 355 is the Hebrew word *Shanah*, for *lunar year*, so taken. Anciently there were three calendar year values, under the forms,

355 : 360 : 365,

where, roughly, 365, the actual *day circle* of the year, is compared with 355, an *abstract* circumference value; while the celestial circle of 360 stands as *the mean* between them. This served as the vague year calendar value form, subject to the bissextile correction, for ordinary calendar use. But, like all things in the Bible, the rougher forms are but indications of more correct methods leading to the nicest exactitudes; for, in this case, *as compared with* the Parker forms, a diameter of 113 does not give a circumference of 355, but of 355.000152415+. Modify the common form, and we have 355.000152415+ : 360.000152415+ : 365.000152415+, where the third value, 365.000152415+, is the vague year day circle value, thus corrected, as an enlargement of 10 on 355. Now, take the proportion of the two measures given above, of the half base side of the pyramid, viz., circumference is to diameter as vague year day circle value (as a circumference) is to what? or,

381.7037037+ : 381.9716669+ :: 365.000152415+ : 365.25638949+ ~~(by actual working, the form becomes 381.971+ × 365.+ = 1355+ / 381.7037+, and as to the number form 1355, see page 317 of the work, 17th line from the top)~~, where the result is the *exact value* of the sidereal year, even to those last figures, in the decimal, *where the very highest authorities differ among themselves.* One great authority gives this value as 365.2563835+, and another as 365.256374+; and there is no possible way of determining the true value in these remote decimal places, save by the discovery of the *natural law* governing the fabrication of this value. Here, however, there is shown a recognized welding together of the *Parker forms*, with the first face form of the Bible, to procure the *exact year value*. It is evident to the author that there is fair hope of arriving at the divine law of the construction of the *time circle* of the earth, through the natural source of the origin of the Parker forms; for he holds that, though Mr. Parker has the truth, and properly so, from his mode of reasoning, nevertheless there is a greater depth in nature as source of his (Parker's) results; and this is to be had in the use of digital forms of numbers obtained by the use of the number 9; for the author can show the concretionary method of nature's building up of the Parker square of 6561, and of the area of his inclosed circle of 5153, from an *elemental number source*, and thence can show, by a simple modification on the *order*, *or series*, of this building process, as results, that the *usual* geometrical value of π is obtainable to the 13th decimal place, and so, also, is the Bible value of 113 : 355; both, however, as *changes worked on the base of the Parker forms.*"

And now as to the character of this work. *It is not subject to criticism*, for the reason that every step is mathematical, and the results accurate. No such question can arise as to whether the work is true or false. There can only be one question: What is to be done about a true, exact, work of this kind? And, as to this, time will render an answer. There is too vast a system shown to admit of that inimical criticism "It is merely a system of Coincidences". It is true as in all recognized systems that coincidences exist. It is the fact of coincidence that proves to us any system of geometrical relations. A powerful writer says: "Mathematical demonstration itself knows no argument stronger than the argument of coincidence. When two triangles coincide with each other in every point of those lines which constitute them and occupy precisely the same space they are said in mathematical language to be equal to each other and are virtually one and the same triangle." Inimical criticism might say: There is no proof. It is mere coincidence."

Perhaps the most remarkable matter shown in this work is the universal resort by the Nations to one and the same great natural geometrical truth, from whence to derive units of measure; making it that *the unit of measure* has been the *crown jewel* of the Nations. The source of this resort lays far back of the historical ages—yea, so far back that it was first the outward manifestation of the Divine Conception. The national symbols of ancient Assyria, as of Egypt, exhibit the fact of possession. The chronological scheme of Berosus as to the Chaldeans witnesses the use with them. Then flow forth the positive use made in the order of the Nationalities, viz: Semitism as a source; then Hebrews and Egyptians and Hindoos; then Romans; then British. But, indeed, as to the British, though the use is the most modern, yet it appears also to have been the most ancient; that is, the British nationality seems to be the most ancient of the world.

This shows that the idea of measure has rested as a *universal one*, upon one and the same natural truth.

No doubt, when the key can be discovered, the languages themselves will be found to relegate to one, and that a Divine Source; that is, that though development took place from simple monosyllabic roots or germs, and ages may have passed before a language was completed equal to the wants of a high civilization, nevertheless, that development itself was guided and directed as it progressed by a spiritual supervision. To illustrate this: Suppose the simplest and earliest words of a language are found to contain, numerically, the germs likewise of a mathematical and geometrical system, which elaborates itself, not alone in the letters, but also in the words of the language. Proof of this fact would necessarily carry with it the evidence that the language itself was *ab initio* scientifically constructed, without the possibility of accidental development, though it may have apparently been so, so far as the people using it were concerned.

SECTION I.

GEOMETRY.

Use of the form 20612 : 6561 to exhibit values of changes of geometrical shapes in integral numbers; showing numbers to be mental creative conceptions, to which shapes are obediences as materializations.

INTRODUCTION.

This entire treatise is essentially founded on the numerical relation of

20612 to 6561,

as being the *true* and *natural* one of circumference to diameter of a circle. This relation is the discovery of the late John A. Parker; and his method of obtaining it is to be found in his "Quadrature," published by John Wiley & Son, New York. What is called the π value is therefore

$$\frac{20612}{6561} = 3{\cdot}141594269+;$$

differing from the usually accepted one, which is

$$3{\cdot}14159265358+.$$

(as to any even the least part thereof

DEFINITIONS.

§ 1. A circle is a perfect curve. It is of such a nature that, *protracted either way, it will re-enter upon itself.* The length value of this curve being found, the length values of the curve and its diameter can be expressed in the numerical terms of this length. As above stated, let the perfect relative value of circumference to diameter be assumed to be

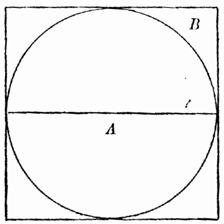
20612 to 6561

(being always of one & the same curvature

This definition is not admissible in modern geometry because it absolutely negates the accepted definition of a circle being polygon of an infinite number of sides of straight lines where 6561 is 3 raised to the 8th power, or 9 to the 4th power, or 81 to the 2d power.

§ 2. The measure of *area* of all regular polygons, including the circle, is ½ the *circumference* by the radius of the inscribed circle. (John A. Parker.)

§ 3. The true ratio of circumference to diameter of all circles is 4 times the area of the circle inscribed in the square for the value of circumference, to the area of the circumscribed square for the value of diameter. (Parker.)



(*a.*) Given *diameter* $A = 81$, area of $B = 6561$, area of $A = 5153$; then,

$$\frac{dia.\ A}{4} \times cir.\ \text{of } A = \text{area of } A$$

or

$$\frac{81}{4} \times circumference \text{ of } A = 5153$$

$$81 \times cir.\ \text{of } A = 5153 \times 4 = 20612$$

$$circumference \text{ of } A = \frac{20612}{81}$$

The *diameter* of A is given, and therefore,

$$diameter : circumference :: 81 : \frac{20612}{81}$$

and

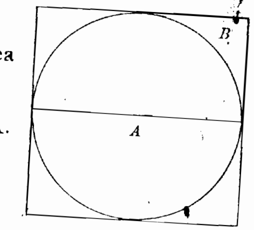
$$diameter : circumference :: 6561 : 20612$$

(The formulations are those of Mr. Charles Horne.)

Thus it is shown that the area of the square of 81 to the side, or 6561, being taken as diameter of a circle, the circumference of that circle will be the numerical value of the area of the inscribed circle multiplied by 4, or $5153 \times 4 = 20612$.

(*b.*) The number forms used in the following cases are 6561 : 5153, and 6561 : 20612, where the last form is assumed to be the true, and perfect, and only integral relation of *diameter* to *circumference* of a circle.

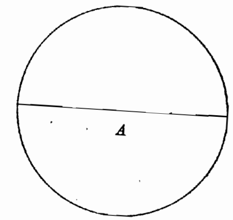
§ 4. *Case I.—Area Measure.*



Side of B, or square, equals 81. Area of B equals 6561.

Area of circle A equals 5153. (John A. Parker.)

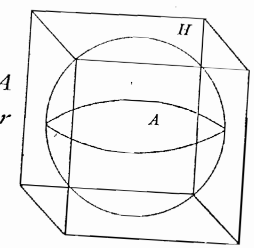
§ 5. *Case II.—Linear Measure.*



Diameter of A equals $81^2 = 6561$: then *circumference* of A equals (Case I.) $5153 \times 4 = 20612$. (John A. Parker.)

But since the above are but measures of length, one would suppose that if the numerical form was contained in *nature*, as a law, it should exhibit itself as integrally applicable to *solids*. Therefore:

§ 6. *Case III.—Solid Measure.*



(*a.*) H is a cube of 81 to the edge; A is its inscribed sphere, having a *diameter* of 81.

The usual and proper formula for obtaining the solid contents of the sphere is

$$\frac{1}{6}\pi\ diameter^3.$$

We have

$$6561 : 20612 :: 1 : 3.1415942691+.$$

Then:

$$\frac{20612}{6561 \times 6} \times 81^3 = 278262.$$

The solidity of the sphere equals

$$278262.$$

But:

$$20612 \times 13.5 = 278262.$$

Therefore:

Solidity of cube equals 81^3 =	531441
" of contained sphere =	20612×13.5

(*b.*) 8 of these cubes of 81 to the edge will make another perfect cube. If the value of the solidity of this enlarged cube be divided by the $\frac{1}{100}$ part of the surface of the sphere contained in the cube of 81 to the edge (§ 7), the quotient will be a solid of

$$20626.4700174+.$$

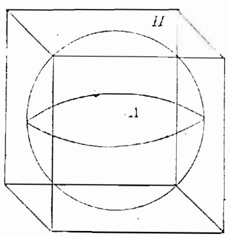
The form is

$$\frac{81^3 \times 8}{206.^{12}} = 20626.4700174+. \#$$

As to the use of this result, see Case VII.

(*c.*) The result in (*a*) is the same as $3435\frac{2}{6} \times 81$, and $34.35\frac{2}{6}$ B. feet are $206.^{12}$ inches, or 10 Turin cubits, and are the breadth, north and south, of the queen's chamber in the great pyramid of Egypt.

§ 7. *Case IV.—Surface Measure.*



Surface of cube *H* equals area of one of its faces multiplied by 6, or $81^2 \times 6 =$ 39366.

The geometrical formula for obtaining the surface of the sphere is

$$\pi \text{ diameter}^2.$$

\# As value of areas in Case I become changed to linear measure in Case II, so Here this Cubic value 20626.47+ becomes likewise changed to linear measure under the formula (b) when in (a) 20.612 : 6.561 :: 64.8 : 20.626470017+ B. inches (a) is the Turin Cubit, and (b) is the Nilometer cubit, values as to which see Case VII and § 14.

Then we have:

$$\frac{20612}{6561} \times \text{by } 6561 = \text{surface of contained sphere.}$$

So we have:

Surface of cube of 81 to the edge,	39366
Surface of contained sphere,	20612

(*a.*) We can now exhibit some very remarkable tests of π values, by means of two *geometrical* postulates or theorems, viz:

(1.) That one given in the class examination papers of Harvard College, December 9, 1876, arising under the *doctrine of limits*, and stated as follows:

State and prove the fundamental proposition in the theory of limits. Prove, by the aid of this proposition, that the *volume of a sphere is one-third of the product of its surface by its radius*.

By the Parker forms, we have, in § 6, *solidity* = 278262, and in this section we have *surface* = 20612; both to a radius of $\frac{81}{2} = 40.5$. Then, by the above, we should have

$$278262 = \frac{20612 \times 40.5}{3};$$

which, in fact, is a true equation.

At first glance, this would seem a conclusive test of the absolute correctness of the Parker form of $\frac{20612}{6561}$ for the value of π, but in fact it is not, for the reason that, though the Parker form, to be correct, *must* answer to this test (and as a proof that the accepted value of π is not correct, it can not be made to answer to this test), which it does; yet it is not *exclusive of other forms* answering the same test. For instance, Mr. W. A. Myers proposes the value of π as $1 : 3\frac{1}{7}$. With an assumed diameter of 21, obtain, under the proper geometrical formulas, *solidity* and *surface* of a sphere, and it will be found that the resultant values are integral, and answer to the above theorem. Mr. James Smyth proposes the value of π to be $1 : 3\frac{1}{8}$. With an assumed diameter of 24 under this, values of *solidity* and *surface* of a sphere will likewise be found to answer to the theorem. Other assumed values of π answer to this test likewise. Therefore, this application does not, of itself, establish Mr. Parker's forms as being correct.

(These facts furnished the author by Mr. S. C. Gould, of Manchester, New Hampshire.)

(2.) That one raised under § 3, *supra*, viz., "The true ratio of circumference to diameter of all circles is 4 times the area of the circle inscribed in the square for the value of circumference, to the area of the circumscribed square for the value of diameter." This, though perhaps not openly stated in the geometries, is nevertheless to be directly shown therefrom, and is given by Mr. Parker.

The Parker form of $\frac{20612}{6561}$ answers (in application) to this *theorem*, as it should do. But so, likewise, will the other π values as above taken.

(3.) There is now a further test, and one in fact which furnishes, at the same time, a numerical as well as a geometrical limit. It is this, as stated by Mr. Parker:

"It has been shown, Proposition VIII (in his "Quadrature"), that the triangle has the least number of sides of any possible shape in nature formed of straight lines; and the circle is the ultimatum of nature in the extension of the number of sides. In this particular, therefore, they are opposite to one another in the elements of their construction. By Prop. VII, it is shown that circumference and radius are the only natural and legitimate elements of area by which different shapes may be measured alike, and are made equal to one another. By Prop. VIII, it is shown that the triangle has the *least* radius of any shape formed of straight lines of equal sides and of the same circumference; and by Prop. II and IV, Chap. I, it is seen that the circle has the *greatest* radius of any possible shape of the same circumference. By the same propositions, the triangle is shown to have the *greatest* circumference and the *least* area of any shape formed

of straight lines and equal sides, and the circle to have the *least* circumference and the *greatest* area of any shape. By a well-known law of numbers and geometry, by which the greatest product which any number or any line can give is to multiply half by half, it will be seen that if we take the aggregate of circumference and radius in each shape, it is most *equally* divided in the circle, and the most *unequally* divided in the triangle of any possible shape. In *every* case, that which is *greatest* in the triangle is *least* in the circle, and that which is *least* in the triangle is *greatest* in the circle, and in every particular the two shapes are at the extreme and *opposite boundaries of nature*, being the *greatest* and *least* that *is possible*. They are therefore opposite to one another in all the elements of their construction."

It follows from this that as these two shapes, the triangle and circle, are the opposites (relatively) of each other in all the elements of their construction, as stated, if we assume a *value for the triangle as a limit*, we can use this value, *in terms of which*, to take the admeasurement of the circle.

Let the area of a triangle be 1, then its diameter (which is a line drawn from a vertex to the center of its side or base) will be the $\sqrt{\sqrt{3}}$. That is, to obtain an *integral* value, this diameter value must be *twice* squared. Then taking 3 as an intermediate relation, to obtain a *proportional relation* for the *diameter of some circle*, this 3 must be *twice squared*, or $3^2 = 9$, and $9^2 = 81$, which must thus be the diameter of a circle (relative to and) corresponding to an equilateral triangle, whose diameter is $\sqrt{\sqrt{3}}$.

If now we have *some known*, *reliable*, approximate value of π to test by, we can, under this test, make application to the measurement of area of this circle of the *limit* of area of the triangle which we have worked from—viz., *one*. Therefore, take the established value of π, or 3.1415926+. By this we find the area of a circle, whose diameter is 81, to be *in excess of* 5152, and *in diminution of* 5154.

But as the *areas* of the equilateral triangle and of the circle are opposite to each other, inasmuch as Mr. Parker affirms that "the triangle is shown to have the *greatest* circumference and *least* area (relatively) of any shape formed of straight lines and equal sides, and the circle is shown to have the *least* circumference and the greatest area of any (such) shape," and as the area of the triangle is *one*, it follows, *necessarily*, that the area of this circle thus constructed (on this opposed diameter of 81) *can not be fractional*, but must be *correspondingly* integral (*under the limitation*).

Therefore, as it is in *excess of* 5152, and in *diminution of* 5154, it must be 5153, —— to a diameter of 81. (In substance, Mr. Parker's demonstration. For further tests, see § 66.)

Now, this test permits *no companionship*; it is exclusive of any and all assumed relations of the π value, save those of Mr. Parker, viz., a *diameter* of 81, with an *area* of 5153. It is remarkable, also, as furnishing *a limit*, both abstractly as regards the comparative relations of the geometrical shapes of the triangle and circle, and numerically in the *area of one* for the triangle, and the susceptibility of its diameter to be raised by twice squaring to the integral number 3, the opposite treatment of which, to procure the corresponding diameter of a circle (the opposite in construction of such triangle), gives a diameter of 3 squared twice = 81.

§ 8. *Case V.—Convex surface of Cylinder, of height and diameter of* 81, *compared with that of its contained Sphere.*

They are the same, viz:	
Surface of cylinder,	20612
Surface of sphere,	20612

§ 9. *Case VI.—Solidity of Cone, Sphere, and Cylinder.*

Where the altitudes of a cylinder and of a cone, and the diameters of their bases, are equal to the diameter of a sphere, the relation of solidity of cone, sphere, and cylinder will stand as 1 for cone, 2 for sphere, and 3 for cylinder, as was proved by Archimedes.

Therefore, the solidity of the sphere of a *diameter* of 81 being

$20612 \times 13.5 =$ 278262,

the relative measures of solidities are as follows:

Cone with *altitude* and *diameter* of 81,	139131
Sphere with *diameter* of 81,	278262
Cylinder with *altitude* and *diameter* of 81,	417393

Note the remarkableness of this Case VII

§ 10. *Case VII.—Use of the Diagonal of the Square of* 81.

The diagonal of the square of 81 is a mean proportional between a value of circumference and of diameter of a circle, such that one extreme is *diameter* to *circumference* of

a circle of 360;

which value, 360, for *circumference*, is the numerical origin of what is called—

The Analytical Unit of Circular Measure,

where the angle measuring the curve of a circle shows that curve to be equal in length to the radius.

(*a.*) In § 6 (*b.*) by use of the cube of 81 to the edge, and the surface of its contained sphere as to their numerical values, we have the form

$$\frac{81^3 \times 8}{206.12} = 20626.4700174+,$$

where the result is a solid cubic quantity.

(*b.*) But this form in (*a.*) is exactly the same as to result, numerically, as the following proportion having relation to the circle; in which proportion the first term is circumference to a diameter of 6561, and the last is a diameter to a circumference of 64800, viz:

$$20612 : 6561 :: 64800 : 20626^{\underline{4700174+}}$$

(*c.*) Divide the resulting form in (*b.*) by 54, and we have

$$381.7037037+ : \frac{6561}{54} :: 1200 : 381.97166+,$$

where the first term is the standard measure, and the last term is the exact measure of the half base side of the great pyramid of Egypt, in terms of British feet. The full side of base is then 763.94+ feet; but 7.6394 is diameter to a circumference of 24. This 24 may be taken as the 24 hours into which the circle of 360 is divisible into 15 parts, each, for the hour, and thus this base side may include some such connection among others.

(*d.*) Multiply this last form by $\frac{3}{10}$, and we have

(1.) $114.51111+ : \frac{6561}{180} :: 360 : 114.5914999+,$

or,

(2.) $114.51111+ : 36.45 :: 360 : 114.5914999+.$

Now, the $\sqrt{}$ of the product of the means in (2.) is $\sqrt{13122} = 114.55129+$, and in fact 114.55129+ is the diagonal of the square whose side is

$$81.$$

Substitute this value in (2.), and we have

(3.) $114.5111+ : 114.5512+ :: 114.5512+ : 114.5914+.$

Therefore the diagonal of the square of 81 is a mean proportional between values of circumference and diameter of a circle originating from the form

$$20612 : 6561,$$

where the diameter value of the proportion, viz., 114.5914+ is in turn, and in fact, diameter to a circumference of [see (1.)]

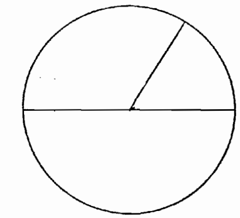
$$360,$$

which can not be true of any other possible value of π.

The radius of this circle of 360 will be, therefore,

$$57.2957499+.$$

(*e.*) Now, what is called the *analytical unit* of measure in trigonometry is where the angle indicates that the portion of the curve of a circle, intercepted between the radii, is of equal linear length to the radius.



The formula for obtaining this angle is

$$\frac{180}{\pi}$$

Applying the formula in this case with the value of π, already proved to be $\frac{20612}{6561}$, and the resulting angle will be

$$57.^\circ 2957499+.$$

But the radius of the circle of 360 is shown [in (*d.*) (3.)] to be

$$57.2957499+.$$

Therefore we have:

Angle of *analytical unit*,	$57.^\circ 2957499+$
Intercepted arc,	$57.2957499+$
Radius,	$57.2957499+$

all having numerically the same value. #

Then we have:

(1.) $57.295+ \times 2 =$ diameter to a circle of 360.

$57.295+ \times 3 =$ the sum of the radii and intercepted arc of this analytical unit of the circle of 360, or

$$57.295+ \times 3 = 171.887249+.$$

(2.) Now, if we divide the form in (*b.*) *supra*, viz.,

$$20.612 : 6561 :: 64.8 : 20.62647001+$$

by 12, taking this form to denote British *inches*, we shall have

$$1.7176+ : \frac{6561}{12} :: 5.4 : 1.71887249+,$$

where the first term is, in fact, the value, in British feet, of that ancient Egyptian cubit now called the *Turin* cubit; and the last term is the value, in British *feet*, of that ancient Egyptian cubit now called the *Nilometer* cubit.

Therefore, it is seen, by the foregoing process on the form 20612 : 6561, that anciently the *analytical unit* was that geometrical and trigonometrical abstraction (in the circle of 360), the numerical measure of which was utilized as a governing

Cubit value,

Thus it is seen that the circle of 360, or of 36, contains within itself not only the circular property abstractly, but it is numerically such as to breed all measures passing them back even most easily even to the numerical elements of the circle 20612 : 6561

which cubit value could, by a very simple division, be made to indicate the radius and diameter of the circle of

360.

(*f*.) This circle of 360 (while it has been for ages used as the measuring mean of the heavens and of the earth) is seen thus to have been eminently appreciated as fitted for a source of linear measures, susceptible at all times of conversion into circular equivalents by means of its radius 57.2957499+. At the point where this measure discloses the value of 171887249+, which is as a diameter value derived from 20626.4700174+, other measures can be constructed on the value 1717666+, which is as a circumference value derived from 20612. The following tables somewhat exemplify this:

(1.) Under the form 64.8 : 20.6264700174+ :

Circum.	Radius.
10.8	1.7188725+ Value of Niche in QS chamber 171.88725+ inches
24.	3.8197166+
36.	5.729575+
144.	22.918300+
243.	38.674631+
324.	51.566175+
432.	68.754900+
648.	103.132350+
1296.	206.264700+
5184.	825.058800+

(2.) Under the form 20612 : 6561 :

Circum.	Radius.
1.7176666+	.273875
3.8170370+	1.215
20.612	3.2805
113.09737+	18.

and so on.

SECTION II.

The Measures of the Nations were derived from the numerical relations of circumference and diameter of a circle, or from the form 20612 : 6561.

§ 11. The Egyptians, Hebrews, Romans, and probably the Hindoos, were indebted for their linear measures to one particular measure, which, as can be shown, has come down through the ages unimpaired, viz:

The British inch.

This measure has its inception in the numerical *integral* relation of

Diameter to *circumference* of a circle.

The area of a square of 81 to the side being 6561, the area of the circle inscribed in that square is 5153; and by a simple geometrical truism, the *diameter* of a circle being taken as 6561, its *circumference* will be 5153 × 4 = 20612. [§ 3. (*a*.)]

All these measures were derived from this formula 6561 : 20612; as to which the geometrical relation of *diameter* to *circumference* is an obedience.

In practical application of these numbers on a measuring stick or rod, they were attached to that actual measure which to-day is styled the *British inch;* proved by the standard yard measure constructed by Captain Kater, in the year 1824, from the British standard, and presented by the British government to the magistrates of Edinburgh. (Life and Works at the Great Pyramid, by Piazzi Smyth.)

The following extracts, taken from an appended memoir of the life of the author, in "Rudiments of an Egyptian Dictionary," by the celebrated Dr. Thomas Young, are very interesting and of value as regards this treatise:

"In 1818 he (Dr. Young) was appointed by a commission under the Privy Seal, together with Sir Joseph Banks, Sir George Clerk, Mr. Davies Gilbert, Dr. Woollaston, and Captain Kater, a commissioner for taking into consideration the state of the weights and measures employed throughout Great Britain. Dr. Young acted as secretary at the meetings of this Board, and to the three Reports which were laid before Parliament he furnished both the scientific calculations and the attached account of the various measures customarily in use. It seems right to state, that in pursuing these investigations, it was his opinion that, however theoretically desirable it might be that all weights and measures should be reducible to a common standard of scientific accuracy, *yet that, practically, the least possible disturbance of that to which people had long been habituated was the point to be looked to*, and on this ground he was extremely averse to unnecessary changes." The Captain Kater mentioned was the same who furnished, under authority, the standard yard measure to the city of Edinburgh.

Of Dr. Young himself, it is also said:

"Dr. Young, as a mathematician, was of an elder school, and was possibly somewhat prejudiced against the system now obtaining, both amongst the continental and the English philosophers; as he thought the powers of intellect exercised by a preceding race of mathematicians were in no small danger of being lost or weakened by the substitution of processes in their nature mechanical." That is, that the substitution of symbols of processes (as of algebraic devices, extending to the Calculus), and purely ideal definitions, threatened the overthrow of universal individual active research into the *rationale* lying at the basis of all mathematical processes. It is true that now, by the preference given to algebraic methods, originality of research has almost vanished.

To return: the reason why the value of the British inch is as it is, is because it was just that value which, on application, would make material cosmic magnitudes correlate with the

times and distances of the planets of the solar system, under a law of construction which, by the ancients, was esteemed to be, and doubtless was, divine.

§ 13. *The so-called Turin and Nilometer Cubit Measures.*

(*a.*) The Turin Cubit.

The *savans* of the French expedition to Egypt, among many other admeasurements, all of which, by the way, are highly praised by Piazzi Smyth, took those of the chambers, passage-ways, etc., of the catacombs of Osimandya. Rev. Dr. Gustav Seyffarth, while making searches in regard to the Egyptian hieroglyphs, under his appointment by the Saxon government, found in the Museum of Turin a papyrus scroll, on which was platted these very chambers, etc., with their dimensions, agreeably to the Egyptian measures, written down thereon. On comparing these written dimensions with the plans of the chambers made by the French, with the measures thereof in the French *meter*, he found the cubit used to be equivalent to .523524 of the French *meter*. (The author has a letter to this effect from Dr. Seyffarth.) And, also, this agrees with an actual Egyptian measuring stick, in existence, which is called the *Turin cubit;* as to which consult the Article on Weights and Measures, in Smith's Dictionary of the Bible, by Rev. W. L. Bevan, Vicar of Hay, in England.

The value of the French *meter*, in terms of British measure, is 39.37079 British inches; then the *Turin cubit* proves to be .523524 × 39.37079, which equals

20.611553+ British inches, or 1.717629+ British feet.

Sir Isaac Newton, by an entirely different process, from many measures taken of the works of the great pyramid of Egypt by Professor Greaves, of Oxford, England, found the value of the cubit to be 1.717 British feet. (Appendix to Life and Works at Great Pyramid, by Piazzi Smyth.)

(*b.*) The Nilometer Cubit of Elephantiné.

It seems to be a fact (and see the Article on Weights and Measures spoken of) that the term *cubit* did not so much signify, anciently, *one specific measure*, as a technical expression, embracing at least two, and perhaps several distinct measures, agreeably to their source. By reason of their close proximity in value, two, at least, of these measures have been confounded with each other, and attempts have been made to reconcile the very slight difference in their values by a kind of mean measure, as answering for both, when, in fact, they should be taken severally and distinct from each other.

The *Nilometer cubit* of Elephantiné, as measured by G. Wilkinson (see Rawlinson's Herodotus, Appleton, 1872; App. to Book II, p. 254), is, in terms of British measure,

20.6250 inches,

or 1.718750 feet.

(*c.*) We then have as the values of these two cubits, *restored* by the *test of actual comparison*, in British measure:

(1.) The Turin cubit,	20.611553	B. inches.
	1.717629+	B. feet.
(2.) The Nilometer cubit,	20.6250	B. inches.
	1.71875	B. feet.

§ 14. Now, take the form [§ 10 (*b.*)], viz:

$$20.612 : 6.561 :: 64.8 : 20.62647001+.$$

Divide it by 12, and we have:

$$1.71766+ : \frac{6.561}{12} :: 5.4 : 1.71887+.$$

Here we see we have the *origin* in the form 20612 : 6561 (which is simply the expression of relation of circumference to the diameter of the geometrical figure of the circle), and in its development to 64.8 : 20.62647+, *of these two cubit values*, as they were practically utilized by divisions on a measuring rod.

By comparison, taking the values as British measures:

As above,	20.612	B. inches.
	1.71766+	B. feet.
The *Turin cubit*,	20.611553	B. inches.
	1.717629	B. feet.

As above,	20.62647+	B. inches.
	1.71887+	B. feet.
The *Nilometer cubit*,	20.6250	B. inches.
	1.71875	B. feet.

These values are seen to be so exceedingly near to each other, that the truth in nature, viz., the geometrical shape of the circle and its numerical expression, may be taken as the *veritable origin* of these measures, and therefore these restorations, viz., the *Turin* and *Nilometer* cubits, are to *obtain their correction* from these original forms as the *law of their existence*. The evidence of the actuality of the existence of these measures is not only cumulative, but it is thought to be of such intrinsic weight and force as to admit of no denial of the fact. This evidence will be given in course.

In "Source of Measures," and in the Supplement thereto, both these measures are used, where the first, here now called the *Turin* cubit, is there called the *cubit* value of 20.612 B. inches, and the second, here called the Nilometer cubit, is there called *the enlarged value* of the cubit, or 20.62647+ B. inches, for want of a better term.

§ 15. The great law of Kepler, that the *squares* of the times are as the *cubes* of the mean distances, is sufficient evidence that Nature herself works by means of proportional relations of geometrical shapes. Herschel said that the B. *inch* seemed to serve the function of a natural measure in astronomy. So it is here seen that the very essential origin of the cubit measures was the geometrical relation of *circumference* to *diameter* of a circle (by the true π value, viz., $\frac{20612}{6561}$); and a diameter value implies both the *square* and *cube*. But the fact is that the B. inch, *as such*, is an *essential element in these cubit values;* that is, those who made use of these cubit values *were aware of that actual measure* which we style the B. inch, and also, as can be shown, the intermediate values of the *yard* as 1296 square inches, and of the extreme of the B. measures in the *mile* of 5280 *feet*. Not only so, but where use of these very B. measures was being made, so great was the reverence for them, and so great was the value set upon them, that their use was only implied by intendment, and mention of their parts was sedulously concealed; in other words, these British measures were part and parcel of the *religious arcana*, and only taught to the initiated.

§ 16. It occurred to the author that one of the properties of the British measures might be the possession of some *flux number*, which might be made to co-ordinate or correlate measures of *time* with measures of *space*. The thought resulted in finding that the number 5184, which is the characteristic value of the 24 hours of the solar day in its division into 5184 000 *thirds*, is also the value of 4 *square yards* in British square inches; then, that this 5184 is evenly divisible in the number of *square inches* contained in an area whose length indicates 5280 *feet*, or 1 British *mile*, with a breadth of the *half of one rod*, when reduced to square inches; the area itself making that integral proportion of these measures called 4 *roods*, or 1 acre. See "Source of Measures," § 30 (*c.*) (3.) This of itself was a very satisfactory result, looking toward the existence of such a *flux number* in these measures.

§ 17. The author found that, by means of the cubit values, viz., the Turin and the Nilometer cubit, with the values thereof, as given in § 14, he could reconstruct the great pyramid of Egypt in a great number of its most important measures, so that they would not only answer to the British measures thereof made by Col. Howard Vyse and Piazzi Smyth, but that, by their use, bringing the exterior and interior works, throughout all the zig-zag lines, to a perfect closing, these measures of reconstruction must serve, necessarily, as the correction of those of the two gentlemen mentioned; just as in § 14 the method of restoration of the cubit values shows that its results can serve for the correction of the attempted restorations thereof. Not only so, but it

became evident from direct work, and from contingent inferences, that these means of restoration were certainly known and made use of in the very architectural design of the builder.

§ 18. As to actual use of the British measures:

(1.) By Col. Howard Vyse, the height of the horizontal subterranean passage-way is 36 inches, or 3 feet, British. The length of the same on its upper line is 324 inches, or 27 feet.

(2.) An east and west vertical plane cutting down through the vertex to the base of the pyramid, will cut off a portion of the queen's chamber to the southward, equal to the π value in feet, (agreeably to the form for π of $\frac{20612}{6561}$), or a value of 3.14159426+ feet, which is circumference to a diameter of 1 *foot*, British.

(3.) The height of the niche in the queen's chamber is composed of two values: one is 1.1664 *feet*, and the other is 171.7666+ B. *inches*, or numerically the Turin cubit in its value of 1.717666+ B. feet.

Where we find the same numerical value actually used in such an important place, not as an equivalent value, but in a reduced scale (and in the same numerical value), as *in inches*, which *inch* measure is part and parcel of the same measures which exhibit the restoration of the Turin cubit as 1.717666+ B. *feet*, it becomes proof positive of the very use of the B. measures themselves, designedly, by the architect of the pyramid.

Many other instances could be given, but it must suffice to make especial mention of two measures having a direct bearing on the subject-matter especially in hand.

(4.) The horizontal distance from the intersection of the roof line of the descending passage-way with the floor line of the ascending passage-way to the vertical axial line of the pyramid, or to the face of an (east and west) vertical plane, cutting through the vertex of the pyramid to its base, is

251.71412356+ B. *feet*,

which is the *square root* of

63360,

which, as *inches* (by scale), is just the value of *one mile* in British measure.

(5.) This distance in (4.) is a very important reference line connected with the interior works of the pyramid. It is directly related with another of equal importance, and the one to which especial attention is directed, viz., the distance on said vertical axial line from the base of the pyramid to the point where this line is intersected by the floor line of the grand gallery is

$$1650.1176+ \text{ B. } inches;$$

which value is precisely (under the π form of $\frac{20612}{6561}$) *diameter* to a circumference of

$$5184 \text{ B. inches},$$

or to 4 *square yards*, numerically, or to that very number appearing in the British measures as a *flux* between measures of *space* and *time*. Now, 1650.1176+ B. inches equals 20.6264700174+ B. inches × by 80, or, in fact, this measure is just equal to

80 Nilometer cubits.

§ 19. So, then, the architect knowingly made use of the British measures in the construction of the great pyramid, as connected with, and related to, and as part of those measures which contained also the Turin and Nilometer cubits; which cubit values, as is proven by the plans and specifications of the said pyramid in Supplement to Source of Measures, were of the actual values stated in § 14.

§ 20. But where was the link of connection? And how were the tables of measures constructed so that the British measures could be shown to be part and parcel of these Egyptian measures? The bare showing of the method of raising this connection gives a satisfactory solution of the question, and serves as an exhibit of the *rationale* of the construction of the Egyptian measures employed on this pyramid; *which measures were in fact Hebrew.*

The Hebrew Measures.

§ 21. Perhaps no book printed in the English language has had more painstaking and exhaustive care bestowed upon its composition than has Bagster's Polyglot Bible. It occupies the place of universally accepted reliability, both in Great Britain and in America. This Bible contains, among others, two tables of *Hebrew long measures;* one table containing the *shorter*, and one table containing the longer measures. The publishers state: "The Tables of Weights, Measures, etc., . . . are from the best authorities." And, again, that they are "chiefly derived from Dr. Arbuthnot's Tables." Dr. Arbuthnot makes the aggregate of the *day's journey*, viz., the close of the table of long measures, to be 33 miles, 172 paces, 4 feet, British, where the pace is taken at 5 feet. See, also, Article on Weights and Measures, in Smith's Dictionary of the Bible, by Rev. Mr. Bevan, where he quotes Jahn as giving this some notice. Where or how the particular cubit value used in Bagster's Polyglot was obtained, the author can not state, but it seems evident that it was assumed for the purpose of perfecting a connecting ratio of admeasurement from the cubit value to the day's journey, in integral values, and that, for some reason, in terms of British measures. Rev. Mr. Bevan says in this regard: "It is impossible to assign any distinct length to *the day's journey*. Jahn's estimate of 33 miles, 172 yards (should be paces), and 4 feet, is based upon the false assumption that it bore some fixed ratio to the other measures of length."

(*a.*) There is no design to touch upon the cubit value appearing in these tables as the base thereof, for the Nilometer cubit value herein established will show itself to be the proper foundation of, at least, the shorter set of Hebrew long measures, by intrinsic evidence. That which is desirable as being obtainable from a work of so great authority as Bagster's Polyglot is simply the *composition* of the table in its *specific parts*. The table of shorter measures is given as thus composed:

4 digits	make	1	Palm.
3 palms	"	1	Span.
2 spans	"	1	Cubit.
4 cubits	"	1	Fathom.
6 "	"	1	Ezekiel's Reed.
8 "	"	1	Arabian Pole.
80 "	"	1	Measuring Line.

where it is seen that the table, which is composed of *digits*, *palms*, *spans*, *cubits*, *fathoms*, the *Ezekiel reed*, the *Arabian pole*, and the *measuring line*, closes with

The Measuring Line,

which is given as being equal to just

80 Cubits.

(*b*.) The table is evidently based upon the *cubit* value, which, by its *divisions*, will show spans, palms, and digits, and, by its *multiplications*, will show the higher measures.

(*c*.) Now, take the *Nilometer cubit* value, as that one on which this set of measures was established, and then the table closes in

80 Nilometer cubits, or in

1650.1176+ B. *inches*,

which is diameter to a circumference of

5184 B. *inches*.

Therefore we find that that height, or reference line, whose value is stated in § 18 (5.), and is so singular as well as important in its meanings and applications, was, in fact, to the architect of the pyramid well known as that *technically* termed "*Measuring Line*," closing the Hebrew table of shorter measures; and it becomes apparent that, while by use of the *ostensible measure*, an actual measure was made (or 80 cubits), yet the *object of the use* was to obtain, *by intendment*, the circumference value of

5184,

which would answer for the *flux* purposes already mentioned.

(*d*.) Herein, then, lays, as it seems to the author, the secret

use of the construction of the Hebrew table of shorter measures. To be perfected agreeably to the more *esoteric intent*, to the ostensible values, *as diameters*, the corresponding but hidden *circumference* values should be given, as follows:

Diameter.			Circumference.	
3.43774+	B. *inches*	= 1 Palm.	10.8	B. *inches*.
10.31323+	"	= 1 Span.	32.4	"
20.62647+	"	= 1 Cubit.	64.8	"
82.50588+	"	= 1 Fathom.	259.2	"
123.7588+	"	= 1 Ezekiel's Reed.	388.8	"
165.0117+	"	= 1 Arabian Pole.	518.4	"
1650.117+	"	= 1 Measuring Line.	5184	"
		or,		
.286478+	B. *feet*	= 1 Palm.	.9	B. *feet*.
.85943+	"	= 1 Span.	2.7	"
1.71887+	"	= 1 Cubit.	5.4	"
6.87548+	"	= 1 Fathom.	21.6	"
10.31323+	"	= 1 Ezekiel's Reed.	32.4	"
13.75098+	"	= 1 Arabian Pole.	43.2	"
137.5098+	"	= 1 Measuring Line.	432	" #

A Method by which the Table of longer Hebrew Measures may have been taken from the closing denomination of the Table of shorter ones, viz., 80 Nilometer Cubits.

§ 22. By Bagster's Polyglot Bible the table of longer Hebrew measures is as follows:

400	cubits	= 1 Furlong.
2000	"	= 1 Sabbath day's journey.
4000	"	= 1 Eastern mile.
12000	"	= 1 Parasang.
96000	"	= 1 day's journey.

The cubit value taken herein in Bagster is the same as in the table of shorter measures, or 1.824 of the B. *foot*, or 21.888 B. inches. The peculiarity about this table is in the measure of the

2 is also a square area whose √ is the
titude of an equilateral triangle whose
e is 24, and the exact measure of the base side of
mid is diameter to a circumference of 2400 B. feet.

Eastern mile, or 1 mile, 403 *paces*, and 1 *foot*, in B. measure. It must be remarked that the *pace* is taken as 5 B. *feet*; therefore this measure is 5280+ 2016 B. *feet*. No doubt Arbuthnot (or those from whom he quoted) had some recondite reason for these values. Had he been a Kabbalist, and perchance he was, one of the reasons for giving to the *pace* the value of 5 *feet* was because it divides the mile so singularly, viz., $5280 \div 5 = 1056$; and 5280 then is equal to the expression,

$$1056 \times 5,$$

or, in number values, it gives the Great Name as a type of measure among its many other significant symbols, for

56501
יהוה;

so, also, 1056 is the Hebrew age of the world to the birth of Noah, who was the Pelasgic Inach, which equals the Hebrew ינח, or *Jah is Noah*, or literally Inch.

Be it as it may, the author would suggest the following as the key to the meaning of this table of longer Hebrew measures:

(*a*.) Take the *pace* as the vulgarly taken (and which is the truest test of enduring tradition) value in what is called *stepping off* a piece of ground, viz., as 3 *feet*, or 1 *yard*; then, in 1 mile, 403 paces, 1 foot, for the Eastern mile (the very parts given in Bagster), we have

5280+ 1210 B. *feet*.

(*b*.) The close of the shorter table of measures is seen to be 80 Nilometer cubits, because this gives, as seen, a diameter to a circumference value of 5184 B. inches.

(1.) Now, $5184 \times 1210 = 6272640$ square inches, British, in *area*. So, also:

(2.) 5280×8.25 B. feet, reduced to square inches, gives a like area of 6272640 square inches.

(3.) But an area of this shape (2.), that is, 5280 feet long by 8.25 feet in breadth, is, at the same time, the British *acre*: and in this form it gives the base form of the *square mile* of 640 acres, while one of its edges gives the British *mile* measure in *length*,

in terms of British *feet*. So thus the entire scope of the British measures, *long* and *land*, lays embraced in this little statement.

(*c*.) Now, since the British measures, as to the *inch*, the *foot*, the *yard*, and the *mile*, are found, as shown, to have been known and used as part and parcel with the cubit values, so here there appears to be the method of construction of a correlative table of measures, through the *flux number* 5184 (which is the reason of the close of the table of shorter measures), which could establish at the same time the value of 5280 *feet* as going to make up the base of a table of *land measures*, while by the use of it (5280) and the number used in connection with 5184 to obtain this base of *land measure*, viz., 1210, the *Eastern mile* was determined; and from this, the Eastern mile, as a datum, the entire Hebrew table of longer measures was composed.

(*d*.) This would give rise to a new cubit value of 1.6225 B. *feet*, or 19.47 B. *inches*; and the table would be:

400 cubits	= 1 Furlong	=	649 B. feet.
2000 "	= 1 Sabbath day's journey,		3245 "
4000 "	= 1 Eastern Mile,		6490 "
12000 "	= 1 Parasang (1 mile, 403 paces, 1 foot),		19470 "
96000 "	= 1 day's journey,		155760 "

the close of 155760 B. feet being equal to 29.5 B. miles.

(*e*.) The closing value of 29.5 B. miles agrees quite well with Lightfoot's approximate statement of the *day's journey*. He says the ordinary day's journey among the Jews was 30 miles; but, where they traveled in company, only 10 miles. Neapolis formed the first stage out of Jerusalem, according to the former, and Beeroth, according to the latter computation. (See Article on Weights and Measures in Smith's Dictionary of the Bible.)

(*f*.) [The equivalent oblong of 5280 by 8.25 feet is given as 5280 *feet* by 8.25 feet, to at once make plain the similitude; but, in the Hebrew method, the basic unit is not taken in a unit block of 12 inches to the edge, but in a unit of 6 inches, and the equivalent becomes 5280 *half feet*, British, of 6 inches each, by 33 *half feet* of 6 inches each, making precisely the same area in square inches: whereof it takes 2 such blocks one way, and 320 the other, to make up the square mile. With the Hebrews the number 6, by reason of its wonderful properties in some special regards, was called *the pillar of the universe*.]

The British Measures.

Refer to proper pre-posed one sent with this to be substituted for this § 23, or appended to it

§ 23. Referring to the form 20.612 : 6.561 as B. *inches*, and to the Hebrew table of shorter measures [§ 21 (*d*.)], in its mode of construction, and it will be seen by tabulating the British measures taken as circumferences, that it simply results in a reproduction of the Hebrew measures, or perfect portions thereof, in their denominations as diameters to those circumferences, as:

Circum.		Diam.				
6. B. inches,		$2\frac{2}{9}$	H. digits	=	1.90985+	inches.
12.	"	$4\frac{4}{9}$	"		3.81971+	"
36.	"	$13\frac{1}{3}$	"		11.45913+	"
144	"	$53\frac{1}{3}$	"		45.83652+	"
5184 + 96 = 5280	"	$1955\frac{5}{9}$	"		1680.67524+	"

The Hindoo Measures.

§ 24. If the Hindoo scale of time cycles is tabulated it will show that they also must have been acquainted with this system, but concealed it by making use of the *circumference* values, keeping all mention of the diameter values in the background. To exemplify, recapitulate the Hebrew table, as:

Diameter.		Circumference.	
10 Palms,		108	inches.
20	"	216	"
40	"	432	"
80	"	864	"
160	"	1728	"
480	"	5184	"

On examination (see Bentley's History of the Hindoo Astronomy), the following are time cycles used among the Hindoos:

One is found to be numerically,	108
This is the half of	216
Their period called Kalpa is	432
Dwapar,	864
Sandhi,	1728
One of their divisions of months is	5184

So, also, for further evidence of their knowledge of this method, and its ground form, see § 57, and "Source of Measures," § 48 (11.)

The Roman Measures.

§ 25. Mr. John A. Parker, in his "Quadrature," found that by the use of his relation 20612 to 6561 (the only true π value), he could obtain data for the determination of the times of the moon and of the earth about the sun. (See §§ 69, 70.) The form was obtained by the multiplication of the above form, a first time by $\frac{4}{3}$, by which he obtained the datum for the moon's time, and this product a second time by $\frac{4}{3}$, by which he obtained the datum for the time of the earth about the sun. The result of this second multiplication is

$$\left.\frac{20612}{6561}\right\} \times \frac{16}{9} = \frac{36643.555+}{11664.}$$

Let this original form be taken as 20.612 and 6.561 B. inches; the products will then be, respectively, 36.6435+ and 11.664 B. inches.

This last value, viz., 11.664, is, in terms of B. inches,

The Roman Foot.

By the very best restorations of the *Roman foot* (see, as to its restored value, in terms of British measures, "*Great Pyramid*," page 25, by Rev. John Taylor), its value proves to be

11.664 B. *inches.*

(*a*.) The numerical circumference value, 36.64355+, of this Roman foot of 11.664 B. inches, multiplied by 1000, is, in B. inches, the so-called, in "Source of Measures," § 50, *standard* *measure* of the circumference of the base of the great Pyramid of Egypt.

§ 26. Thus it is seen that the B. inch is the *universal base of measure;* that it rests for its origin upon the geometrical and numerical relations of diameter to circumference of a circle in the value

20612 : 6561 :

and that all the measures of the nations named *relegate themselves to this geometrical and numerical truth practicalized in the measure of the B. inch for their existence.*

The Ancient Symbols of this origin of Measures, viz., the circle 20.612, *and* 20.626470+ *British inches, or of the Turin and Nilometer Cubit values.*

(1.) The Ansated Cross.

§ 27. (*a.*) Revert to § 10 (*b.*), and (*e.*) (2.), for the forms:

(1.) 20.612 : 6.561 :: 64.8 : 20.626470+ B. *inches.*

(2.) 1.71766 : .54675 :: 5.4 : 1.7188+ B. *feet,*

where (2.) is the division of the *inches* in (1.) by

12,

and therefore can be taken either for a quotient in *inches* or for *a new denomination* of measures, viz., for a reduction from

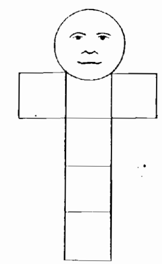
inches to *feet.*

(*b.*) Take the form 20.612. It is, as has been shown, the *perfect circumference* value, as a truth in nature, and therefore a divine truth. If it is desired to display this numerical value as a *line* measure issuing from a circular shape, this will be symbolized by such a division as will throw this value evenly onto the *edges of a cube.* A cube having 12 edges, this division will make its display as 20.612 *inches* divided into 12 equal parts, *each of which* will represent *one of the edges* of such a cube, or 1.71766+ *inches* or *feet.* [See (*a.*)] In fact, the very process is one of *cubing*, or of *cubiting*. There results two geometrical shapes, viz., the *circle* and *cube* displaying these two numerical

original measuring qualities, viz., 20.612 and 1.71766+, say, *inches* and *feet.*

To fully display these symbols in their significancy, and as related to each other, let the cube be *unfolded*, showing its edges, depend it from a *circle*, and in the *circle surmounting a cross* (see "Source of Measures," § 23) we have as a symbol of the Origin of Measures the

Ansated Cross of the Egyptians.



(*c.*) Now, however, while this is true, it does not go to the extent of its symbolization. While these 20.612 *inches* and 1.71766+ *feet* are the *originals* or *mother measures* (Hebrew Ammau and Omudim), so to speak, for 20.612 is a circle and symbol of femininity, yet it has been seen [§ 10 (*e.*), (2.)] that it is incomplete as a source of measure until perfected by the form

20.612 : 6.561 :: 64.8 : 20.626470+,

in which the result gives rise to a *diameter* in 20.62647+ (which, however, can also be used as a new circumference of a circle), the Nilometer cubit value, as a particular enlargement of 20.612, the Turin cubit value, which is a *circumference;* where, besides the differences of value, there is *opposition* in the differences of geometrical condition, as of *two opposites*, which may be compared to a *woman-likeness* for the *circle*, and a *man-likeness* for the *diameter.* By the involution, or inter-embracement of these forms, arises the last term or diameter value; and in the completion of the form we have, as *derived*,

The two great original cubit values from this original source.

Perfected thus, the *ansated cross*, to symbolize the use of these antagonisms and the fruition (viz., the analytical unit of measure in the circle of 360 degrees, as already shown, which may be called Horus, in connection with Isis and Osiris), could come under the term *man-woman* (or man-woman and son, in the diameter of 360 for the son), or as it is said that they two "shall be one flesh," the generalized term *man* would be appropriate as a description of this primordial generating measure. (See particularly, as to this, Frederick Creuzer's Symbolik and Mythology, first half of the third volume, *ansated cross* values, numbers 4, 5, and 6, of Table 1, where the cross is humanized and converted into *father*, *mother*, and *son*.)

Now, in fact, under the rude similitude of a *human being*, this *ansated cross*, as an Egyptian emblem, has the name of *ank*, *existence*, *being*, *life*, the Hebrew *anochi*, the personal pronoun I; and in the rendering of this word by the Egyptians into other languages, as *ex. gr.* the Greek, this symbol is translated as *anthropos*, or *man*. And, indeed, there can be no other reason for the appellation than the one here given. Thus it is seen that just as in the case of man and woman, who, though functionally different, are to be regarded as one-flesh, so here was a numerical and geometrical parallelism, to which in honor of, or as symbolic of these hidden measures, the name of *man* was given, as a living, working measure in the cosmos, springing from the inter-involution of antagonisms. It is a fact, too, that amongst almost all nations (English *Yard*, Hebrew YRD, *Jared*, German *Ruthe*) the idea of measure actually took origin and name from the opposite organs of generation. With the Hebrews this was especially the case with the number *six*, which is the letter *vav*, *pillar*, where this value in the square of 36 represents also the circle of 360.

More absolutely the sexual opposition of geometrical shapes is indicated by the triangle as the opposite of the circle. [See § 7, (*a*.) (3.)]

(2.) The Great Assyrian Symbol.

§ 28. The great Assyrian symbol was also derived from this source. It has many forms of representation, but two are especially noticeable.

(1.) See Figure 2, p. 4, Vol. 2, of Rawlinson's Ancient Monarchies. The upper half of a man rests in a ring or circle. (The entire length of a man was the symbolic measure of the cosmos. The lower half, from the thighs down, was the earthly measure, while the upper half was the heavenly measure, or source of all measures, or *the* man before separation took place. The old Assyrian was the Semitic source of the Hebrew, or, at any rate, they were in common as Semitic stocks and as to religious myths (and thence cognate with the old Chaldean). The word *man* in Hebrew is 113. The half of this is 56.5, which in Hebrew is HVH, the female half of the Great Name. The expression 56.5×10 in *letters* is exactly the Great Name. Therefore the upper half of a man, signifying a union of man-woman, equals this expression of 56.5×10, or Jehovah, and symbol of the measurer of the heaven and the earth. The man is drawing an arrow on a bow. The arc of the bow thus drawn is symbol of twice the analytical unit of measure already spoken of. The string of the bow as drawn are two *radii*, while the arrow is the *third radius*. The radius of the analytical unit of measure is that of the circle of 360 degrees, as shown; while the radius multiplied by 3 equals the *Nilometer cubit* value, as shown. Hence symbols of sources of measures, of cubit values, of the great measuring circle of 360 degrees, of Jehovah, and of the means of obtaining (in the *man*, 113, diameter to a circumference of 355.0001524+, as shown) the exact year value, or circle of the sun. The hand holding the bow shows the *four* fingers. This is, at the same time, the mark of a definite measure of the *Nilometer cubit*, in the *tephach*, or *four fingers*, and the symbol of Jehovah as of the *four letters* of His name.

Besides this, by collateral signification, this representation is a Hebrew one of the Garden of Eden, as to the *tree* in the garden. For the *tree* is made in Hebrew of the letters *ayin*, *tsaddé*. The symbol of the letter *ayin* is an *eye*, or *circle*, or *female;* while that of the letter *tsaddé* is a *hunter's dart*. The showing of the two gives the bow and arrow in the hands of the man, the symbol of the heart and dart, or cupid with his arrow, or of *Mars generatoris*.

(2.) Where this symbol is changed so as to form the *Heaven tree* (see George Smith's Chaldaic Genesis), the bow is no longer in the man's hand, and the circle is broken to represent the moon, whose periods are marked by the number 7. He is now connected with an Ashera or Grove, the characteristic of which, (besides the greater one of the man) is the *mons veneris* with the number 7 attached (as to the number 7, see "Source of Measures," p. 202), and with the number 8 exhibited below. Out of the fruit showing these numbers, each fruit sends forth three rays, in all $15 \times 3 = 45$. Here, again, the garden, in a more detailed version, with Adam in it; for Adam is 45, or, reduced to unity, he is $4 + 5 = 9$.

The feathers in these symbols shadow forth especially significant numbers with their radiations. In (1.) the feathers at the sides are multiples of 6, and those radiating out below in place of the lower extremities of the man are 12. Both of these numbers are essential in the Garden of Eden, in the Hebrew Bible, to comport with the measures of the great pyramid of Egypt.

SECTION III.

THE GREAT PYRAMID OF EGYPT.

INTRODUCTION.

§ 29. To a mind unbiased by the prepossession of a theory that way, the assertion that the great pyramid of Egypt was built to perpetuate a series of measures, astronomical and otherwise, and to contain a mathematical and geometrical system of calculation and admeasurement, can not but be received with incredulity, and rightly so. *Given* a great number of pyramids in a land, the uses of which were notoriously for sepulchral purposes, and a rule is established applying to all, unless proof to the contrary can be made as to any one or more isolated exceptions. But taking the affirmative of the issue, then as to reconstruction; *given* a pyramidal mass, utterly destroyed as to its exterior surface, save the corner base sockets and a casing stone *in situ*, with the connection of the exterior with the construction of the interior lines seriously impaired, to be restored in an original measure, which has been lost. None but proof of an extraordinary kind as to ability to reconstruct, after the mental conception of what the architect intended to represent, ought to become or will become acceptable. This is especially the case when the time of the building of the mass dates back beyond what may be called the *historic* ages, and where every theory advanced must rest for support upon its *own intrinsic merits*, unsupported by positive evidence of any kind filtering through *the historical* channels of the world.

Where a question of measure is concerned, it will not do to cut and carve a mass, so as to fit it to such a measure, particularly adopted on supposition; nor will it do, as occasion requires, to change the value of the adopted standard to suit a stubbornly resisting condition of the mass. It is true that this method is the one to be employed in arriving at a possibility, or probability, as *a theory;* but this accomplished, the further step is required of eliminating *all* theory, and *all* probability, and *all* possibility, leaving a standard of measure as fixed and rigid, for instance, as is the *British inch.* As a sequence to this, the restoration of the mass is to be made in terms and divisions of this measure, connected with technical denominations of cubits and parts of cubits. Subject to these considerations, and they seem to be fair and pertinent, if a standard of measure can be arrived at, as a rigid and fixed one, derivable from an elemental source, by use of which a structure can be erected, as to its whole and most of its parts, similar to that of the great pyramid in its geometrical shapes, and in such manner that the evidence is convincing that the actual measures of its original construction are being used, then, indeed, the recognition of that standard, its source, and its use in that connection, it is thought, should be conceded, even though the particularities of the method of use may not be certain.

§ 30. If, from the foregoing elements of measure, founded, as shown, on the Parker forms (from whence the value and the reason of the value of those same cubit measures is seen to be derived), the pyramid structure, with the chief outlines of its interior works, can be restored, with a manifest reason why it was built,—this reason why being an essential in these very elements,—it will not only be a proof that the cubit values thence derived *were* the cubit values, but also that these were the elements whence they took their rise. Still further, if it should happen that such a restoration of the pyramid answers to the *British measures* in *inches* and *feet* of that structure, then it would seem almost impossible for even exacting criticism to charge upon such a complicated series of correspondencies the escape of coincidence so glibly resorted to by the thoughtless ignorant on one hand, and by baffled superficial algebraic mathematicians on the other.

§ 31. Professor Piazzi Smyth has given to the world a mass of measures of this structure. He was laboriously, and even painfully careful in their taking, on a measure adjusted to the British *standard* (§ 12), at Edinburgh, even to the balancing and dwelling upon *tenths*, and sometimes *hundredths* of inches. He had found such discrepancies in the measures of the multitudes of those who had preceded him, that he was prepared beforehand for his work, both as to measures and also as to corroborative proof by the taking of angles. Besides, he desired to discover who of those others had done their work well. Of those who had preceded him, he found, in general, the measures of Colonel Howard Vyse, of the French *savans*, and of Prof. Greaves, reliable.

§ 32. There are three points to be taken into consideration, and which should be always had in mind in this matter, viz:

(*a.*) That it is next to impossible to have measuring instruments alike, though taken from a same standard; and it is almost impossible that, even though having the same measures, their uses will bring out the same results. Discrepancies are liable, from these causes, to show themselves in, say, *tenths* of inches, and even more, where lengths of thirty or more feet are taken. No one will better appreciate this statement than Prof. Smyth.

(*b.*) In long distances in great masses of mason-work, it is absolutely impossible to practically obey, by reason of *jointing*, the mathematical exactitudes of the architect. And, where continued great precision may not have been necessary, defective masonry, as to positively intended measures, is to be found, as, for instance, with reference to size of the ramps in the grand gallery, etc.

(*c.*) Prof. Smyth found a very curious feature (which is to be found on our present scale measures for proportionate parts of different measures) as to lengths of passage-ways, the proportions of the king's chamber, and of the coffer therein. He also infers the same as to the grand outlines of the pyramid base. It is: (1.) That a passage-way may present two lengths, the east side, say, being longer, or shorter, than the west side. (2.) That, compared with a perfect cubical chamber, the (king's), and notoriously the queen's chamber, is out of shape, or askew. (3.) The same happens as to the coffer.

Very many circumstances connected with these irregularities of admeasurement would seem to point them as *purposed*, so that the differences between the measures of a standard cubical chamber, or coffer, and these as they are, served to give some derived result as the working out of a problem; or else that a purposed variation in height or breadth might be intended to satisfy, in fact, two or more sets of measures, differing from each other by some very slight quantity.

As to above, see "Source of Measures," § 36, *et seq.*

§ 33. There are two features about this pyramid which have been well established, that prove other objects of construction than for sepulchral purposes: (*a.*) One may be taken *as astronomical*, from the facts that the *north base side* of the structure coincides with the parallel of 30° north latitude, and that the mass, as to its sides, evidenced by its corner socket lines, is oriented as perfectly as could be expected of human ability. (*b.*) Another may be taken *as geometrical*. It was considered by the Rev. Mr. Taylor, who had made this structure a study (see "Our Inheritance in the Great Pyramid," by P. Smyth, prior to his Life and Works), that it was so built that its *height* (carried to a point) should be to *one-half* its circumference as diameter to circumference of a circle; a statement afterward sufficiently verified by Prof. Smyth.

Architectural Details of Measures of the Interior of the Great Pyramid of Egypt, in terms of the Measures established in Section II.

§ 34. The forms (of *circumference* to *diameter* of a circle), viz:

20612 : 6561,

utilized in value as British inches, were the basic measures used to construct this pyramid in all its parts. Take the forms,

20612 is to 6561

as 64800 is to 20626.47001+

as *inches*. Divide by 1000, and there results:

(1.) 20.612 is to 6.561

(2.) as 64.800 is to 20.62647001+

where (1.), 20.612 inches is the Turin *cubit* value as a *circumference*, and in (2.) it is seen that a *diameter* value of 20.62647+ inches, which is the Nilometer cubit value, approximates very closely to it. Upon these two forms depended the entire construction of the pyramid, in measures of inches, feet, yards, cubits, miles; of days, weeks, months; of periods of the moon and of the earth; of the size of the moon and of the earth, with the distance to the sun, as springing from them.

§ 35. To more fully appreciate the following details, which are to some extent supplementary (especially as to interpretation of use of lines), reference is made to "Source of Measures," by the author. This is simply a development from the grounds and measures there laid down.

The *height* of pyramid to twice its *base-side* has the proportion of *diameter* to *circumference* of a circle. 20626.47001+ (variation on 20612), as *feet* divided by 27 = 763.943333980+ feet, is the length of side of base. This is the same as 20626.47+ (or 1000 Nilometer cubits) × $\frac{16}{9}$ = 36669.280031+ inches, equals

Always give the two kinds of measure viz., the Standard and Exact. By this rule the circumf[erence] of the base of the pyramid is Standard $\frac{20612}{27}$ feet × 4, or it contains the 20612 as a factor. 20612 ... the moon, & this product × 4/3 = = 27482666+ = the base for obtaining the exact mean time of the moon, & this is the base f[or] inches the Exact Standard Circumference of the base of the pyramid in inches and this is the ... See forward page 83. The real measure ... 3664355+ for obtaining the Exact Solar year (Parker)

the entire circumference of the base of the pyramid; or for the base side in feet 763.94333398o+ feet. The height, therefore, was $486.\frac{341+}{}$ feet. As to the pyramid being truncated, see Appendix to Supplement to "Source of Measures."

§ 36. The interior works were referable to the slope line of the exterior to the base, and to the vertical axial line, or center line, of the mass; therefore the diagram annexed hereto, exhibiting in vertical section the half of the structure, is sufficient for lengths and heights.

§ 37. The entrance passage as to the center of its floor, longitudinally, was set off a distance to the eastward of the center of the base side, $24.\frac{42190+}{}$ feet (?), for reasons given in section 7, "Source of Measures"—a token of the geometrical origin of the shape of the entire mass.

SPECIFICATIONS.

§ 38. (1.) The pyramid is based on a pavement which is included in the mass of the structure. Its thickness is $20.\frac{612}{}$ inches, or 1 Turin cubit, or $1.\frac{7176+}{}$ feet, or it may be 1.71887+ feet, or 1 Nilometer cubit.

This is a *circumference* to a *diameter* of $6.\frac{561}{}$ inches, or a diameter to a circumference of 64.8 inches.

(2.) Line $a\ a^1$ is the one-half base side of pyramid, and equals in length $\frac{20626.\frac{47001+}{}}{12}$ inches $\times \frac{16}{72}$ equals 381.971666990 feet, or $222.\frac{222+}{}$ cubits, or 4583.660003880+ inches. Actual measure by Howard Vyse, 382. feet; difference, .02 of a foot.

NOTE.—$381.\frac{971+}{} \times \frac{18}{200}$ equals the length of the king's chamber in feet. Also this distance is *diameter* to a *circumference* of 1200 feet, or 14400 inches, or area of one square foot multiplied by 100; or, as minutes, it equals 10 days in time measure. #

§ 39. (3.) Line $a^2\ c$ is the vertical height, above the base of the pyramid, of the point of intersection of the floor line of the descending passage-way with slope line of the structure. Its length is 31 cubits, or $20.\frac{612}{} \times 31 = 638.\frac{972}{}$ inches, equal to $53.\frac{2476+}{}$ feet. The same measure computed by Howard Vyse, 53.1975 feet. ("Source of Measures," p. 119.) The line $a\ c$ to the foot of this line is 41.820641111+ feet, or 501.84769333+ inches. These lines are in the following proportions to each other: $a^2\ c$: $a\ c$ :: 6561 : 5153, or as the area of the square of 81 is to that of its inscribed circle. In the scale of inches for feet, they very nearly represent the relation of *vertical* height of descending passage-way to its breadth, so much so as to proportion, that those given, viz., 6561 : 5153, may be taken as a guide for the dimensions of that passage.

NOTE.—The height values of the descending passage-way as taken (7), are height vertical to horizon 52.7895656+ inches, and the perpendicular to the incline of the passage 47.25419656+ inches. By using the proportion given, to find the breadth, we have 6561 : 5153 :: 52.7895+ : 41.460849+ inches for breadth of passage; or, for dimensions of descending passage-way, we have:

Height, vertical,	52.7895656+	inches.
" perpendicular to incline,	47.25419656+	"
Breadth,	41.460849+	"

The dimensions of this passage-way may show a change of values on these, by the biased construction of its sides, and top and bottom, of:

(*a*.) For vertical height take $\frac{318.309722}{6} = 53.051620+$ (where 31.8309722 is *diameter* to a *circumference* of 100); then we will have as a variation:

Height, vertical,	53.051620	inches.
" perpendicular to incline,	47.488772+	"
Breadth,	41.666666+	"

(*b*.) For vertical height take $\frac{314.159426}{6} = 52.359904+$ (where 314.159426 is *circumference* to a *diameter* of 100): then we will have as a variation:

Height, vertical,	52.359904+	inches.
" perpendicular to incline,	46.8695884+	"
Breadth,	41.1233939+	"

Suppose the arithmetical *mean* of (*a.*) and (*b.*) is used, as:

Height, vertical,	52.70576+ inches.
" perpendicular to incline,	47.17918+ "
Breadth,	41.39502+ " :

now the measures of Piazzi Smyth show a much greater limit of accommodation than here required.

The line $a^1 a^3$ is shown to be (8.), 251.71412+ feet; or, numerically, the square root of *one mile* in inches. $\sqrt{251.71412+} = 501.7111953$, and this is a very slight variation on the value $a\ c$, or 501.8476+ inches. So, also, the line $t^1\ d$ (see diagram of part of descending passage-way) is 14.842243+ inches; this divided by 12 = 1.23685+ feet; showing a very close agreement with the floor line of the ascending passage-way, proportionally, that line being 123.6830+ feet.

§ 40. (4.) Line $a^2\ a^3$ is the *floor* line of the descending passage-way, and is $20.\underline{62647001+}$ inches × 200, equal to 4125.294003-493+ inches, or 343.774500291+ feet. Same measure by Howard Vyse "about 4126" inches. The angle $a^2\ e\ c$ is 26° 28′ 24″.10. Piazzi Smyth makes it, by one of his measures of actual test, 26° 28′ 16″.

NOTE.—This, as seen, is a *diameter* line, and gives a *circumference* of 1080 feet, or 12960 inches, or 10 times *one square yard*, or $\frac{1}{400}$ of one solar day. Moreover, 1080 = 355 + 360 + 365, which separation was the ancient year calendar form.

The length of this line is 10 times the length of the king's chamber. The line $d\ b^1$ equals 100 feet, or 1200 inches. Compare with (2.) "Note."#

§ 41. (5.) Line $a^3\ c^3$ is the distance from the floor line of the descending passage-way to the vertical axial line of the pyramid. Its length is 32.42377769849+ feet, or 3890.853238188+ inches, or 18.87664+ cubits.

NOTE.—Though this distance may be relied on as architecturally correct, no interpretation can be given of the line. As a whole, it is cut by the wall of the subterranean chamber.

$\frac{324.2377+}{12}$ = 27.019+ feet is probably the measure of the upper line of the horizontal passage way to the Subterranean Chamber

This line is the 1/2 base side of pyramid less 1/10 th of itself, or
381.971+ − 38.19716+ = 343.774+

§ 42. (6.) The key to the works above the descending passage-way rests in the value of the line $b\ d$, or on the perpendicular let fall from the roof line on to the floor of the horizontal passage-way. The line $a^3\ b$ is parallel to the exterior slope line of the structure.

The length of this line $b\ d$ is 3.16227766+ feet, or 37.94733192+ inches.

NOTE.—The interpretation of this line is very remarkable. Form of *circumference* to *diameter* is 20612 : 6561, as said.

Circumference to a *diameter* of 1 foot, is 3.141594269+ feet.
Diameter to a *circumference* of 10 feet, is 3.1830972249+ "

The *mean proportional* between these values is (as stated),

3.16227766+ feet.

Now, this last value is the *square root* of 10: in inches, as 37.94733192+, it is the *square root* of

1440 *inches.*

The half base side of the pyramid (2.) is seen to be a *diameter* to a *circumference* of

14400 inches.

Thus the relation becomes manifest. But as the half base side equals $\frac{200}{18}$ of the length of the king's chamber, connection with that is shown. And as the length of the descending passage-way is shown (4.) to be 10 times the length of the king's chamber, connection with that is shown. Therefore all of them are connected with the square of 12 inches, or 144, both as a linear measure and a measure of time, because 1440 is the minutes in 24 hours. For an immediate check upon this value, the dimensions of the descending passage-way are now given.

§ 43. (7.) From the data in (6.) the height of the descending passage-way, *perpendicular to its incline*, will be

47.25419656+ inches.

Piazzi Smyth's measure of the same, as per his tables of actual measure,

47.24 inches.

(most approved

Difference:

.014 of an inch.

Its vertical height will be

52.78956568+ inches.

NOTE.—At the foot of the descending passage-way in actual construction, as per Howard Vyse, the mason work is set back and down, as indicated by the dotted lines (also see Perring's Plates), so that the actual vertical height of the passage to the subterranean chamber is contracted or reduced from the descending passage-way to

3 feet,

or

36 inches;

which accords again with contents of note to (6.), because 36 inches is 1 *yard*. Its area is 36^2, or 1296 inches, and $1296 \times 4 =$ 5184, the $\frac{1}{1000}$ of 1 solar day; thus making the yard *numerically* a base for the correlation of distances and time measures. He also gives the length of the top line of this passage-way to the subterranean chamber as 27 feet.

Note, also, that as the length of the descending passage-way is diameter to 1080, this equals $355 + 360 + 365$, which was anciently the base of the ordinary calendar system for termination in the vague year day value. Deduct the height of the subterranean passage-way, or 3 feet, from this 1080, and it leaves 1077, which equals $354 + 359 + 364$, which likewise was an ancient calendar form, involving in 354 days the ancient lunar year, and in 364 days the week year founded on the week of 7 days. (See "Source of Measures," § 92.)

§ 44. (8.) The line $a^4\ a^5$, extending from the intersection of the roof line of the descending, with the floor line of the ascending passage-way to the vertical axial line of the pyramid, is the base line of construction of all the upper works.

Its value is

251.714123560+ feet,

or

3020.5694827+ inches.

The line $a^4 b$ is taken as governing by its parallelism to the floor line, but in practical work it is contracted back or stated, while the ideal line governs as the key to the construction of the passage-way & the real line is a proportion ... feet

NOTE.—The interpretation of this line is, that it is the *square root* of

63360,

which, *as inches* (by scale), is just the value of *one mile* in British measure, or

5280 feet.

So that, all the upper works embraced between the lines $a^4\ a^5$ and the vertical axial line of the pyramid, viz., $a^1\ a^8$, are included in a square area denoting 1 *mile, British*. As a check on this line, Howard Vyse gives the line $a^4\ b$ as 247.7 feet. It is 247.75265939+ feet. Difference, .05 of a foot. But the accuracy of this line is checked back, again and again, by the coming together of all the lines of the upper works.

§ 45. (9.) The consideration of the contents of (8.) leads first to the measure of the line $a^1\ a^8$. This line is in length

137.5098001164+ feet,

or

1650.1176013968+ inches.

NOTE.—This line is 4 times the length of the king's chamber. Its main interpretation is, that as *inches* it is a *diameter* to a *circumference* of 5184 inches, or the number of inches in 4 *square yards*, or the exact value of the $\frac{1}{1000}$ of one solar day in *thirds*.

The connection between this line and $a^4\ a^5$, noted in (8.), is remarkable. The extremes of the British long measures are the *inch* and the *mile*, or, say, the cubic foot of 12 inches, and the cubic mile. Then 12^3 and 5280^3 represent these extremes. Performing the operation, we have

1728 and 147197952000.

Dividing the one by the other, we have a quotient of

85184000.

Dividing by 80000000, and we have a quotient of 1, with a remainder over of

5184000,

which, as *thirds*, is just *one solar day*. That this value thus found was used for this showing, to connect the line $a^4\ a^5$ with

is ideal line is 247.75 — 26 + feet or this measure of correlation. The measures of this correlation of the Meton Cycle are carried right along in the measures of the Grand Gallery, the Antechamber & King's Chamber.

$a^1\,a^8$, which last, as seen, is a *diameter* to a *circumference* of 5184, seems positively to have been the case to the author. It does not seem that by the system of the ancients, our method of multiplication and division was used, but rather addition and substraction. In this view, having the value $5280^3 \div 12^3$, as seen, the use would have been

$$\begin{array}{rr} & 85184000 \\ \text{less} & 80000000 \\ \hline \text{Remainder,} & 5184000 \end{array}$$

or 1 solar day value thus arising. Their method of use is yet to be discovered; but an example of a like use to get the value of a line is shown in (10.)

Of this line, for verification, reference is made to "Source of Measures," where, not at that time being able to interpret any lines connected with the roof line of the ascending passage-way, but simply working with the forms 20612 and $20626.\frac{47+}{}$ as nearly in harmony with the found measures as possible, making a positively dependent use of Piazzi Smyth's measures as regards that roof line and the upper works, the author arrived at the determination of this line to within so small an amount, viz., .0095 of a foot (see page 136), that he at once accepted of this value as, without doubt, the true one. No attempt was there made at intermediate exactitudes, from inability at that time to interpret any meanings of lines which would serve as a guide to work back and forth, checking results by the harmonies of relations.

§ 46. (10.) The line $a^6\,d^1$, embraced between the north wall of the grand gallery and the north wall of the queen's chamber, comes next in order. Add to itself, as inches, the $\frac{1}{2}$ of 206.12; or, $206.12 + 103.06 = 309.18$. Add to itself, as inches, the $\frac{1}{2}$ of $206.\frac{2647001+}{}$; or, $206.\frac{2647001+}{} + 103.\frac{1323500}{} = 309.\frac{3970501+}{}$ inches. Subtract one sum from the other, or,

$$309.\frac{3970501+}{} - 309.\frac{18}{} = .2170501 \text{ of an inch.}$$

Raise this by 1000 times, it equals

$$217.0501 \text{ inches.}$$

Multiply this product by 7, or,

$$217.0501 \times 7 = 1519.3507 \text{ inches.}$$

This is the measure of the line $a^6\,d^1$; and it is very observable as being a difference founded on 10 Turin cubits and 10 Nilometer cubits, or the difference between the width, north and south, of the queen's chamber, to which the line leads, which is 10 Turin cubits, and the width, north and south, of the king's chamber, which is the enlargement on 10 Turin cubits, or 10 Nilometer cubits.

Piazzi Smyth's measure of this line is 1519.4 inches: difference, .0493 of an inch. As another verification of this use, he found that the line was a multiple of 217 by 7.

§ 47. (11.) The line $d^1\,a^7$, or the mean width of the queen's chamber, north and south, is

$$206.\frac{12}{} \text{ inches,}$$

or 10 Turin cubits.

Piazzi Smyth gives for this measure, four measures: two taken on the east side of the room, and two on the west side; taken at two separate times. East side, 204.7, 206.5; west side, 206.3, 205.6. The taken measure, which is typical and in general harmony, will, however, verify itself as correct. But bear in mind that this chamber affords extremes of measures taken on a mean.

§ 48. (12.) The line $a^6\,a^8$, being the floor line of the grand gallery, intersecting the vertical axial line of the pyramid at a^8, is

This measure is $\quad 156.8744966+$ feet.

$$91.\frac{33}{} \text{ Turin cubits.}$$

Piazzi Smyth gives this line as 156.9 feet: difference, .025 of a foot.

The angle at a^6 is the same with Mr. Smyth's to within a few *seconds*.

§ 49. (13.) Having this line with $a^6\,d^1$ and $d^1\,a^7$, as given in (10.) and (11.), we can determine the line $c^2\,a^8$: and also, which is a matter of the greatest moment, where the vertical axial line of the pyramid cuts the floor length (north and south) of the queen's chamber.

(1.) $c^2\,a^8$ is found to be

69.48255243+ feet.

(2.) It is found that the length $c^2\,a^7$, of the floor line of the queen's chamber, lays to the *south* of the vertical axial line of the pyramid, and its value is found to be

3.14159426+ feet;

or, *circumference* to a *diameter* of 1 foot; or, it is the circumference of a circle, *inclosed in the area of one square foot*, or 144 inches, or the $\frac{1}{10}$ part of one solar day in *minutes*, or the other extreme of the British measure from the line $a^4\,a^5$, which, as seen, is the square root of one mile as 63360 inches.

§ 50. (14.) We can now work back to ascertain the value of the line $a^4\,a^6$, which is the length of the floor line of the ascending passage. From the above data, as ascertained, its value proves to be

123.68300698+ feet.

Piazzi Smyth makes it

123.683 feet:

difference, one may say, nothing. $20.612 \times 6 = 123.672$, showing, in inches for feet, this value as modified on the typical form. Or, also, 123.68300698+ feet are 72.00+ Turin cubits.

The angle at a^4 agrees with Mr. Smyth's to a few *seconds*.

§ 51. (15.) Reverting now to the queen's chamber, $d^1\,a^7$ equals $206.\frac{12}{}$ inches, or $17.\frac{1766+}{}$ feet, or 10 Turin cubits. $c^2\,a^7$ equals 3.14159426+ feet, or 37.69913112+ inches. Then $d^1\,c^2$ must equal

168.42086888+ inches,

or

14.03507240+ feet.

(1.) The part $d^1\,c^2$, thus found, governs the *height* of the walls of the room, as $d^1\,d^2$ above (vertically) the point a^6, or the line $a^6\,a^7$; making this height, with the length $d^1\,c^2$, a *perfect square*. This height, therefore, is

168.42086888+ inches.

$d^1\,o$ to the floor is given by Piazzi Smyth as

14 inches, or 1.1666+ feet,

which should be 1.1664 feet (see § 25), or 13.9968 inches.

Sum:

182.41766888+ inches.

Piazzi Smyth measured this full line as

182.4 inches:

difference, .017 of an inch.

(2.) The value of the solar day, in *thirds*, is

5184000‴.

The value of one sidereal day is

5169846‴.

Take these values as represented by

$5.\frac{184}{}$ feet,

and $5.\frac{169846}{}$ feet,

or, in *inches*, 62.208 inches,

and 62.038152 inches.

The line $m\,n$, or the height of the gable, is thought to represent either one or both of these values; if the latter, then, by a bias on the roof line of this gable. Piazzi Smyth gives this distance as

62. inches.

But, by correcting his computed measures of the floor line as 205.8 to 206.12, his value would have been 62.2 inches.

There results, therefore, for greatest height,	62.208 inches.
	168.420 "
	13.996 "
Sum,	244.624 inches.
or,	244.454 inches.
Piazzi Smyth makes the full height,	244.4 "
Difference,	.054 inches.

It would seem better to take this line $m\ n$, as at its least value to be 5.153 feet, and at its greatest value to be 5.184 feet.

NOTE.—The height of the digging down of the floor of the queen's chamber below the line $a^6\ a^7$ is curiously valuable. (See the method of obtaining the Roman Foot, § 25.) The form is:

$$\left.\begin{array}{r}20.612\\6.561\end{array}\right\}\frac{16}{9}=\begin{array}{l}36.643555\\11.664\end{array}$$

Here is seen the raising of the value of the *Turin* cubit, with its diameter 6.561, in inches.

If the same process is performed on the *Nilometer* cubit, as

$$\left.\begin{array}{r}20.62647+\\6.56560+\end{array}\right\}\frac{16}{9}=\begin{array}{l}36.669286+\\11.6721+\end{array}$$

in 36.669286 we have the $\frac{1}{1000}$ part in inches of the circumference of the base of the pyramid.

Now, $\frac{1}{10}$ of the diameters of these values, viz., 1.1664 and 1.16721+ are, in fact, either the one or the other of them, the height in *feet* of this digging down of the floor of the queen's chamber. Piazzi Smyth says it is 14 inches. This is 1.16666+ of a foot. This fact, in connection with all other measures, shows the origin of this particular measure; which is confirmed, when we come to see the value of the height of the famous *niche* in this queen's chamber, which is as follows:

§ 52. (16.) Piazzi Smyth gives the height of this *niche*, from the bottom of the digging out of the floor of the queen's chamber below the line $a^6\ a^7$ to the top, as 185.8 inches.

This value, separated into its parts, as (1.) all above the line $a^6\ a^7$ and (2.) all below this line, shows clearly enough what the real measures were to be by the intention of the architect.

(*a*.) Take 1.1664 feet, this is	13.9968 inches.
Add the numerical value of the Turin cubit value in *feet* × 100, in the scale of *inches* for *feet*, and we have	171.7766
Total,	185.7634
Piazzi Smyth's measure as above,	185.8
Difference in hundredths of an inch,	.0364

Take the other value based on the *Nilometer* cubit, and we have:

1.16721+ *feet* equals	14.0065 inches.
Add, as above,	171.766
Total,	185.772
Piazzi Smyth,	185.8
Difference in hundredths of an inch,	.028

Here, evidently, is the reading of the measures of these niches. It would seem, however, that the first use is most likely the true one.

NOTE.—The above is strengthened by the following in regard to the *widths* of the niches. Piazzi Smyth gives the width of the lowest or foundation niche as 61.3 inches. Multiply the value for height, 171.7666+, given above, by $\frac{10}{28}$, and there results

$171.7666\times\frac{10}{28}=$	61.34+ inches.
P. Smyth,	61.3
Difference,	.04 inch.

The breadth of the 4th niche he makes by *estimation* as

	34.3 inches.
Multiply 171.7666 by $\frac{2}{10}$, and we have	34.35 "
Difference,	.05 "

There can now be little doubt as to the measures of these niches.

§ 53. (17.) Nothing certain can be said as to the *lengths* of the sides of the queen's chamber, east and west, because of the uncertainty of Mr. Smyth's measures. Here he finds a difficulty, and does not hesitate at an assumed allowance for true measure of even an inch. But, subject to this, one side is persistently longer than the other.

He gives one side (by actual measure) as	227.4 inches.
And the other as	226.0 to 226.5 "

Refer to § 49, where it is seen that a portion of 3.1415942+ feet of the queen's chamber lays to the southward of the vertical axial line of the pyramid. This is circumference to a diameter of *one foot*. In inches it is 37.699128. Suppose this was a guide to the (or one) length of this room, as being $\frac{1}{6}$ of the length,

37.699 × 6 = 226.194 inches.

And as Mr. Smyth concludes this length as 226.+ *inches*, the above may be taken as a valuable item of measure.

Now, the Parker forms, with which we have been dealing, were anciently used in connection with the form 113 for diameter to 355 for circumference. Compared, the exactitude is

6561 : 20612 :: 113 : 3550001524+.

Now, in fact, the *mean width* of this room *is* 206.12 inches.

Multiply 3.5500015241+ by 6, and we have	21.300009
Add this width,	206.12
Sum,	227.42

which gives us the length line of one side of this room, as growing out of the length of the other side, and at the same time connected with its width; and also as showing a raising of this particular form of 113 : 355+ (see Preface), as worked in connection with that of 6561 : 20612, as shown above. As a fact, these two forms of 6561 : 20612 and 113 : 355 are intimately used together (one may say married together) in the Bible.

For other suggested measures as to the length of this room, see "Supplement to Source of Measures," p. 17, note. Also see § 42 (6.), where 37.947 inches × 6 = 227.6 inches.

From the foregoing, it is seen that the measures of the queen's chamber are founded on and seemingly confined to the typical value of 20612 (and 6561), or the *Turin* cubit value. This is in marked contrast with the measures of the king's chamber, which are based on the derivative value, or the *Nilometer* cubit, as follows:

§ 54. (18.) The typical form is 20.612 inches, or the Turin cubit, from 20612: the modification is 20.62647001+, a *diameter* value, or the Nilometer cubit (an enlargement on 1 Turin cubit). On this last form all the measures of this chamber are founded.

(*a.*) Breadth, 206.2647 inches; *diameter* to *circumference* of 648 inches.

(*b.*) Length = breadth × 2 = 412.5294+ inches; *diameter* to *circumference* of 1296 inches, or 1 *square yard*, or the $\frac{1}{4}$ of 5184, characteristic of the solar day.

(*c.*) Height $2062.647001 \times \frac{192}{1728} =$ 229.1820 inches. #

Piazzi Smyth's measure of (*a.*)	206.28 inches.
" " " " (*b.*)	412.56 "
Howard Vyse's " " (*c.*)	229.2 "

The floor line of the king's chamber, or the line $k\ a^9$ is, vertically, by Piazzi Smyth, 7 inches above the intersection of the floor line of the grand gallery with the vertical axial line of the mass.

§ 55. (19.) The length of the line $k\ d^3$ is taken at 330.13752 inches, differing as being less than Piazzi Smyth's measure by .16248 of an inch; but he says 330.3± inches.

330.13752 + 206.2647001 (= $d^3\ a^9$) = 536.4019+ inches: for which see "Source of Measures," p. 138.

§ 56. Closing these specifications, an interesting note may be made of the variety of values to be found within very narrow limits. By this system of measures, taken astronomically,

$$\sqrt{31415942.69+ \times 2 = 62831885.38} \text{ equals } 7926.565+$$

or the *miles* equatorial diameter of the earth. Now, take the line $b^1\ b^2$: it is in length 13.61519648+ feet; modify this by the addition of .00983206 of a foot, making it, 13.61519648, numerically,

$$13.61519648 \times \frac{12}{20612} = 7926.656$$

or this very equatorial value. Such results, germane to the subjects-matter of the general construction, serve to convince one of

See § 49 (5) Then the line $a'a^8$ is 1650.11760 + B. inches.
$\frac{10}{72}$ of this equals 229.1820+ B. inches, or this very value
of height of King's Chamber
229.1820+ × 40 = 9167+ inches = Base side of Pyramid

the existence of permitted extremes on a mean of measures, confined within very narrow limits.

It is seen that, from first to last, in these works, they are founded on the idea of co-ordination of measures of space (in terms of the British measures) with those of time; justifying all that the author advanced, by anticipation, on this idea, in "Source of Measures."

§ 57. The king's chamber dimensions were made in terms for computing tables of *sines*, *cosines*, *tangents*, and *co-tangents*, etc., though not immediately apparent. The Hindoos have the same method, in the same terms, for the same purpose, coming from their most ancient sources. Thus, in computing the sines, they take the radius at 3437.74+ (the length of the king's chamber in *feet* being 34.3774+) *diameter* to a *circumference* of 10800, which *circumference* multiplied by 2 equals 21600 *minutes;* the diameter is therefore 6875.48; hence the proportion is

6875.48+ : 21600.

Reduce these numbers to their least terms, by dividing them by 36, and we have

190.985+ : 600;

where, in 190.985, we have 10 times the height of the king's chamber in feet. (See Bentley's History of the Hindoo Astronomy, who says this (not identically the same, but evidently obscuring this form) form was used by the most ancient Hindoos to compose tables of *sines*, *cosines*, *tangents*, and *co-tangents*. "Source of Measures," § 48.)

REMARKABLE.

§ 58. (1.) By the Turin cubit value the $\frac{1}{4}$ base side of the pyramid is

190.851851+ feet.

(2.) By the Nilometer cubit value the $\frac{1}{4}$ base side of same is

190.985833 feet.

This last (2.) is the exact value, but contains and carries the first (1.) by intendment, and *vice versa*.

(3.) The $\sqrt{364.256374}$ is 19.085501+ feet.

(4.) The $\sqrt{364.242256}$ is 19.0851317+ feet.

Here (3.) is the sidereal year day value, with its *exact decimal*, and lacks just *one day* of 24 hours to complete the perfect year; and (4.) is the tropical year day value, with its *exact decimal*, and lacks just *one day* of 24 hours to complete the perfect year.

Hence it is seen that this slight change of values on the $\frac{1}{4}$ base side of the pyramid works out these year values. This is the more observable since the height of the king's chamber is $\frac{1}{10}$ part of (2.), and carries (1.) by intendment, and *vice versa*.

(5.) Now (3.), or 19.085501+ × 216 = 4122.468+.

(6.) And (4.), or 19.0851317 × 216 = 4122.388+.

(7.) But 41.22468 × 3 = 123.67404;

which is a variation of .009 of a foot on the length of the floor line of the ascending passage-way, or line $a^4\ a^6$.

(8.) And 41.223888 × 3 = 123.6716;

which is a variation of .01 of a foot on the length of the same line.

It would seem, therefore, that these values must have been had in view by the architect of the pyramid, and were worked from the base of the pyramid up the ascending passage-way, toward the queen's and king's chamber, as affording the exact year values to within *one exact day* of 24 hours.

§ 59. All this is the more observable (see (6.) above) since

20612 × 2 = 41224.

It is seen that the values in (5.) and (6.) are the same as far as 4122, where they separate, and by taking up different values beyond this they give the correct year values, as seen.

Now, the word B'rith, *covenant*, in the Bible reads 4122, or this very value, to this very point of separation. And, indeed, the Lord says: "Were my covenant (B'rith) not, there would be no heavens or earth," showing this measuring use. This B'rith was greatly used in connection with Abram, whose name, placed in a circle, reads likewise 4122. His name, if added together, is 243, which is diameter to a circumference of 763.4074, the standard half base side of the pyramid, and carries the exactitude by intendment. It was this man who said to the king of Sodom: "I swear by Almighty God, *the measurer* of heaven and earth." When his name was changed to Abraham, an *h* was added, or the number 5, and in place of 4122 it became 41252, and, indeed, 20626 × 2 = 41252, which shows the use of the *Nilometer cubit* value also.

§ 60. The *ark* of the *covenant* (B'rith) was 2½ cubits long, or 51.53 *inches*, or, numerically, the area of the circle inscribed in the square of 6561. Its height added to its breadth was 3 cubits, or 5.153 *feet*. It was so constructed as to at once bring forth the abstract numerical and geometrical origin of measure. But it was the ark of *the covenant*, or B'rith, and the base measure of the ark multiplied by 8, or 5153 × 8 = 4122[4, gives the very resulting value indicated in the word B'rith (or covenant) or 4122.

§ 61. The *outward form* of the Sepher Thorah, or the Books of the Law—that is, the five books of Moses—as to letters and words, was exactly prescribed as the outward objective visible marks of an inner hidden sense. There is *no* middle *word* in the Books of the Law, but there are *two middle words*, viz., DRS—DRS, so that the first terminates all that has preceded in the Law, and the last commences all that follows. Now, these words read 324—324. It means that the Books of the Law center upon the two halves of a circle, the two halves of whose circumference amount to 648, the line of division separating the two parts necessarily forming the diameter of the circle, or consequently 2062647+, or the Nilometer cubit value.

§ 62. The center *letter* of the books of the Law is the letter *vav*, or 6, the symbol of a *pillar*, around which the hidden mysteries of these books revolve. The meaning is that the number 6 lays at the foundation of the Biblical scheme of calculation, for this number is the value of that letter. And it is a tradition that this letter *vav* is the pillar of the universe. In fact 6 is circumference to a diameter of 190985833, the exact ¼th base side of the pyramid.

If the radius of the DRS—DRS circle (§ 63) is taken, we have as this radius, numerically, ½ of the Nilometer cubit value in inches, or 103132+. These are the values of the *letters* of the word Israel (or Isr-el), when the word is separated and arranged as El-Isr or *El is straight*. For the numbers of the letters of this word, read 13132. The *cipher* is always to be numerically supplied in Hebrew, or 103132, because their method of using it was such that they had no *letter* character significant of a *cipher* or *nought*. It is true the *a* in El, which is 1, is to be exchanged for the *jod* in jsr, which is 10, but this is rulable; and, indeed, as the 10 in Hebrew is considered as 1, and 1 as 10, so *a* is *jod*, and *jod* is *a* for this purpose. So, also, it must be understood that rearrangement of letters for number values is not only rulable, but also a word, as Israel, may have many various essential and significant *meanings* by re-arrangement: just as, for example, the word B'rashith is used variously for significations.

SECTION IV.

A CRITICISM ON THE, SO-CALLED, LEGENDRE AND PLAYFAIR METHOD OF RECTIFICATION OF THE CURVE OF THE CIRCLE, BY MEANS OF INSCRIBED AND CIRCUMSCRIBED POLYGONS, SHOWING ERROR IN THE MEANS EMPLOYED.

§ 63. Where an erroneous deduction has for long been postulated and accepted as a truism, the error of such a deduction must be shown as a first step toward the ascertainment of what the specific truth really is.

There are very many men so made up by nature that where, by long habitude, they have unconsciously entertained and cherished a postulate which perchance is radically wrong, they prefer to adhere, as by custom, to the error, and resolutely close their eyes to the truth, even though it be presented to them. It is for this reason, chiefly, that radical reforms, no matter in what department of culture, are so obnoxious to a conservatism which, to a great degree, is perhaps as necessary to the well-being of culture as truth itself.

But sometimes, where mighty consequences toward the betterment of humanity offer themselves as the reward of the establishment of a primal truth, in the face even of the profoundest convictions, entertained and cherished for never so long, supported even by the highest authorities and the most illustrious names, the hand should not be stayed by any considerations of conservatism from pointing out radical error.

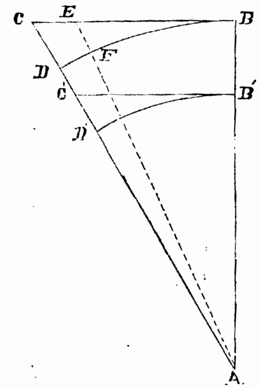
The author is well aware of the obloquy attaching to any criticism of the kind he is now entering upon; and he believes he understands, too, that really this kind of obloquy is shot out from a very base interest at bottom, which desires that the error may prevail rather than that the truth may be ascertained. He appeals, therefore, to the fair-minded, to give this criticism a careful reading; he being perfectly willing, if in the wrong, to bear the jeers usually attendant upon any effort of this kind.

§ 64. Before proceeding to the demonstration of error in the Legendre or Playfair method of rectification of the curve, he will give two instances of erroneous deductions connected with the subject-matter of approximate values.

(*a*.) Sir Isaac Newton, in laying the foundation of his Principia, in "Lemma I.," postulates:

"*Quantities and the ratio of quantities which, in any finite time, converge continually to equality, and, before that time, approach nearer, the one to the other, than by any given difference, ultimately become equal.*"

This postulate is manifestly untrue, for: let $A\ B\ C$ be any triangle, and with the length $A\ B$ as a radius, let the arc $B\ D$ be drawn to intercept the line $A\ C$. Suppose this figure, both for triangle and segment of circle, be continually and proportionally reduced, as $A\ B'\ C'$, $A\ B'\ D'$; the *relative* differences *will* never be changed, however far the reduction be made, and consequently the ratio of difference will always remain the same. The proposition is axiomatic, and does not require demonstration.



But take the triangle $A\ B\ C$ with the circular area $A\ B\ D$, as decreasing toward $A\ B$, by different and successive steps, one of which is, say, $A\ B\ E$, with the circular area $A\ B\ F$. By this method, no geometrical ratio can be preserved. The ratio of diminution has to be calculated by numerical computations. But *there being* a ratio of diminution, in which the difference between the straight line and the curve is, say, a decreasing one, it is, nevertheless, plainly to be seen that the only equality of the curved line $B\ D$ with the straight line $B\ C$, in

criticism of this it is said the author has misconceived
purpose and statement of Newton: but he answers by
plying such objection to the diagram of Newton himself
lustrating his Lemma.

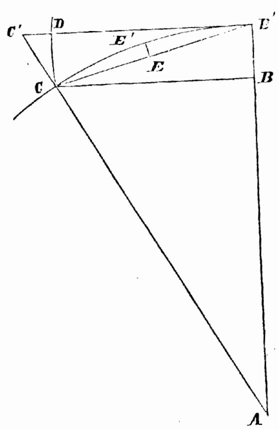
any possible diminution, will be when the line $A\ C$ shall so close upon $A\ B$ as to wholly coincide with it (as to the value of their lengths now or at last becoming alike), and become, with $A\ B$, one and the same line, at which stage or condition there can be neither curved line nor straight line left for comparison: *therefore*, so long as these lines—i. e., $C\ B$ straight, and $B\ D$ curve—exist at all, either in whole or in part, there can, by possibility, be no equality between them.

Hence, the "*Lemma*" is false in its terminology; nor is it even right in a showing of a growing or proximate *equality of likeness* as regards the *ultimate structure* of these different kinds of lines, as will be now shown.

(*b.*) This method of Legendre and Playfair was criticised by Torelli, as thus stated by Playfair in the appendix to his Euclid:

"It is impossible, from the relation which the rectilineal figures inscribed in, and circumscribed about a given curve, have to one another, to conclude anything concerning the *properties of the curvilineal space itself*, except in certain circumstances, which he has not mentioned."

As regards this statement, Playfair assumed the affirmative as against Torelli; and yet, as to the structural conditions, or properties of the lines, Torelli's statement *can be demonstrated*, Playfair to the contrary notwithstanding. This is to be seen from the following:



The burden of the effort of Legendre and Playfair is to show that, by the growing diminution and equality between the circumscribed $C'\ B'$ and the inscribed $C\ B$, the curved line penned up between them becomes measurable; which curved line, at any stage of bisection, being an even and known part of the curve of the entire circle, from it the length of the entire circumference, and consequently the area of the curved space, is to be had. The measure of this growing equality is always to be tested by the difference, at any stage of bisection, between $C\ B$ and $C'\ B'$. In the diagram, which may stand for any stage of bisection, $C\ B'$ is the chord of half the arc, and therefore $E\ E'$ is $B\ B'$ for every succeeding bisection. Now, from B' as a center, with $C\ B'$ as a radius, describe the arc $C\ D$. Then $C'\ D$ will be the quantity which, vanishing by diminution, the triangle $C\ B'\ C'$ will eventually, by the Lemma of Sir Isaac Newton, become $C\ B'\ D$, and isosceles; when the curve lying between $C\ B'$ and $D\ B'$ *must*, by hypothesis, become equal to $C\ B'$, or to $D\ B'$, as a straight line. Such being the conditions, it might be looked for as a certainty that with the diminution of $C'\ D$, an accompanying diminution would take place in $E\ E'$, as by a direct ratio, so as to exhibit the fact of growing coalescence of the curved with the straight line. But to the *contrary of this*, as a fact, taking the value $C'\ D$ (the difference between $C\ B$ and $C'\ B'$) and $E\ E'$ for a number of bisections, and it will show that, with relation to the diminution of $C'\ D$, $E\ E'$ is *increasing*. It becomes a question, on the showing, whether the arc is not, *relatively*, separating from, instead of approaching the chord. If so, the question is: What is the effect of this? What does it mean? And this question is left to the reader for answer.

Practically, a calculation of the value of π to 6144 sides of the polygons taken from the base that the perimeter of the polygon of 6 sides is *one* with 25 ciphers, making the radius one with 6 repeated 24 times, yields the following data as to the relation, or ratio, between $C'\ D$ and $E\ E'$, as they respectively diminish with continuing bisections of the arc:

6 sides,	$C'\ D$	: $E\ E'$	::	1 :	0.5706
12	"	"		1 :	1.2404
24	"	"		1 :	2.5301
48	"	"		1 :	5.0847
96	"	"		1 :	10.1818
192	"	"		1 :	20.3697

384 sides, $C' D : E E'$	::	1 : 40.7426
768 " " "		1 : 81.4882
1536 " " "		1 : 162.9917

which shows a rapid ratio of diminution of $C' D$ with relation to that of $E E'$; and the practical diminution of $C' D$ may be judged of from a statement of its value at 6 sides and 6144 sides, as follows:

6 sides, $C' B' =$	962250448649
" " $C B' =$	862730150341
$C' D$, or difference,	99520298308
6144 sides, $C' B'$,	000852211623
" " $C B'$,	000852211539
$C' D$, or difference,	84

which simply shows that the triangle $C B' C'$ is approaching to being isosceles unattended by a relatively rapid approximation, *in structure*, of the chord $C B'$ to the curve $C B'$. But the relation of this approximation can be had by a statement of the continuing ratios between $B B'$ and $E E'$, and these are as follows:

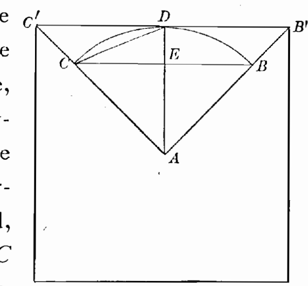
$E E'$ for	6 sides : $B B'$ ::	1 : 3.9318516
	12 " "	1 : 3.9828897
	24 " "	1 : 3.9989291
	48 " "	1 : 3.9997322
	96 " "	1 : 3.9999330
	192 " "	1 : 3.9999832
	384 " "	1 : 3.9999958
	768 " "	1 : 3.9999989
	1536 " "	1 : 3.9999997

which simply shows that while the ratio of $E E'$ to $B B'$ can never become 1 : 4, the ratio of $C' D$ to $E E'$ can become 1 : ∞ large; or, that the triangle $C B' C'$ may become isosceles, while yet, absurdly enough, the chord and arc have not as yet assimilated: not only so, but have separated by a relatively infinite quantity.

These instances serve to qualify the estimation now had of the exactitude of the foundation conditions in this specialty, lying, as they do, at the base of the higher regions of mathematical science as at present accepted; a science so much vaunted as being accurate and beyond error. If it be affirmed as to § 64 (*a.*) that, geometrically, the manifest error is to be cured by application of the *doctrine of limits*, this shows of itself the error of the geometrical postulate. It is precisely on this same ground that the Playfair geometrical method, numerically calculated, showing, because its π value *can not be integrated*, a like *essential* defect, this defect is only to be cured by finding a numerical limit, by which its π value can be integrated. (See forward, § 66 (*b.*)) They serve as an introduction to the following:

§ 65. *The Legendre or Playfair method of obtaining the value of π, or rectification of the curve of the circle, is geometrically defective; and is insufficient to obtain, as claimed, the exact numerical value of the curve to within less than any assignable quantity.*

(*a.*) *The Essential Element of the Playfair Method.*



Let $C D B$ be the $\frac{1}{4}$ of the curve of a circle, embraced in the square polygon, of which $C' B'$ is the side, and itself embracing the square polygon, of which $C B$ is the side: the sides of these polygons being parallel to each other, and embraced, respectively, between the radii $A C$ and $A B$, and the same radii extended to $A C'$ and $A B'$: the termini of the side $C B$ of the inscribed square being the termini C and B of the embraced curve $C D B$, or the $\frac{1}{4}$ part of the circumference of the circle, and also the termini C and B of the radii $A C$ and $A B$. The side $C' B'$ of the circumscribed square touches and terminates the radius $A D$ and the middle of the curve $C D B$, in the *point D*. The reductions of the sides of the polygons take place by drawing the chord $C D$ of the curve, or arc, $C D$; a perpendicular is let fall from A, the center of the circle, on $C D$, and continued till it touches the curve, necessarily bisecting the curve $C D$, which is the $\frac{1}{8}$ part of the entire circumference. $C D$, straight line, is the side of the second inscribed polygon. The radii $A C$ and $A D$ are extended to terminate a tangent line to the curve $C D$, drawn parallel to $C D$, and this tangent line becomes the side of the second circumscribed polygon.

This process is continued an indefinite number of times agreeably to the attainment of the desired exactitude of the value of the curve. The value of the curve, as regards the entire circumference, is always known, for it runs down with succeeding bisections from $\frac{1}{4}$ to $\frac{1}{8}$, then $\frac{1}{16}$, then $\frac{1}{32}$, and so on.

Now, this very fact (as claimed), viz., that even and known portions, as $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, and so on, of the curve of the entire circumference, *are respectively limited, wholly limited, and not less than limited*, between the sides of the polygons, as bisections take place, is that on which the method of Playfair and Legendre is founded. Thus it is absolutely necessary that the termini C and B of the chord $C B$ shall wholly limit, no more than limit, *and exactly terminate*, the length of the curve $C D B$, as (in this case) $\frac{1}{4}$ part of the circumference of the circle. The same may be said of the termini C and D of the chord $C D$, of half the arc $C D B$, terminating the curve $C D$, as (in this case) $\frac{1}{8}$ of the circumference of the circle; and so on for every succeeding step of bisection. And this fact is an essential element in this method.

It is seen that the geometrical function or use of the sides of the polygons in this problem is in the mere mechanical fact of *exactly limiting the termini of the curve, and nothing more, nothing less*. Apart from this, there is no structural relation whatever between the right lines and the curved line.

It so happens that the value of $A C$ and $C E$ being known, we have $\sqrt{A C^2 - C E^2} = A E$; and $A D$ being known, $A D - A E = D E$; thus we have the value of the sides $D E$ and $C E$ of the new triangle $C D E$, of which the side $C D$ is the chord of half the arc $C D B$; and so on. Reduction being thus made in the sides of the polygons, which, as claimed, always embrace a *known* portion of the curve of the entire circle, when, at some remote reduction, the sides of the polygons have become exceedingly small in value, it is *assumed* that the curved line, *penned up* between them (a known portion of the curve of the entire circle) is of the same value with that of the reduced sides of the polygons, and on this assumption, which is, as said, dependent on the fact of the exact limitation of the termini of the curve by the termini of the sides of the polygons, the value of the circumference of the circle is claimed to be obtainable to *within less than any assignable limit*: because any limit being assigned, the bisections can be continued until the exactitude of relation shall extend to and beyond the assigned limit.

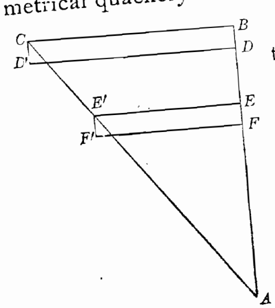
(*b*.) *The Definition of a Line.*

Modern geometry has to do, and only to do, with shapes or magnitudes, the analysis of shapes, and the relations of shapes, similar or dissimilar to each other, in its specialty. If number equivalents are used in modern geometrical analysis, they are simply expressions of, and translations of, geometrical conditions into another and an *equivalent* form of expression. The definition arising in modern geometry of a line, that it has length without breadth or thickness (as numerically a 1, or *one*, of length alone), could *only* have been adopted for the translation of geometrical conditions into other forms of expression, as being, in the *first place, permitted by geometrical relations*. It was found that admitting breadth of a line as, say 1, or *one*, in all geometrical calculations involving the use of right lines, the value or breadth might be reduced indefinitely, and finally eliminated, because the geometrical discussions of plane figures admitted of this. It was assumption to unqualifiedly make use of the same definition as regards the discussion of the relation between right and curved lines, in calculations of the sides of the polygons, as by Legendre and Playfair, without first showing that the geometrical conditions of the method, as it progressed in the bisections of the chords of the arcs by means of the calculations of the sides of the polygons, permitted the use of this definition as applying to the measure of the curved line considered to be penned up, or limited between the sides of the inscribed and circumscribed polygons, as continued and successive bisections took place. The proper and very first step in the problem, as it is one peculiar to itself, and occupying a place *sui generis*, should have been, if possible, the establishment of this fact. As a fact, it seems that this step is impossible.

(*c.*) *Proof of the correctness of the definition of a line, that it may have length without breadth or thickness, when applied to the admeasurement of plane shapes, or magnitudes.*

The propriety of, or the properness of, the definition of a right line, that it has no breadth, or thickness, *limiting this definition to the discussion of plane shapes*, can be exhibited and proved geometrically, which is the only proper mode of its establishment.

Empirical assumption of such a definition would be but geometrical quackery.



In the right-angled triangle $A\ B\ C$, the two right lines $B\ C\ D\ D'$ and $E\ E'\ F\ F'$ are to be made use of as half sides of polygons attempted to be embraced between, and to be used to measure the space or magnitude between the bounds $A\ C$, $A\ B$, and $C\ B$, and $E\ E'$, by, if possible, a reduction of the lines in width, they being of equal breadth—that is, $B\ D = E\ F$. These lines being of the same breadth, *i. e.*, $B\ D = E\ F$, we have the proportion

$$A\ E : E\ E' \times E\ F :: A\ B : B\ C \times B\ D;$$

where $E\ E' \times E\ F$ and $B\ C \times B\ D$ equal, respectively, the quadrangles, or lines, $E\ E'\ F\ F'$, and $B\ C\ D\ D'$. But since $E\ F = B\ D$, dividing the second and fourth terms of this proportion by $E\ F (= B\ D)$, we have

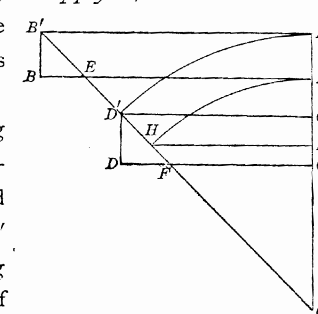
$$A\ E : E\ E' :: A\ B : B\ C;$$

where $E\ E'$ and $B\ C$ are the extreme edges of these lines, exhibiting length without any other quality.

(*d.*) *But this definition is not good, and will not hold good, when attempted to be applied in the Playfair method* (*a special one, and sui generis*) *to the admeasurement of the curved line of the circle.*

If this definition is to be applied to right lines as measuring the values of a curved line, in the particular problem of the rectification of the curve by calculations of the sides of the inscribed and circumscribed polygons, as by Playfair and Legendre, then the propriety or properness of this definition, *as thus applied*, should be susceptible of being shown also.

Referring now to the fact shown in (*a.*) that the essential feature of the Playfair problem, or method, is that the extremities, or termini, of the curved line claimed to be penned up between the sides of the polygons are wholly defined, wholly limited, exactly terminated, no more, no less, by the ends or termini of the sides of the polygons, let us attempt to establish Playfair's and Legendre's definition of a line, that it has length without breadth, *as it has application, and as they do apply it*, to the admeasurement of the curved line of the circle, embraced between the sides of the polygons.



Testing this matter, and leaving out of view that right lines having breadth must be right-angled parallelograms, as $A\ B\ B'\ A'$ and $C\ D\ D'\ C'$, and dropping consideration of the surpluses of these lines, viz., $E\ B\ B'$, and $F\ D\ D'$, laying outside of the area $O\ B'\ A'$. Let the sides of the inscribed and circumscribed polygons be $C\ F\ D'\ C'$ and $A\ E\ B'\ A'$, limiting between them and the radius $O\ A'$, and the radius $O\ D'$ extended to B' the curved line $A\ A'\ D'\ H$, which has the same *breadth* $A\ A'$ (measured on the radius cutting this line, viz., $O\ A'$) with the right lines; that is, $C\ C' = A\ A' = A\ A'$ for the breadth of the lines straight and curved.

It is seen that the right line $C\ F\ D'\ C'$ *more than limits* the terminus, or end, of the curved line $D'\ H$, by the excess of the value of the area $C\ F\ H\ H'$, and of its width $C\ H'$. Therefore, as the *gist* of the problem by Playfair is the exactly defining, the wholly limiting, the exactly terminating, no more, no less, of the ends of the curved line, by the ends of the right lines *in position* (without which that problem is a geometrical failure for exactitude), *deduct* this surplus area $C\ F\ H\ H'$ (a part of the right line $C\ F\ D'\ C'$) from the right line $C\ F\ D'\ C'$, so as to leave the geometrical condition of the problem as exhibiting that which Legendre and Playfair postulate as a fact, viz., that the right lines always (in connection with the radius $O\ A'$ and the radius $O\ D'$ extended to $O\ B'$) wholly define, wholly limit, exactly terminate, no more, no less, the termini of the curved line.

This being done, which is an essential necessity to be in accord with Legendre and Playfair, the right lines $A\ E\ B'\ A'$ and $C'\ D'\ H\ H'$, remnant of $C\ F\ D'\ C'$ are no longer in a *condition, geometrically, such* as will admit, *in pari passu*, of their reductions in breadth to the value of *zero*.

In (*c.*) we had

$$A\ E : E\ E' \times E\ F :: A\ B : B\ C \times B\ D,$$

and $E\ F$ being equal to $B\ D$, dividing by $E\ F$, we have

$$A\ E : E\ E' :: A\ B : B\ C,$$

establishing the Playfair definition as applicable to the admeasurement of plane areas.

But here $O\ C' : C'\ D' \times H'\ C'$ *is not as* $O\ A' : A'\ B' \times A\ A'$. But let this proportion stand as true, viz:

$$O\ C' : C'\ D' \times C'\ H' :: O\ A' : A'\ B' \times A\ A';$$

or rather as taken to be true by Playfair and Legendre, for they *have assumed it as true*, though $A\ A'$ is greater than $C'\ H'$ by the value $C\ H'$. Divide this proportion by the value $A\ A'$ to obtain the value $A'\ B'$ as a line without any other quality than breadth. Diminishing the values thus, as Playfair does, the width $C'\ H'$ becomes *negative* as to value, necessarily, or less than *zero*, in its effect; that is, the lines being taken at *zero* as to breadth, and taken in their calculations of the sides of the polygons, *as applying to the measure of the curved line* $A\ A'\ D'\ H$ (reduced in its breadth $A\ A'$, *in pari passu*), must necessarily, as a practical fact, *detract from the value of the curve.*

Such being the inevitable fact, resulting from assuming the definition of a line, to be equally applicable in this particular and especial case, with its use as applied in the admeasurement of plane areas, or magnitudes, Playfair's method is *defective* in the geometrical means employed: therefore his method is but proximately right, and his claim that, by his method, he can ascertain the exact value of the curve to within less than any assignable quantity *is false.*

As a resulting truism, the value of the curve of the circle, as worked out by the method of Playfair, *is less than it should be.*

Q. E. D.

Exeter, *December*, 1875.

It is affirmed by some, but very superficially, that the foregoing, though indisputable *as presented*, does not affect the present reach of what may be called *transcendental* geometry, where, for instance, the vulgarly used definition of a line, *that it has length, without breadth or thickness*, is dropped for the higher mathematical conception that there is *no such thing as a line*, but that that gross and erroneous idea is simply to be superseded by the *contemplation of distance*. But this is flimsy, because, as in this case, when you come to practically apply such a vague idea of distance, you find that it can not be applied in the diagram in (*d.*) without suffering the same modifications there presented, necessarily. Geometry being, in fact, *ex vi termini*, the real relations which shapes, or parts of shapes, bear to each other, can not be so idealized away as to wipe out or destroy the positive incongruities displayed in (*d*.)

NOTE TO PART II.

TESTS FOR CORRECTION OF THE RESULT BY THE PLAYFAIR METHOD, BESIDES THOSE IN § 7 (*a*.)

§ 66. (*a*.) By a peculiar method of test, John A. Parker shows in his "Quadrature," Proposition III, Appendix, that error occurs in the sixth decimal place in the Playfair result.

(*b*.) Another test is as follows, presuming that though there is inevitable error in the Playfair method, that error is so small that it is to be found in a far-off decimal: Take a disc assumed to be *perfectly* circular, the greatest distance across it in a right line *must be* integral with relation to its bound of circumference, because the lines are *closed* with relation to each other. (And this of itself is positive conclusive evidence that the so-called Legendre method is essentially defective. The accepted value of π to fulfil these axiomatic conditions *must be* susceptible of integration. But it is not, as is admitted, so susceptible; therefore it is essentially defective.) Since this is so, there is, and must be in nature an integral number form, which will exhibit or notate this perfect and determined and integral relation. Assuming that that form which will most nearly restore the Playfair result is one that will correct it, then the form

$$113 : 355$$

is that one which, divided by its least member, gives

$$1 : 3.1415929+;$$

differing from the Playfair result in the seventh decimal place. That this result was anciently taken as corrective of this same

approximate value, its presence in the Bible (as the first face one, underneath which the Parker form of

$$6561 : 20612$$

lies as the perfect one) sufficiently shows.

Besides the efforts of all the years of ancient research, modern efforts have failed for any other form which will give so close an approximate to the Playfair result as this of 113 : 355. The efforts and experience of ages, therefore, as to trial for this, empirical though they be, should be of value in this investigation, and weight of authority should be given to this form.

But John A. Parker rediscovered the form

$$6561 : 5153 \times 4 = 20612,$$

of which 113 : 355 is but a modification, or, from which it is but a derivation: *because*

$$6561 : 20612 :: 113 : 355\tfrac{1}{6561}$$

$$20612 : 6561 :: 355 : 113\tfrac{20611}{20612}$$

while testing 6561 : 20612 by 113 : 355, integral results of this peculiar harmony will not appear in both proportions.

On the ground that shapes are obediences to number forms, as mental creative conceptions, we have a perfect test in this particular case as to which of these forms is the governing one in the proposition that the true relation of *circumference* to *diameter* is 4 times the area of the circle inscribed in the square for the value of circumference to the area of the containing square for the value of *diameter*, as has been shown. The form 6561 for area of square to 5153 for area of inscribed circle gives, under this rule, integration of *diameter* to *circumference* as 6561 : 5153 $\times$ 4 = 20612, while no such result attends a like attempted use of 113 : 355. (Parker's criticism.)

These considerations (with the marvelous results as to the use of the form 6561 : 20612 as determining geometrical shapes and astronomical data of space and time as shown), seem to have great weight in determining what may be the true value of π, and what may be correction of the manifest error in the Playfair method. Attention is now especially directed to the "Quadrature of the Circle," by John A. Parker (John Wiley & Son, New York), for further light on this subject.

The following formulations are given, as arising from use of the number $3^2 = 9$, and as by their use exhibiting these three noted values of π.

$$\frac{20612}{54} = \text{standard } \tfrac{1}{2} \text{ base side of great pyramid} = 381.7037037037037$$

(1.) $$\frac{381.7037037037037}{121.5} = 3141594269166+$$

the Parker value of π.

(2.) From 381.7037037037037

deduct $\dfrac{81 \times 30}{81^2 \times 113} = 1638806948$

Remainder, 381.7035398230088

$$\frac{381.7035398+}{121.5} = \frac{355}{113} = 3.1415929+$$

or, the Metius value of π.

(3.) From 381.7037037037

deduct 2000000

Remainder, 381.7035037037

Add 37074

Sum, 381.7035074111

$$\frac{381.7035074111}{121.5} = 3.14159265358 97,$$

or the accepted value of π to the thirteenth decimal place.

APPENDIX I.

Astronomical use of the form 6561 : 20612.

Case I.

§ 67. The usual measure of the earth's time about the sun has been taken in the terms of a *natural measure* of time, viz., the rising and setting of the sun. By long continued observation, the numerical notation of this period of time, viz., the solar year, has been found to be, in the terms of this natural measure,

365.256374+ days.

Now, suppose that, while this is so, some mental creative power had thought of, and willed that the proportional parts of the earth's orbit, as regards all other cosmical measures, should correlate with that number value to which the abstract relation of diameter to circumference of a circle is found to render obedience in shape. This value, as thus found empirically, can be relegated for its origin to *circumference* values of a circle, taken from the form 6561 : 5153, as follows:

$$\begin{array}{r} 360000000 \\ 5153000 \\ 103060 \\ 31415 \\ \hline 365.256374+ \end{array}$$

where 360 is the normal measuring circle derived from the square of 81 and the form 6561 : 5153 (see § 10), 5153 is $\frac{1}{4}$ *circumference* of 20612, 10306 is $\frac{1}{2}$ circumference of 20612, and 31415 is *circumference* to a *diameter* of unity. This value of the year can not be reconstructed, integrally, from a common, or unit, numerical source, or from the numerical value of any shape, diameter, more refined measures, especially those founded on the vast results of triangulation, have enlarged this value to 7926.708 miles. Here the difference between this and

save as interpreted by the above form of 6561 : 5153 only and alone. (See also § 58.)

Case II.—Diameters of the Earth in Miles from the form 6561 : 20612.

§ 68. (*a.*) Take *circumference* derived from this form of 31415942.6916162: Multiply by 2, and we have

62831885.383324

as a circumference value. Suppose we change the nature of this value to *that of the area of a square.* Then the side of that square will equal

$\sqrt{62831885.+}$, or $7926.\underline{565+}$ #

which, in *miles, is the equatorial diameter of the earth.*

Here is a change of numerical notation, comporting with a change of geometrical shapes, producing this result. Consider how we have found in the pyramid works linear measures co-ordinating with time measures. Here we find the same thing with the addition of the bringing in on to the same ground the co-ordination of geometrical shapes.

(*b.*) Reduce this miles value to *feet*, or

7926.565 × 5280 =	41852743.680
Deduct	144135.
Remainder,	41708608.680

which, brought back to miles, gives

$7899.\underline{357+}$ miles;

and this is the *polar diameter of the earth in miles.*

NOTE.—This value 144135 is the *reverse reading* of the cube of 81, where $81^3 = 531441$. It is a biblical use. 144 is Adam, and 135 is A S H, or *woman*, and it is stated that God brought the woman to the man and joined them, or 144135, which, reversed, is the cube of 81. Why, for instance, the astronomical formula that the *squares* of the times are as the *cubes* of the mean distances *is so*, is to us a mystery. It simply is so because it is so: it is part of the *fiat*. So this, to us, so novel use of *reverse* values, if found to be useful, or used, in cosmical developments, must be accepted as a use in natural building. Here it seems to point to some method of notating elliptical properties.

one we result in § 68 is so small that as a matter of fact it will always be a question which is the exact value. In other words all measures of actual measure the exact value will never be obtained to within 500 feet ±.

Case III.—The Moon's Time from Parker's Quadrature.

§ 69. Mr. Parker takes the following cosmic values:

The solar day of 24 hours has	5184000‴
The sidereal day has	5169846‴
The circular day has	5153000‴

where this, as an abstract measure, is taken as the ¼ of a *circumference* of 20612, or as the area of the circle in the square of 6561.

Take the form

$$\left.\begin{matrix}20.612\\6.561\end{matrix}\right\} \times \frac{4}{3} = \begin{matrix}27.482666+\\8.748\end{matrix}$$

This value of 27.482666, as *circular* time, reduced to solar time, gives

$$27.482666+ \times \frac{5153}{5184} = 27.3183220164+$$

or reduced to time scale, *as days*, gives

27d. 7h. 38′ 23″ 1‴ 20⁗

To this add the difference between one sidereal and one circular day, or

16846‴ = 4′ 40″ 46‴

and there results

27d. 7h. 43′ 3″ 47‴ 20⁗

which is the exact value of the moon's period.

NOTE.—By Mr. Parker, the time of a sidereal lunation from the best authorities when he wrote was 27d. 7h. 43′ 4″ against his as above, showing the difference of $\frac{1}{5}$ of a second. The solar lunation was given at 27d. 7h. 44′ 3″, against his of 27d. 7h. 44′ 2″.$\underline{84}$.

At the present day, this value of the solar lunation is retained as 27d. 7h. 44′ 2″.$\underline{87}$, agreeing with Parker to within $\frac{3}{100}$ of a second, while, however, a great difference has been made as to the value of a sidereal lunation, as 27d. 7h. 43′ 11″.614; for this reason, as given by Godfray: "This is the value at present, for comparison with ancient observations led Halley to the conclusion that the moon's mean velocity is being accelerated, and the period of a revolution shortened." It tells badly for astronomical accuracy to make a change of 9″ in such a period on the strength of ancient records, where great uncertainty exists as to the correct chronological periods of those old observations. (See John Von Gumpach on Mr. Airy, the Astronomer Royal.)

Case IV.—Mean Solar Year by Mr. Parker.

§ 70. He takes the form

$$\left.\begin{array}{r}206.12\\65.61\end{array}\right\}\times\frac{16}{9}=\frac{366.43555+}{116.64}$$

where he makes 366.4355+ the base for the calculation of the mean solar year. By simple and orderly means from use of this form, he gives this value at

$$365\text{d. } 5\text{h. } 48' \ 50'' \ 53''' \ 6''''$$

His steps are:

1st. *Circumference* value as stated, 366.4355+

2d. Reduced to solar time by the factor $\frac{5153}{5184}$

3d. He adds one sidereal day.

4th. He adds $1\frac{1}{3}$ of the excess over the mean between one circular and one sidereal day, reduced to solar time.

NOTE.—There is a method of use of the form of 113 : 355 for obtaining the year value. To compare and force the form 113 : 355 by that of 6561 : 20612, we have (see Preface):

$$6561 : 20612 :: 113 : 355.000152415+,$$

Then

$$355.000152415 : 360.000152415 \quad : \quad 365.000152415,$$

And

$$\frac{20612}{54} : \frac{20626.\frac{47001}{}}{54} :: 365.000152415+ : 365.256389+$$

which is correct, as compared with the received value, to less than the $\frac{16}{1000000}$ of a day in the year's period.

Case V.—The Angle of Solar Parallax, and the Sun's mean distance.

§ 71. The results to be derived from the late transit of Venus are not expected to be ranked as original or basic data, but rather

as data to be compared with, and made to conform to other data derived from independent sources. A very high authority has written to this effect, and gives the independent results as follows:

(1.) By the effect of the sun's attraction on the motion of the moon.

Parallax by this method, 8.″ 83

(2.) By measures of the planet Mars when nearest the earth, under very favorable circumstances.

Parallax by this method, 8.″ 85

(3.) By measuring the velocity of light.

Parallax by this method, 8.″ 86

(4.) By an independent method by Leverrier.

Parallax by this method, 8.″ 83

He then says: "From the general accordance of these various results, it would appear that the solar parallax must lie between pretty narrow limits, probably between 8.″ 82 and 8.″ 86." Elsewhere, he gives the result as 8.″ 84+.

(*a.*) The astronomical formula for obtaining the sun's distance (see Godfray's Astronomy) is

$$\text{Distance of sun} = \frac{\text{Radius of Earth}}{\textit{Sin. Horizon.}\text{ parallax}}$$

and

$$\text{Distance} = \frac{\text{Radius of Earth}}{\dfrac{\text{Value of } \textit{Sin. Horizon.} \text{ parallax}}{206264.7001}}$$

(Here 206264.7001 is assumed as the correction of 206264.8+ by Godfray.)

(*b.*) Now, Mr. Parker has also a form for finding the sun's distance (see his "Quadrature"), which is

$$\text{Distance of sun} = \text{diameter of earth} \times 11664,$$

where 11664 is derived from his original form as

$$\left.\begin{array}{r}20612\\6561\end{array}\right\}\times\frac{16}{9}=\frac{36643.555}{11664.}$$

He takes diameter of earth as *mean* diameter, for which he gives no sufficient reason. On the contrary, the author takes this as the equatorial diameter of the earth.

(*c*.) Making the equations in (*a*.) and (*b*.) equal—

$$\textit{Diameter} \text{ of earth} \times 11664 = \cfrac{\text{Radius of Earth}}{\cfrac{\text{Value } \textit{Sin. Horiz.} \text{ parallax}}{206264.7001+}}$$

which, reduced, gives:

Value *sin*. horizontal parallax =	8.″84193
Or length of arc,	8.84193 ;

which agrees as closely as seen with the values as found above, expected to be confirmed by the transit observations. It must be noted, however, that the transit was observed the earth being in perihelion, and therefore this result of 8.″84193 being taken as the *mean*, the results of the transit should give a larger angle, say 8.″91, or thereabouts.

(*d*.) Taking the earth's equatorial diameter, as found, at 7926.656 miles, distance of sun will prove to be

7926.656 × 11664 = 92.456515 miles.

(Note here the use of this value 20626.47001 in this parallax formula and in the pyramid construction.)

Case VI.—General Law of Interplanetary Distances.

§ 72. There is but one further case to be noticed in this astronomical connection, which is the general law of Kepler. It is that

The *squares* of the *times* are as the *cubes* of the *mean distances*.

This terminology fits exactly as part and parcel of, and as a sequence to the method herein stated.

So we have in the foregoing sections and this Appendix:

(1.) A Source of Measures; Egyptian, Roman, British, and, without doubt, Hebrew.

(2.) The great pyramid constructed from this source; essentially justifying the use in the perfect closing of the lines by means of its rigid application.

Error See §68 should be
∴ 7926.5651 × 11664 = 92.455,454, miles
Here again this brings out the value of parallax and
distance in miles to within so close a limit that practically
... naturally.

(3.) The most important features in geometry exhibiting themselves as obediences to this source, as to a creative mandate.

(4.) And, finally, the governing features of astronomy, as to measures of space and time, relegating themselves to this same source as to a creative origin.

Evidently we have been dealing with a *natural*, or, better, a Divine system; albeit in the mist, for lack of an immediately right method of using the model form.

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