THE

INTERNATIONAL STANDARD

A MAGAZINE

DEVOTED TO THE DISCUSSION AND DISSEMINATION OF THE WISDOM CONTAINED IN THE

GREAT PYRAMID OF JEEZEH IN EGYPT

VOLUME I.

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The International Institute as a body is not responsible for the facts or the opinions put forth by any of the writers for this Magazine.

All in favor of advancing truths most absolute, as portrayed in the revelations of the Great Pyramid of Egypt, and of the success of the Society in preserving inviolate the Anglo-Saxon weights and measures, will kindly communicate with the President, by whom also subscriptions, donations and communications will be gratefully received.

THE INTERNATIONAL INSTITUTE

FOR PRESERVING AND PERFECTING THE ANGLO-SAXON WEIGHTS AND MEASURES

CLEVELAND: 30 EUCLID AVENUE

BOSTON: 345 TREMONT STREET

J. A. Garfield

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ILLUSTRATIONS.

THE INTERNATIONAL STANDARD.

MARCH, 1883.

INTRODUCTION.

Believing an organization for the preservation and perfection of our hereditary weights and measures to be an absolute necessity, we invoke the blessing of the God of our fathers upon our efforts, and especially upon this magazine, that they may be the means of awakening the minds and hearts of our people and race to the importance of the objects to which they are devoted. Our Anglo-Saxon weights and measures have been handed down to us from an age so remote that their origin seems lost to the memory and research of man; but the organization of the International Institute for their preservation and perfection dates back only to noon of the eighth day of November, 1879, when, at the old South church, Boston,—that spot of wonderful memories and more wonderful prediction—we asked the blessing of God upon our undertaking, and the guidance of His Holy Spirit, through the merits of his Son. For three years this blessing has followed us amidst such discouragements as attend all new and important undertakings,—the ridicule of some, the unfaithfulness and indifference of others, and the weakness and indecision of many. Fortified by the steadfastness and courage of a few who have never looked back nor

been moved by jeers and sarcasm, we stand to-day hoping, praying that the eyes of the people may be opened to see the importance and necessity of our undertaking, and that all may share in the blessings of the grand study placed before us, surpassing in interest as it does anything that the mind of man could have conceived of as belonging to the apparently dry subject of weights and measures.

Some will ask, "What is the use of an organization to preserve our weights and measures?" The question is pertinent because the ignorant, the careless, and indifferent, and, it is to be regretted, a vast multitude who are always ready to have some one else do their thinking for them, say there is no danger of any change, and Congress will and does look out for this matter, so that we have nothing to do with it. But while the Nation has been asleep on the question for these many years, another organization has sprung into existence, using all its power and money to overthrow our ancient system, and to substitute in its place a foreign one—*The French Metric System.* That organization is sustained by the influence of France, Germany, Italy, Spain, Turkey, Egypt, Austria, Norway, and Sweden,—all moving against the *Anglo-Saxon world.* The issue forced upon us to-day is either the adoption of the French unit of measure, born of infidelity and atheism in 1792, or the retention of our own unit of an age immemorial, which is woven into the fibre of our Nation's interests, enterprises, and conditions. Which shall it be?

Those nations which have adopted the new meter are those upon which it has been forced by the decrees of the tyrannical governments to which they are subject. That which has been accomplished elsewhere by arbitrary power may be wrought here by subtlety and intrigue. The many who are saying this matter will regulate itself and there is no danger, are like those who scoffed at the probability of a flood in Noah's day. The danger is upon us, and an ounce of prevention is worth a pound of cure. The duty of the hour is to inform ourselves as citizens upon this subject. How can any man or woman who values the Nation's birthright, in respect to our hereditary standards, witness the efforts being made to abolish our present

weights and measures in favor of a foreign system, without desiring to learn the truth in regard to the origin and merits of the two standards in comparison with each other? Can any one so careless be called a truly loyal and faithful citizen?

But for the organization and efforts of the International Institute, it is more than probable that a compulsory law would have been enacted already, forcing upon us a variety of awkward and unfamiliar units of weight, measure, and coinage, with foreign names, to the extinction of our present system and Anglo-Saxon nomenclature. As it is, one of our coins is already constructed on the metric system, both in weight and dimension, and a permissive law has been passed, legalizing the use of the French weights and measures in commercial transactions, at the option of the party thereto, while the use of the metric standard is made compulsory in the marine hospitals, custom houses, and to some extent in the coast survey.* The people have this Institute to thank that the friends of the metre have not yet succeeded in forcing more sweeping enactments upon us. But we do not, as yet, expect a wide appreciation of our efforts, since the very rock to which we look to prove the origin and illustrate the value of our weights and measures is, to so many, a stone of stumbling and a rock of offense—I mean the Great Pyramid of Jeezeh.

The wonderful investigations and discoveries of the last twenty years concerning the Great Pyramid show it to be an epitome of our weights and measures, and transcendently more. Constructed with a most marvelous wisdom, it is now revealed to the world as a record in stone of the fundamental principles of geometry and astronomy. It embodies in its massive proportions and exquisite interiors, in terms of our own units, the analogies of the stupendous measurements of the earth and of the planetary system, to rediscover which the wealth of nations and the earnest labors of scientific men have been devoted for the last century. It bears within itself the record of the date of its erection 4,053 years ago, and since then the treasures of wisdom committed to its charge have remained hidden there

*In the State of Ohio the French system has been legalized, and is the only one mentioned on the statute books.

ready to be revealed to us in these last days. We therefore feel called upon to study more thoroughly its teachings, and to demonstrate them to the people, that they may understand the bearing of our weights and measures upon their social and most sacred interests. This subject is not merely national—it is international and universal.

To those who say that the Pyramid has nothing to do with our weights and measures, and that therefore the Institute should have nothing to do with the Pyramid, we have to reply, that they utter words without knowledge. We know whereof we speak.

There are, therefore, two grand and paramount duties presented to us at this time: *First*, to secure the PRESERVATION of our system. Other nations have cast away their birthright without knowledge, but it remains for us to stop all legislation in that direction *at once*. Anything short of this is criminal negligence; and *Second*, to investigate the history of what we have to preserve, and its value in relation not only to our daily necessities, but to the world and the universe. We shall not, as an Institute, neglect either of these duties.

In the work that lies before us we propose to discuss the practical questions relating to Weights and Measures as given in the tables, the best adaptation of the several units to commerce and the arts, and the best modes of subdivision; we propose to discuss instruments of precision, to discuss the great question of a Prime Meridian, and Standard of universal Time. We shall also discuss the kindred subjects of Astronomy, Archæology, and the History of Man, and particularly the history and teachings of the Great Pyramid, to all of which we are naturally led by the general subject of Weights and Measures.

Whoever talks of the Institute having "degenerated into a Pyramid Society," and of its having "adopted that Pagan structure as a symbol," forgets that the reverse of the Great Seal of the United States is "a pyramid unfinished." If others object both to pyramid discussion and to the invoking of God's blessing on our work, we care nothing for the crude opinions on which such objections are founded. We shall always seek the Divine guidance in our labors, and we can do no less than

study that venerable and stupendous monument which was erected, as we believe, for "an Altar to the Lord in the midst of the land of Egypt, and a Pillar at the border thereof to the Lord."—Isa. XIX: 19.

We believe our work to be of God; we are actuated by no selfish nor mercenary motive. We deprecate personal antagonisms of every kind, but we proclaim a ceaseless antagonism to that great evil, the French Metric System.

We desire to draw into the Institute all earnest minds who would seek for truth with us. We solicit honest discussion—open, free, and respectful. For candid and thoughtful objectors we shall have sound arguments in reply; but the jests of the ignorant, and the ridicule of the prejudiced, fall harmless upon us and deserve no notice. We battle to preserve our ancient rights; it is the battle of the Standards. May our banner be ever upheld in the cause of Truth, Freedom, and Universal Brotherhood, founded upon a just weight and a just measure, which alone are acceptable to the Lord.

CHARLES LATIMER.

IN ANSWER TO THE QUESTION,

"What reasons are there in favor of retaining the present units of weights and measures?" I would say:

1.—They are now the standards of all the English-speaking people of the world.

2.—The *inch*—the foundation of all—has a special qualification in connection with mechanical engineering. Its subdivisions and multiples predominate in the parts of all our machinery. It is the basis on which are founded all English and American calculations of the strength of materials, sectional areas, steam-pressures, power, velocity, capacity, and weight; "so that," as has justly been observed, "the mechanical engineer may be said to think in inches, calculate in inches, and work in inches."

3.—For finer measurements, such as rifle-bores, wire, and

metal gauges, etc., the desired degree of accuracy is readily and conveniently expressed in tenths, hundredths, and thousandths of an inch—expressions understood by everybody. Moreover, by taking the inch as the unit of measure, any longer dimensions can be exactly expressed in a decimal system without fractional remainders.

4.—The preponderance of population now using the inch, over that using the metre, includes the great machinery producers, whose work already exists in such large quantities in all parts of the world in the form of engines, agricultural machinery, railway-plant and tools.

5.—The difficulties in the way of a change from the *Inch* to the *Metre* are so insuperable as to practically amount to a prohibition, to say nothing of the cost, which would probably exceed $50,000,000.

6.—The objections generally urged against our measures of weight and capacity are not against our units, but against the multiples and sub-divisions entailed by usage from time immemorials, such as the ton, stone, hundred weight, bushel, gallon, Apothecary, Troy, and Avoirdupois weight, etc., etc. Were the grain taken as the unit of weight, and the pound as now to consist of 7,000 grains and divided by tenths instead of sixteenth as now, all objections on that score would disappear, as would all others if Congress would make the ton 2,000 pounds for all commodities and abolish all measures of capacity, requiring all articles of merchandise to be sold by the pound.

7.—The inch, being one five-hundred-millionth of the earth's polar diameter, and in use by the people of God from the remotest antiquity, is of Divine origin, and therefore not to be displaced by man's invention.

In reply to the question, "What reasons are there for accepting the French metre?" I would say:

I know of none, though its advocates make a chief merit of its decimal character. The great mass of users of weights and measures care nothing about a decimal system; for in daily practice the division by halves, quarters, etc., is much more convenient and more easily understood. But in this respect the metre has no advantage over the British system, which is

substantially ours. Engineers and machinists who have the most to do with measures of dimensions, have already adopted the method of dividing the inch and foot decimally; so that the most minute or the most extended dimensions can be expressed in the ordinary arithmetical terms of tenths, hundredths and thousandths. Were our pounds divided decimally, as suggested above, all objections to our measures of length would at once disappear. And if measures of capacity, which are wholly unnecessary, and always giving untruthful results, were abolished—the pound of 7,000 grains being substituted instead—the United States would be placed in possession of the best system of weights and measures in the world.

GEORGE C. DAVIES.

PRESIDENT'S ADDRESS.

MEETING OF THE INTERNATIONAL INSTITUTE, HELD AT CLEVELAND, OHIO, NOVEMBER 8, 1882.

Members of the International Institute and Auxiliary Societies:

On this day three years ago was organized this Institute, having for its primary object the preservation of the hereditary weights and measures of our race, now threatened to be overthrown and extirpated by the advocates of the *French Metric System.*

The organization of this Institute was none too soon. It occurred at the very highest point of success with our adversaries, and when it seemed as if our land was to fall an easy prey to their insidious attempts.

It was at a time when the apostle of the new system, President Barnard of Columbia College, said in his address:

"Our analytical chemists use the metric system altogether; and with our physicists its use is becoming every day more general.

With the science of the world, therefore, the metric system has a powerful ally, which, added to the influence of the National interests enlisted in its favor, must make its final triumph inev-

itable. But a dissenter like Sir John Herschel, who holds that the system is good, but that the base ought to have been the ten millionth part of something else, rather than the quadrant of the meredian, is not much of a dissenter after all; and one who, like Professor Piazzi Smyth, bases his meteorological theories on *religious grounds, is not likely to gather around him a very powerful party of opposition.*"

Of our system he writes thus:

"*Such systems having originated before anything like intellectual culture existed, have been constructed without thought of scientific method, and have owed their earliest forms to accident or caprice.*"

The language above was used by Frederick A. P. Barnard, LL. D., President of Columbia College, New York City, in an address delivered before the convocation of the University of the State of New York in 1871. The University having steadily refused to recommend the introduction of the new system in the United States, President Barnard was invited to give his views. We are ready to take up the gage of battle upon the ground which to President Barnard seems so untenable, viz: that our units of weights and measures are not the result of accident or caprice, but have their origin in the very highest order of intellectual development, reaching even to inspiration.

We are the creatures of a Heavenly Father, and we should consider all things religious—what more so than the subject of weights and measures, and what more strictly enjoined in the Scriptures than just weights and measures? Could the prophets of the Lord have so earnestly and so persistently declared for a just balance, and a just measure, if the origin of these was the result of *accident* or *caprice?*"

Three years have passed since our organization. What have we accomplished? One thing we may say, we have checked the onset and forced the advocates of the French system to the defensive here. Before our organization they had it all their own way. Bill after bill favoring the metric system was pressed upon Congress with hope of passage. Strong pressure also was brought to bear upon the executive departments of the country, so that persons high in authority were persuaded and influenced to issue orders to subordinates in the name of the

Government to use only the metric system. To-day the Hospital Department of the Marine Service is staggering under the weight of a compulsory order of the chief surgeon to use only the French system. I am perfectly satisfied that he has done so without the proper authority of law, which only *permits* and does not *compel* the use of the French system. In relation to this matter I dispatched a letter to President Garfield, which was referred to the Secretary of the Treasury, but to which no reply has yet been received.

Bills have been presented and advocated before Congress asking the compulsory adoption of the French system in the custom houses of the country. I believe I state the exact fact when I say that the memorial of the International Institute, issued two years ago against this and other bills, prevented their adoption. The most insidious of all attempts, however, was made during the last session of Congress. House Bills Nos. 112, 113, 114, and 115 were before Congress, presented by Hon. Alexander H. Stephens, which, if they or any of them had been adopted, would have engrafted the French system upon our coinage, a result which probably could not have been eradicated without great difficulty, and would have been hailed by our antagonists as a great triumph. The report accompanying these bills says:

"The Committee on Weights and Measures, to whom were referred House Bills Nos. 113 and 115, have considered the same, and beg leave respectfully to report back the same with recommendation that they do pass."

Bill No. 113 provides for "a new metric gold coin for international as well as domestic use, to be known as the 'Stella.'"

Bill No. 115 provides for "the coinage of the goloid metric dollar, two dollars and fractions of a dollar, and also for the coinage of metric gold double eagle, eagle and half eagle, all of standard value."

These bills describe the weight of the coins, and of the proportional parts of gold, silver and copper which they contain in foreign terms, substituting the word "gram" for grain, and omitting all mention of our Anglo-Saxon weights.

The other bills are of the same character, but one feature in

all of them will particularly attract your attention. These bills, approved by the committee and recommended for passage, provided that William Wheeler Hubbell, or his legal representative should have one mill to the dollar in value of the alloy used for coinage, to be paid for the patent right for said alloy—that is for the discovery of the alloy necessary to make these coins international. Mr. Hubbell signs himself "counsellor, inventor, and patentee." Now, if the bills had passed as recommended by the committee, we should have been thrown into interminable confusion.

The point with us is not to object to an international coinage, but to the fact that the Anglo-Saxon weights were entirely left out, and not made the bases of comparison. It was and is nothing but a scheme to make the French system compulsory in our coinage.

We saw that more than an ordinary effort was necessary to resist this attack, and so nine thousand copies of a memorial were circulated for signatures in the different States, and the protest of the Ohio Legislature was also obtained. Consequently the National legislators were kept informed, and hence the recommendation of the House committee was not carried at the last Congress.

The misfortune is that our legislators are not informed upon the merits and demerits of the question. The advocates of the French system adroitly call it the decimal system, and many ignorantly throw up their hats and say: "Hurrah for the decimal system; we will go for that," but they do not take time to consider, nor do they know that an utter extirpation of all our hereditary units is sought, nor do they investigate what the origin of either system is.

They are satisfied with the dictum of the learned Rev. Dr. Barnard that the measures we have are the offspring of *accident or caprice.* What kind of legislators are these who vote away their birthright without knowledge? Dr. Barnard and his followers say that the National legislature has the right to overthrow our hereditary weights and measures, and substitute others. But that is clearly an *error.*

Congress, I maintain, has no right whatever to overthrow,

abolish, or extirpate them. They can make changes in the system, but not abolish the units.

The question must come to the polls. How few of our citizens seem to realize the fact that our measures are in danger? Nearly all of the principal nations of the earth to-day have adopted the French metre. Russia, Great Britain, and the United States alone stand out, and the last two forever will, I believe.

One thing is significant: no nation has adopted the French metre within the last three years; and one thing is certain, no nation can adopt it unless the military power is predominant.

Russia is an imperial government, and we wonder why she does not adopt the French metre. I can only account for it upon the fact that Peter the Great went to England to study the art of shipbuilding, took English artisans back with him, and adopted the British foot as the standard. That may be the reason why Russia stands alone with the Anglo-Saxons against the world.

Dr. Barnard gives us a remarkable and significant thought when he tells us:

"At the close of the last century, the metric system was thrust upon France under circumstances of disadvantage, and with an imperfect success, which Mr. Adams has very ably described in his report of 1821.

"Though the commission by which the system was matured, was so far international as it was possible in the then existing condition of Europe to make it, representatives being present, not only from France, but also from the Netherlands, Denmark, Spain, Switzerland, Sardinia, Rome, and the cis-Alpine and Lyurean Republics; yet no government except the French spontaneously adopted, and endeavored to apply in practice, the result of their labors. The conquests of the first empire carried the system *forcibly* into the low countries, into portions of Germany, into Italy, and into the Iberian peninsula; but the difficulties which it met with there were in general greater than at home; not only because the manner of its introduction did violence to the established habits of thought, but because its existence was a badge of subjugation and a perpetual reminder of the humiliation of those who were *compelled to use it.*"

And France was *compelled.* Napoleon was the first ruler to put his name to the compulsory edict, and with sword in one

hand, and the French balance in the other, as the NEMESIS of the eighteenth century he went forth conquering and to conquer, and no man could buy nor sell except he had the mark of the French metre.

Such, fellow citizens, is your fate if you permit the change of your weights and measures. You must realize the importance of the work before us.

There are but two things that will prevent a catastrophe; these are, organization, which we have, and investigation into the records of the past, in which we must be diligent. It is a part of our duty to perfect our system. This one work consists in presenting for criticism tables founded upon our present units of inch, foot, yard, cubit, grain, ounce, pound, ton, etc. To this end a committee was appointed at the last annual convention, consisting of S. F. Gates, mechanical engineer, Boston; Alfred B. Taylor, chemist, Philadelphia; W. A. Haven, C. E., and Joseph Churchyard, Buffalo; Professor Samuel Bates, Meadville, Pa.; Dr. J. Edwards Smith, and N. B. Wood, of this city.

Two of these gentlemen, Alfred B. Taylor and S. F. Gates, have reported, and their papers have been printed.

The committee should be continued and increased, as the subject is a difficult one.

This is the practical part of our work, and to some may be dry, but there are some remarkable curiosities connected with it which will make it interesting. These will show that our weights and measures have nothing to do with the Darwinian theory, and are not the result of "caprice or accident."

. . . . . .

Our membership now is, according to the secretary's report, 401.

Surely if each one would take hold, we could run the subscription list up to thousands. I can see now in the future a magazine of the Institute, embellished with cuts and engravings, and containing reading matter of priceless value to our people, and to the world.

I commend this to the most favorable and prompt action of the society. Two members have offered to be of twenty-five

who will give $100 each, and two others have offered to be of 100 to give $25 each, to sustain the magazine.

But it is claimed that it will be self-sustaining, and it ought to be. . . .

We have had arrangements with the *Cleveland Leader* during the past year for the publication of our proceedings, by which means the subject has been presented to many thousands.

The *Cleveland Herald* also has sometimes published similar articles.

We desire to give our most heartfelt thanks to the newspapers of Cleveland for their kindness and attention in forwarding the interests of the Institute. Many of the editors feel a lively interest in the subject, and will do all in their power to aid us in the future as in the past. I am sure that we shall give the readers of the public journals an occasional feast in the papers of the Institute.

In speaking of papers, I would remark that as an Institute we do not pretend to be responsible for the peculiar views of the members. When the Institute acts as such, and in its corporate capacity upon any question, then it may rightfully be criticised, but each member must be responsible for his own utterances.

We wish all earnest and thoughtful men and women to join us, as we believe it will do them good. We feel and know that we have a work of no ordinary character before us, and one of paramount interest to our race.

We have no idea of confining ourselves to the limits of our own country, for already we have some members in foreign lands. We have contributors of the highest intelligence and learning—men noted for their ability. Lately we have added to our list two very distinguished pyramid students, and men of letters—Mr. Charles Casey, civil engineer of Pollerton Castle, Carlow, Ireland, and M. L'Abbe F. Moigno, of Paris, editor of *Cosmos Le Mondes*, author of *The Splendors of the Faith* and other works.

In writing to us, when he had finally concluded to take a bold and decided stand against the metre even in the place of its birth, the venerable abbe says:

"It is already a long while since I promised our illustrious common friend, Mr. Piazzi Smyth, the revealer of the Great Pyramid of Ghizeh, to address you my congratulations, not only sincere, but also enthusiastic, for the now well secured success of your society, as I stand most fully convinced of your brilliant campaign in behalf of the ancient lineal measures, both human and Divine, viz.: the inch, the foot, and the cubit."

A number of our members, from time to time, have written and spoken upon the great importance of sending an expedition under the auspices of the Institute to make an official exploration of the Great Pyramid, and one gentleman has offered to pay my expenses and a salary if I would take charge of the expedition.

This duty of course would be very pleasing to me, and were it the wish of the whole membership, and were the money furnished, I would feel honored by the appointment, and would undertake it, provided I could get a leave of absence from my official duties here.

I feel sure that Providence will open a way for us, the children of the builders of that great structure, which is the symbol of our nation, to fulfill this longing desire in the near future.

It stands there, the only remaining one of the seven wonders of the world, as an altar to the Lord in the midst of the land of Egypt, according to the prophet Isaiah (XIX–19). And the prophecy is more glorious when it says that the Lord will send the Egyptians a Saviour, and a great one, and he shall deliver them.

The dark clouds hanging over that benighted land are now being swept away, and "our inheritance" now stands there under the protection of the children of those who build it. God grant that they may always protect and defend it.

When the time has come for us to move, where shall we find the means? Will it be as it was with that noble man, Piazzi Smyth, who besought vainly the rich to help him, and then in despair sallied forth with his faithful wife, and did the work of measurement alone?

During the last year two of our members have visited the Great Pyramid. One of them stood upon the top, but did not

go in. I think he ought to be fined $100. The other, Mr. E. L. Wilson, of Philadelphia, Pennsylvania, the great photographer, went as Greaves, the astronomer, did in 1642, and has returned, bringing his sheaves with him. He took photographs of the exterior and interior of the Great Pyramid,—the latter with magnesium lights; and I have just received from him sixteen views, which will be exhibited this evening or to-morrow. Among them there is a splendid view of the coffer. Thanks to Mr. Wilson.

We have been encouraged greatly during the past year with earnest and valuable letters from the astronomer royal for Scotland; from Charles Casey, Cockburn Muir, and M. L'Abbe Moigno.

The astronomer royal has been a most faithful worker with us—God bless him and his! He has never forgotten to give us a helping hand. M. L'Abbe F. Moigno, the Canon of St. Denis, has published in the *Cosmos* the paper of Mr. J. H. Dow, and has mine in press. He is working earnestly with and for us.

One other matter should engage our attention this year, and that is the important one of standard time. Mr. Sanford Fleming, of Canada, a distinguished civil engineer, has proposed dividing the clock into 24 parts, and using 24 meridians 15° apart, distinguishing them by the letters A, B, C, etc., so that each of these may furnish the standard for uniform clock time in its own vicinity. As a part of this plan a prime meridian must be established. Dr. Barnard and others are declaring for a prime meridian through Behring straits.

It seems to me that the longitude of the Great Pyramid is the place for the prime meridian of the world. It is for this Institute to examine into the matter, and declare and advocate its preference on some cosmic principles. To this end, a committee should be appointed on standard time.

Among the works of the Institute we must specially mention the beautiful scale of the inch measure, constructed by Professor W. E. Rodgers, of Cambridge, Massachusetts, dividing the inch into 25,000 parts; a delicate balance unequaled heretofore, we believe, by which one ten-thousandth of a grain may be

weighed, constructed by Professor H. B. Wood, of Cleveland, Ohio; the beautiful thermometer constructed by J. S. F. Huddleston, of Boston, under the direction of Rev. Jesse H. Jones and Mr. S. F. Gates, divided to the Pyramid scale of 250 parts between the freezing and boiling points of water.

The thanks of the society are due these earnest workers for these valuable specimens of their skill, which are now in the possession of the Institute.

We are making progress. Let us press forward with renewed energy and courage and never cease work until the French metre is overthrown in the very citadel of its birth and power. Do not doubt the result, it will come.

I much regret to chronicle the death of three members during the past year. The venerable minister of the Gospel, Rev. J. F. Halsey, of Norristown, Pennsylvania, one of the noblest and best, and most earnest in our cause, died full of years; Mr. S. C. Baldwin, of Marietta, Ohio, one of my friends who felt the deepest interest in our work, but was so much absent from the city that he had but little opportunity to meet with us; Mr. Guert G. Finn, one from whom we hoped much, cut off in the prime of life, a manly, noble soul, full of inspiration. We mourn his loss.

In the new year opening upon us we feel the influence of momentous events, whose shadows are cast before. We are fellow workers in a great and noble cause; let us realize this, let us redouble our energy, let us hold fast to our faith, let us look to the Lord to continue his blessing upon our society and its work, and be assured that we will know of a truth that we are working for the advancement of His kingdom upon the earth.

OUR SPECIAL WORK.

Modern civilization and modern science unite in demanding an improved system of weights and measures.

Every table must be referable, by exact and practicable methods, to a single unit of linear measure. The unit of meas-

ure must itself be commensurable with some natural standard whose length is unchangeable.

The subdivisions of each table must bear that ratio to each other which will best adapt them to use everywhere—in commerce, agriculture, the arts, sciences, manufactures; by everybody—rich, poor, learned, ignorant, skilled, and unskilled; on land, by sea; in summer, in winter; in counting room, laboratory, work shop, field; under every possible condition.

The French metric system is the result of the only modern attempt to meet *all* these conditions, and consequently its path to public favor has been easy, and its course rapid.

On the other hand the English and American tables of weights and measures are commonly believed to be a complex mass of names and numbers, lacking in system, which have descended to us from time immemorial; the patched up relics of a barbarous age.

If the popular estimates of our tables and of the metric system were correct, we would say, "sweep the old away and adopt the new at once;" but, because we know the popular estimate to be mistaken and *dangerous*, we issue THE INTERNATIONAL STANDARD, whose paramount object is to advocate "*the preservation and perfection of our* (hereditary) *weights ana measures.*"

To this end we propose to prove, from cumulative evidence gathered everywhere, by writers, expert, each in his own department, that the French metric system is not worthy to supersede our own, but that, on the contrary, our hereditary weights and measures may be made far superior to the French, at a tithe of the cost of introducing the latter.

We shall show that the Anglo-Saxon system, far from being a relic of a barbarous age, is really the somewhat degenerate outgrowth of a primeval system of marvellous perfection, whose extinction would be an irreparable loss.

We shall find that our inch was used in the construction of the Great Pyramid of Egypt, 4,000 years ago, and that it there forms part of a complete and perfect system of mathematics, whose range is as broad and as deep as the science of to-day.

These are our claims, and we hope to argue them with such

force that our readers shall realize the momentous interests which are at stake in this contest between our heritage and its modern rival. J. H. D.

THE METRIC SYSTEM.

A COMPARISON OF ITS MERITS WITH THOSE OF THE ENGLISH SYSTEM OF WEIGHTS AND MEASURES.

The Philadelphia *Record* of Friday says: "A gathering of very worthy fossils took place at Cleveland yesterday. It was called the annual meeting of the International Institute for Preserving Weights and Measures. It is hard to understand how men of average common sense can waste their time in such folly." This action, however, has become necessary from the secret and persistent attempt of certain parties to introduce the French metric system into our country. It is well for the public to know, and for parents to know, that in many scientific papers and in nearly all the recent school books the French system is put forward, and the English kept in the back-ground.

Let us examine the two systems, and see where the folly comes in. The French system is based upon the metre, which is 39.37 inches in length. Now, that is a very awkward number and cannot be halved and quartered by any of our measures, and is not evenly divisible by any whole number. Nor is there any measure between one of 3.93 inches and that of 39.37 inches. Now our yard of 36 inches can be halved and quartered, and we have a 12-inch measure and a 24-inch measure. The metre is based on a measurement of part of the rough surface of the earth. Our system is based on a correct measurement of the axis of the earth; that line on which the earth turns daily, and is straight. Of course, a straight line is a better origin of measure than a crooked one. Our system is based on the inch—not on the yard. By far the greater number of measurements made by us are less than a metre, and therefore, the inch is the most used of all measures.

The writer admits that the length of the metre is not correct,

as found by more recent measurement. But he says that makes no difference, we have got the stick. Well, that's rich! Why not take any stick? Why not take one of more convenient length, say 40 inches? What was the use of measuring the arc of the meridian?

No, that won't do. When you come to measure lands and countries and earth distances your measuring rod must be correct.

Where do you get your measure from, but from nature, and where do you get your time from but from the heavenly machinery? He would have all nations depend on a yard stick, kept at Paris.

But to make the matter worse, the metre has the decimal system grafted on it, in which the chief dividing number is ten. This makes it very unsuitable for many purposes. In money systems five is a much more natural and convenient divisor and harmonizes better with halves and quarters. There are five fingers on each hand, and the natural method is to count each hand alternately as five.

Now our system is duodecimal, in which the dividing number is twelve, and is better than the decimal because twelve can be divided evenly by four numbers, and ten only by two.

2, 3, 4, 6,	12—10	5, 2.
3, 4, 6, 8, 12,	24—20	10, 5, 4, 2.
3, 4, 6, 9, 12, 18,	36—30	15, 10, 6, 5, 3.

So the multiples of 12 can be divided evenly by more numbers than the multiples of 10.

Twelve inches make a foot rule, 24 inches the 2 foot rule, and 36 inches the 3-foot rule. Each of these measures can be halved and quartered, which cannot be done with the metre or parts of the metre.

So there are 12 ounces in a pound; ounces meaning units or ones; and with the pound we can measure any weight. As to how many grains should form an ounce might be open to revision. An ounce is equal to 1.732 cubic inches of water and has been so from the beginning.

Now if you will take the square root of 12 you will have 3.464; multiply this by 10 and you have the number of cubic

inches in one pint, 34.64. All our measures of capacity are multiples of this number. The writer says: "A peck measure may be referable to the cosmos and yet have no relation to a pint cup, such as would enable anyone to calculate quickly the number of pints in a given number of half pecks." Well, 16 pints make a peck, and 8 pints a half peck; what could be easier?

The English system is far more comprehensive and practical than the metrical. We have pecks, bushels, sacks, quarters, etc., for dry measure, and gallons, kegs, pipes, hogsheads, etc., for liquid measure.

The surveyors have their chains, rods, and perches, and acres, roods, and perches. We have yards and furlongs, miles and leagues; cloth measure is also different. Now, the metric system cannot take the place of all this, for it is utterly deficient in availability for all these applications.

The writer says the "metric system has been adopted in France with very little inconvenience to the people, and with wonderful satisfaction to every body." The United States Dispensatory says: "Though the decimal system of weights and measures was established by law in France, it was found impossible to procure its general adoption by the people, who obstinately adhered to the old *poids de marc* and its divisions; or if they adopted the new weights, gave them the names of the old weights to which they most nearly approached. One reason for this adherence to the old weights was the convenience of division into halves, quarters, etc., of which the new were not susceptible. So that three systems are now more or less in use in France."

Now that is a pretty mess they invite us to. "Confusion worse confounded." This writer does not seem to be aware that the metrical system has been thoroughly tested in the shops of William Sellers & Company, and found to be utterly impracticable.

It is therefore no improvement, and should not be adopted.

W. F. QUINBY.

November 14, 1882.

SKETCH OF THE GREAT PYRAMID'S MODERN DISCOVERY.

One day, in the year 1829, that eminently great and good man, John Taylor, of London, was deeply impressed with the remarkable fact that of "the Seven Wonders of the World," the Great Pyramid of Egypt was the only one still existing. This first as well as last of the seven has occupied the minds of the learned and unlearned of all ages, "but it was given to John Taylor to be the first to see, and then make known to mankind in speech and books, some of the deep and important truths really hidden for so many ages in that wonderful monument." Thirty years of constant thought and calculation, particularly the tracing of measures of length and contents made use of in Great Britain, well qualified him for the collection of a large mass of information, which he published under the title of "The Great Pyramid: Why was it Built and Who Built it?" To this he subsequently added a supplement, entitled "The Battle of the Standards: The Ancient of 4,000 Years against the Modern of 50 years, the less perfect of the two." In these publications he opened up for archæology a purer, nobler, more intellectual pathway to light, than that study had ever enjoyed before.

Early in the year 1864, there began a correspondence between Mr. Taylor and Professor Smyth; a correspondence too early terminated by the death of the good and wise old man, aged 83 years. A few months before his death he wrote his esteemed friend: "The cause of truth is the great object. If in any way we are able, while on earth, to vindicate the ways of God to man, we have not lived in vain. There is an immense deal of knowledge half hidden from our minds, which calm inquiry, if pursued in a right spirit, would open out."

Soon after the decease of Mr. Taylor, his executors placed in the hands of Professor Smyth a large quantity of MS., which he, with almost his last breath, had emphatically confided to the care and use of his trustworthy and able friend, it being the most important labor of his long life.

It became manifest that more accurate and reliable measures were required of many of the crucial parts of the Great Pyramid, to establish Mr. Taylor's theory on an unquestionable basis, or rather, either to establish or overthrow it. To this end, Piazzi Smyth and his noble wife resolved to betake themselves to Egypt with as little delay as possible, taking with them all the best instruments of mensuration obtainable. They took their departure in November, 1864, and during four months devoted themselves to measuring every required part of the Great Pyramid, occupying for a residence two adjacent vacant tombs, the one for a sleeping apartment, the other for culinary purposes. The results of the measurements obtained, after two years further occupation in computing and printing, were given to the world in three octavo volumes, entitled "Life and Work at the Great Pyramid," published in Edinburgh in 1867. These volumes confirm the truth and value of John Taylor's discovery, and are exercising an influence over the world at large. This influence, acquiring new strength from year to year, is spreading in Great Britain, the United States, Australia, New Zealand, Tasmania, India, Canada, and elsewhere; and everywhere are arising hosts of able advocates of the truths thus disseminated. To John Taylor was vouchsafed the honor of being the first to discover traces of a divinely inspired message to mankind in a primeval monument, conveying lessons of the highest benefit to these days of materialism and unbelief, because testifying to the Lord God of Israel from the beginning of human history to its prophetic close. The astronomer royal for Scotland, Piazzi Smyth, has been granted the second place of honor and happiness in the work of disseminating the teachings of the Great Pyramid; and the International Institute for Preserving and Perfecting Weights and Measures, in the organization of which Prof. Smyth was an efficient coöperator, is third in the line of service, disseminating the beneficent revelations of the Great Pyramid still more widely. In this last and more general instrumentality are included many distinguished workers for the preservation of our Anglo-Saxon weights and measures, all more or less animated by an earnest and intelligent conviction that the standards for which we contend have

been preserved for us, as our legitimate inheritance, during 4,000 years, in the mathematical and cosmic proportions of the Great Pyramid of Jeezeh. L. G. BISBEE.

THE SITUATION.

The work of introducing the French metric system of weights and measures into this country, is to-day having the support of men distinguished for their attainments as scholars and ability as aggressors. That they are making a determined effort, cannot be gainsaid; and that they will succeed, is certain—unless they are thwarted by action as earnest and uncompromising. What advances have been made? Let us review some of the most important. In 1864 the French metric system was legalized in Great Britain; and in 1866 our Congress passed a law legalizing its use in the United States, and directing the bureau of weights and measures at Washington to furnish to the executive authorities of the several States proper standards. In 1875 a metrical convention was held in Paris, at which the United States was represented by our minister, Mr. Washburne, who, by the direction of our President, signed the agreement for the establishment of a metrical bureau at Paris.

In 1881 Alexander Stephens introduced into Congress a bill "to authorize the coinage of silver dollars and fractions thereof, of full standard value, upon the metric system." Here we have examples of what has been done by our representatives. Apart from this, there is a strong influence brought to bear, emanating from numerous scientific associations and from organizations formed especially for the purpose, to force, if necessary, upon the people the French metric system.

That money is being used freely to attain the object must not be doubted, or whence this powerful undercurrent which we feel but cannot see? Whence comes the influence upon our public schools, the corner-stone of our institutions? Already we find men to whom the charge of educating our children is given, openly and boldly declaring themselves in favor of the

scheme. Brothers! let us not be overawed by the acts and strength of our foe—neither underestimate his power. Take courage. The organization of the International Institute, at Boston, on December 8, 1879, has already borne its fruit. It has caused a halt, and, so far, has proved a stumbling block to our adversary. The good work is but begun. The lines are drawing closer, and soon you will be called upon for all your strength and fortitude. Friends to the cause, stand not in wondering apathy, but lend us your aid. We need you, not to-morrow or next day, but *now*. *Now* is the time for action. Disabuse the public mind of false notions; educate our people to a true sense of the danger which threatens. Give us your work, your *best* work, and success will surely crown your efforts.

November 9, 1882.

THE ARGUMENT CONDENSED.

Arranged from a former paper—"A Restored Leaf in the History of the British Inch."—That paper was based on a preceding one by Mr. Charles Latimer, and on the prior discovery of the origin of the British inch, and of our circular measure by Mr. J. Ralston Skinner.

The British inch is coeval with the Great Pyramid of Egypt.

The ratio of the height of the pyramid to its base has been accurately determined, by angular measurement, to be as diameter to one half the circumference of a circle. This ratio, the most important in the whole range of mathematics, is so conspicuously displayed that it seems to have been designed by the architect to be a sort of title page to the contents of the pyramid.

With this natural inference as a guide, we find that the British inch, aided by the British division of the circle into degrees, minutes, and seconds, discovers a whole system of simple, practical π formulæ in the pyramid's dimensions; and since the *least* deviation in the units of measure, even the one-thousandth part, renders the π formulæ unwieldy and worthless,† we are

†The original paper reads: "Every formula contained in the table *vanishes* as soon as we change the British inch a hair's breadth."

forced to the conclusion that the British inch, in its present length, was used in the construction of the pyramid.

The King's chamber is the most perfect room within the pyramid. It is constructed of granite blocks, perfectly jointed, and polished like jewelers' work; consequently its dimensions may be obtained with very great accuracy.

The ante-chamber is a small room adjoining the King's chamber, more roughly finished than the latter.

The following table formulates the accurately measured dimensions of these rooms; also the original height of the pyramid and its base, assumed from an average of somewhat discordant measures, but rendered well nigh certain through "the reaction of the interior upon the exterior dimensions."

$$\text{Established } \pi = 3.1415926535897932 +$$

$$\sqrt{\pi} = 1.77245385$$

$$\text{Analytical unit} = \frac{180}{\pi} = 57.2957795 +$$

PYRAMID MEASUREMENTS IN BRITISH INCHES.

Let A = analytical unit.

No.

1. Length of King's chamber, $7.2\ A. = \frac{1296}{\pi}$

412,529612 +

2. Width of King's chamber, $3.6\ A. = \frac{648}{\pi}$

206,264806 +

3. Height of chamber, $1\sqrt{16.2}\ A. = \frac{3241\sqrt{5}}{\pi} = 1.81\sqrt{5}\ A.$

230,611064 +

4. Solid diagonal of chamber, $9\ A. = \frac{1620}{\pi}$

515,662016 +

5. Floor diagonal of ch'r., $61\sqrt{1.8}\ A. = \frac{6481\sqrt{5}}{\pi} = 3.61\sqrt{5}\ A.$

461,222128 +

6. Side diagonal of ch'r., $1.8\sqrt{21}\ A. = \frac{324\sqrt{21}}{\pi}$

472,612043 +

7. End diagonal of chamber, $5.4\ A. = \frac{972}{\pi}$

309,397209 +

8. Granite floor of ante-ch'r., $1.8\ A. = \frac{324}{\pi}$

103,132403 +

9. Whole length of ante-ch'r., $\frac{3.6\ A,}{\sqrt{\pi}} = \frac{648}{\pi\sqrt{\pi}}$

116,372457 +

10. Height of pyramid, $\frac{180\ A.}{\sqrt{\pi}} = \frac{32400}{\pi\sqrt{\pi}}$

5818,622870 +

11. Base side of pyramid, $\frac{180^2}{2\sqrt{\pi}} = \frac{16200}{\sqrt{\pi}}$

9139,8712581 +

12. Area of right section of pyramid, $\frac{180^4}{4\pi^2}$

13. Area of base of pyramid, $\frac{180^4}{4\pi}$

14. Height west wainscot of ante-ch'r., $= 50\sqrt{5} = 111,803398.$

PROPOSITIONS WHICH MAY BE PROVED FROM THE FORMULÆ CONTAINED IN THE ACCOMPANYING TABLE.

1st. Fifty times the whole length of the ante-chamber equals the height of the pyramid.

2d. The height of pyramid : twice its base : : 1 : π.

3d. The square of granite floor length equals the area of a circle whose diameter is the whole length of the ante-chamber.

4th. The solid diagonal of the King's chamber is 5 times the length of granite floor in ante-chamber.

5th. The square of solid diagonal multiplied by 100 equals the area of right section of pyramid.

6th. Fifty times the granite floor length squared, equals the area of right section of pyramid.

7th. The granite floor length of the ante-chamber multiplied by 100, is diameter of a circle whose area equals the area of base of pyramid.

8th. The granite floor of the ante-chamber multiplied by 100 is a mean proportional between the height of pyramid and twice its base.

9th. The square of 100 times the granite floor length equals the area of a circle having a circumference equal to the perimeter of the pyramid at its base.

10th. The granite floor length of the ante-chamber multiplied by 100, equals the surface of a sphere whose diameter is the analytical unit.*

Solution. $1.8\ A \times 100 = A\,\pi \times A$, because surface of a sphere equals its circumference multiplied by its diameter. $1.8\ A \times 100 = 180\ A$, and $A\,\pi \times A$ may take the form $A\,\pi \times \frac{180}{\pi} = 180\ A$.

11th. Divide the length, breadth, and height of the King's chamber, each by the granite floor length of the ante-chamber, and the squares of the respective quotients will be 16, 4, and 5, whose sum is 25.

12th. Divide the floor diagonal, side diagonal and end diagonal of the King's chamber, each by the granite floor length of the ante-chamber, and the squares of the respective quotients will be 20, 21 and 9, and $20 + 21 + 9 = 50$.

13th. Divide the solid diagonal of the King's chamber by the granite floor length of the ante-chamber, and the square of the quotient will be 25.

14th. Add together the squares of all the quotients in propositions 11, 12, and 13, and the sum will be $25 + 50 + 25 = 100$.

15th. The square of height of the King's chamber is one-fifth the square of the solid diagonal.

16th. Area of pyramid right section : Area of base : : 1 : π.

17th. The area of the right section of the pyramid is 500 times the square of the height of the King's chamber.

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* The British inch and our Circular Measure are shown conjointly in this proposition. Was it accidental?

18th. The pyramid formula for the constant by which we multiply the diameter of a circle to obtain the side of a square of equal area to the given circle is $\frac{\sqrt{\pi}}{2}$.

19th. The right section of the pyramid is equal to the square of ten times the solid diagonal.

20th. $\frac{\text{Height of King's chamber}}{\text{Width}} = \frac{\sqrt{5}}{2}$

21st. $\frac{\text{Solid diagonal,}}{\text{Floor diagonal,}} = \frac{\sqrt{5}}{2}$

22d. $\frac{\text{Floor diagonal,}}{\text{Length,}} = \frac{\sqrt{5}}{2}$

$= \frac{\text{Height of west wainscot}}{100}$

23d. The floor diagonal of the King's chamber is a mean proportional between its solid diagonal and its length.

We must all admit by this time that the Great Pyramid is a record of a higher order of mathematics than is usually credited to the ancients. So far as we have tested it we find it *without flaw*. Will it prove to be perfect throughout? If so, is its inch —OUR INCH—a perfect unit of measure?

Let us keep our inch a while longer, and spurn that known falsity, the French metre.

J. H. Dow.

PARALLAX OF THE SUN.

[Synopsis of a paper upon *The Astronomy of the Pyramid*, delivered by Charles Latimer, June 7th, 1882, before the Ohio Auxiliary society.]

Godfrey's astronomy gives the following formulæ:

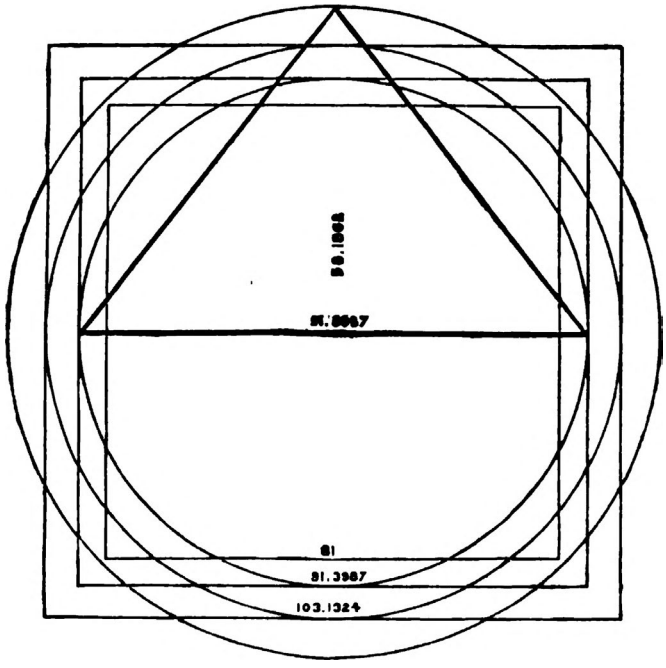
$$\text{Sun's distance} = \frac{\text{radius of earth} \times 206265}{\text{sine of sun's parallax.}}$$

$$\text{Sine of sun's semi-diameter} = \frac{\text{radius of sun} \times 206265}{\text{sun's distance.}}$$

$$\text{Sine of sun's parallax} = \frac{\text{radius of earth} \times 206265}{\text{sun's distance.}}$$

$$\text{Therefore,} \quad \frac{\text{radius of sun}}{\text{radius of earth}} = \frac{\text{sine of sun's semi-diameter}}{\text{sine of sun's parallax.}}$$

The following diagram and explanation give in compact form the mathematical principle upon which the Great Pyramid of Jeezeh in Egypt is based.



First, we have a square of 81 inches to the side; next, a circle of equal area whose diameter is one-hundredth part of the base side of the pyramid; next, a circle of equal area to the square of this base, whose diameter is the length of the granite of the ante-chamber floor; next, a circle of equal area to the square of this granite floor, whose diameter is the whole floor length of the ante-chamber (granite and limestone); this is one-hundredth of twice the height of the pyramid.

Draw lines from the zenith to each end of the diameter of the circle of equal area to 81 square, and we have the precise proportions of the Great Pyramid, in which the circumference of the circle described with the height of the pyramid is equal to the four sides of the base,—or the problem of the squaring of the circle exemplified.

Mr. Petrie's method of obtaining sun's distance with the height of the pyramid, in British inches, is 5818.622870 inches,

multiplied by 10 to the ninth power; this reduced to miles is 91,840,011.

Take the length of the ante-chamber floor in British inches, multiplied by 100, or twice the height of the Great Pyramid, with the rigid formulæ as above in diagram, viz: 11637.24573 inches, and extract the square root of it; we have 107.8760665 inches. This number, as shown by Mr. Cockburn Muir, in "*Life From the Dead*," is a constant =

$$\frac{\text{sun's distance}}{\text{sun's diameter}} = \frac{\text{sun's diameter}}{\text{earth's diameter}} = \frac{\text{moon's distance}}{\text{moon's diameter}},$$ and therefore, by Godfrey's formulæ, it must also equal

$$\frac{\text{sine of sun's semi-diameter}}{\text{sine of sun's parallax}}$$; hence it is not an empirical number. Chambers gives the number 108, and Godfrey gives 109 as the value of the constant—the difference simply arises from the fact that astronomers do not know the exact parallax of the sun.

The distance, as given above by Mr. Petrie's method, will determine what the parallax was, and, that obtained, we will know what the semi-diameter of the sun was at the same time, and these three elements must give a certain date.

First we will calculate the diameter of the sun. The distance to the sun is equal to the diameter of the sun multiplied by 107.87 +. We have the distance already, and so, dividing it by the above number, we get 851,313 miles as diameter of the sun. Dividing the diameter of the sun by the same number, we get 7891.591 miles for diameter of the earth.

Now, by the first of the formulæ from Godfrey, we have:

$$\text{sun's distance} = \frac{206265}{\text{parallax}} \text{ (radius of earth)}.$$

This 206265 will be recognized as the number of seconds in the analytical unit, and as one thousand times the theoretical width of the King's chamber. We will use it more exactly, and we therefore have for the parallax of the sun:

$$\text{Parallax} = \frac{206264.806247}{91,836,011}(3945.7955) = 8.''86226925 = 51/\pi$$

This is ten times the constant used for obtaining equality of area of squares and circles; for

$$\frac{81}{\frac{1}{2}\sqrt{\pi}} = \frac{81}{.886226925} = 91.398712581,$$

or the one-hundredth of the base of the pyramid in British inches.

Calculations based on a large number of observations taken of the transit of Venus in 1874, have fixed the parallax of the sun between the limits of 8″.75 and 8″.88;—Professor Newcomb gives 8.″855. He says:

"*It is probable* that the true distance of the sun is 92,000,000 of miles and a fraction;" but in many recent works the distance in question is stated at 91,000,000 of miles and a fraction. But up to 1874 the astronomers did not know very closely the distance to the sun, nor do they yet know the parallax; and in 1882 large sums were expended in observing again the transit of Venus to obtain the latter.

Aristarchus first tried to get the distance to the sun by measuring the angle between the sun and moon, when the latter appeared half illuminated. The result gave the distance to the sun as 20 times the distance from the earth to the moon—about 5,000,000 miles.

Ptolemy next found the parallax 3′11″, or 191 seconds, and the distance to the sun, 5,000,000 miles. *And this result was taken as correct for 1400 years.*

Kepler first discovered that the distance was too small. Wendell declared that the parallax of the sun could not exceed 15″.—Here was a great difference of opinion, 191″ and 15″, so the distance to the sun was raised from five millions to about forty or fifty millions of miles.

Huygens guessed at the magnitude of Venus and Mars, and considered them together about the same magnitude as the earth, and he obtained ninety-nine millions of miles from earth to sun. This was considered a better result than any obtained previous to the transit of Venus in 1769; but it was through an error that he obtained this result.

Next came the measurements of the parallax of the sun. The observations of 1672 were worked, and Cassini found it 9½ seconds, and for 100 years the parallax of the sun was considered

to be about 10 seconds;—the distance from earth to the sun eighty or ninety millions of miles.

In 1761, France, Russia, Sweden, Denmark, and England made observations in different parts of the earth by the transit of Venus to obtain the parallax. The results varied from 8″.5 to 10″.5.

Encke worked the observations and made the parallax 8″-.55776. Encke's result remained undisputed for thirty years.

But the parallax has been obtained in other ways, as follows:

1st. Gravitating force of the sun upon the moon; this gave 8″.83.

2d. Velocity of light, *Cornu*, 8″.894; that is, taking the velocity of light as 185,200 miles per second, and saying it takes the light of the sun to reach the earth 498 seconds, the distance would be 92,230,000; but a more accurate measurement of light is 185,300 miles per second, and the time from sun to earth for light 493 seconds, making the distance 91,836,000 miles.

3d. Mr. Leverrier has made a calculation by another method. The earth, on account of gravitation, from attraction of the moon, describes a small monthly orbit around the common center of gravity of the earth and moon, the radius of which is 3,000 miles. He found oscillation in arc 6″.50; from this he made parallax 8″.95, corrected afterwards by Mr. Stone to 8″.85.

4th. Mr. Leverrier found the parallax by taking the relative masses of the earth and the sun, and comparing the distance which a heavy body will fall in one second of time at the surface of the earth, with the fall of the latter towards the sun in the same time. This gave 8″.86.

5th. Van Asten, of Pulkowa, by the action of the earth upon Encke's comet, found parallax 9″.009.

6th. J. G. Galle, of Breslau, found 8″.875, by observations of *Flora;* and the distance to the sun 92,570,000 to 93,000,000 of miles.

Looking into the astronomies—Newcomb's especially—to find the results of ancient and modern times as to the sun's

distance from the earth and the parallax, we have the following:

SUMMARY OF OBSERVATIONS OF SUN'S PARALLAX.

MODERN TIMES.

Leverrier	1858	8″.95	8″.85	8″.86
Foucault	1862	....	....	8″.86
Hall	1862	....	....	8″.8415
Stone	1863	....	....	8″.943
Hansen	1863	....	....	8″.97
Hansen	1863	....	....	8″.9159
Winnecke	1863	....	....	8″.964
Powalky	1864	....	....	8″.86
Stone	1867	....	....	8″.916
Stone	1867	....	....	8″.91
Stone	1867	....	....	8″.85
Newcomb	1867	....	....	8″.848
Stone	1868	....	....	8″.91
Faye	1868	....	8″.7	8″.9
Powalky	1871	....	....	8″.7869
Leverrier	1872	....	....	8″.86
Cornu	1874–76	....	....	8″.794
Galle	1875	....	....	8″.873
Puiseux	1875	....	....	8″.879
Lindsay and Gill	1877	....	8″.765	8″.815
Airy	1877	....	....	8″.754
Stone	1878	8″.86	8″.979	
Tupman	1878	8″.857	8″.792	
	2170 B. C.			
Pyramid	**1882 A. D.**			**8″.86226925** or $5\sqrt{\pi}$

Let the reader judge if this does not look like the true cosmical value of the sun's parallax. The diameter (polar) of the earth, as given by astronomers, is 7899.14, and the distance to the sun, determined lately by the astronomers of the world, is 91,840,000 miles.

I do not pretend to assert here the correctness of these pyramid figures against positive scientific proved facts, as to the sun's distance, the diameter of the earth, or the diameter of the sun; but it will be observed that astronomers have made great

mistakes heretofore, and even now they have not positively decided upon the shape of the earth, nor the distance to the sun, nor its parallax.

The distance to the sun, as given above, is almost exactly that obtained by the transits of Venus in 1874.

The polar diameter of the earth is less than that given by astronomers by seven and fifty-five one-hundredth miles. The parallax agrees to the first three figures with Mr. Leverrier's, and is almost an exact average of all modern calculations, viz: (8″.86) eight seconds and eighty-six hundredths.

I did not manufacture these figures.

I said that the number

107.87+is the $\frac{\text{sine of sun's semi-diameter}}{\text{sine of sun's parallax}}$, therefore, the parallax being known, we have the arc 15′ 55″.1287128712 +; a repeating decimal of a second. This number, in seconds, is exactly the diameter to a circumference of 3000,— a round number,—therefore the diameter of the sun in arc $\times$ π = 6000.

This semi-diameter is not a mean exactly, but nearly so; and is twice a year correct, viz: in May and September. As I said, all of the elements should, I think, fix a certain date.

It will be seen that we do not get the pyramid inch in the polar diameter and other elements of the calculation.

It is curious, however, to observe that this polar diameter, 7891.591, reduced to inches, gives 500,011,218 inches, or 500,000,000 to within 935 feet.

The whole calculation is based, as will be seen, upon the circle of 360°, reduced to seconds,—that is 360×60×60 = 1,296,000″—as circumference. The diameter of this circumference is 412529, and its parts agree with the actual measures of the pyramid structure, frequently to within the one-hundredth of an inch.

REMARKS OF JOSEPH BAXENDELL

On Mr. Dow's paper, "A Restored Leaf in the History of the British Inch," and on Mr. Latimer's "On the Astronomy of the Pyramid, the Distance to the Sun and Moon—Sun, Moon, and Earth Diameters."

Mr. Dow bases his calculations upon Mr. Latimer s argument for the British inch, in which it is assumed "that certain dimensions in the pyramid, when expressed in British inches, are diameters corresponding with exact integral circumferences;" and he adopts the three numbers 324, 1296, and 1620 as the circumferences of circles of which the diameters are the length of the granite floor of the ante-chamber, the length of the King's chamber, and that of the solid diagonal of the latter chamber; and commencing with the length of the granite floor of the ante-chamber and the analytical unit A, he gives a series of equations which he regards as proving that the modern British inch is coeval with the Great Pyramid. But if we adopt any other value of the inch, the result is simply to alter a little the coefficient of A, and the results will still bear the same relation to each other as they do by using the British inch, thus showing that Mr. Dow's equations cannot fairly be regarded as proving that the present British inch was the inch used by the architect of the pyramid. Moreover, the numbers 324, 1296 and 1620 do not represent anything important in nature, or in the religious observances of either Hebrews or Christians, and no attempt is made to assign a reason why the architect had selected them in preference to any other whole numbers.

Two important omissions have been made by Mr. Dow—important because upon them depends the whole question of the real value of the inch used by the architect, unless we adopt the very improbable hypothesis that two different inches were used. The first of these omissions is an equation expressing the length of the year; and the second, an equation expressing the length of the grand gallery in terms of the length of the granite floor of the ante-chamber, or of the length of the King's

chamber; and, seeing that the length of the base side of the pyramid, divided by 25, approximates so closely to the number of days in the year, it seems remarkable that it did not occur to the author that in all probability it was the length of the year that was intended to be represented by the length of the base side, and that this length, so important an element in this world's affairs, was much more likely to be selected by the architect as the basis of his calculations than a series of numbers which have no particular significance.

While Mr. Dow's calculations are all based upon the π theory of construction of the pyramid, Mr. Latimer, in calculating the sun's distance, has adopted the 9 : 10 theory, but as this theory is not supported by facts, and is only an approximation to the true theory, results derived from it cannot be entitled to much confidence, though they might, perchance, approach very near to the truth. He also appears to have attached undue importance to Mr. W. G. F. Chambers' three problems, and Mr. Muir's "Metre Span;" and, employing the latter in connection with the 9 : 10 theory, he obtains results which are inconsistent with the results of the best astronomical observations to an extent which renders them quite inadmissible. Thus, his distance and diameter of the sun give a mean apparent diameter about 10″ less than the mean of all the best observations hitherto made; his polar diameter of the earth is more than seven miles less than the generally received value, and cannot be accepted by any practical astronomer; and his distance and diameter of the moon give a mean apparent diameter decidedly greater than the true.

On page 27 Mr. Latimer refers to Howard Vyse's measure of the downward passage, 4,126 British inches; but this measure, so far as I am aware, has never been verified, and in Our Inheritance it is stated to be 4,404 pyramid inches, or deducting the horizontal portion, 4,080 pyramid inches, so that the assumed relation of this passage to the diameter of a circle having a circumference of 1,296,000 does not exist, or at all events, is not proved.

With respect to the length of the pyramid inch, Mr. Latimer seems to think it cannot be one-thousandth greater than

the British; but it appears to me that the only reliable data we have for its determination are the relation between the length of the year and that of the King's chamber, and Professor Piazzi Smyth's measure of the length of the King's chamber in British inches, which, no doubt, is the best and most reliable of the pyramid measures; and from these data, I find that the pyramid inch is one-nine-hundred-and-eighty-seventh greater than the British.

The Observatory, Birkdale,
Southport, Lancashire,
November 16, 1882.

THE PROPORTIONS OF THE KING'S CHAMBER.

In reading Mr. Dow's excellent paper, "A Restored Leaf in the History of the British Inch," I was led to inquire what was probably the motive of the pyramid architect in giving to the King's chamber its peculiar proportions. I say proportions rather than dimensions, because the room might have been built either larger or smaller than it is and still have possessed similar proportions. I fail to find the value of the ratio π in the King's chamber, but I do find the demonstration of several beautiful geometric problems, sufficient in themselves to supply a motive for its proportions.

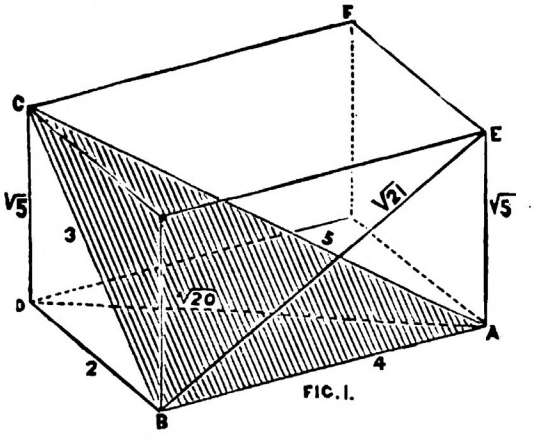


FIG. I.

If it were asked of almost any architect, "How many dimensions can be given to a plain rectangular room," he would at

once reply, "Three; the length, width, and height;" but the architect of the pyramid has shown us how, in designing such a room, we may assume *four* integral dimensions, namely, the length *AB* (Fig. 1), the end diagonal *BC*, the solid diagonal *CA*, and the width *BD*. To accomplish this it is necessary, first, to construct a right angled triangle, taking for its base the length of the room along the base of one side wall, and second, to incline the triangle until its apex touches the opposite wall, at the assumed width of the room. The ceiling will then be drawn through the apex and the design of the room will be complete. It will be seen that after assuming all three sides of the triangle, giving the length and two diagonals of the room, we may still assume the width at pleasure between the limits of zero and the length of the end diagonal which forms the perpendicular of the triangle. As we increase the width we have only to increase the inclination of the triangle to the vertical. We therefore conclude that the architect of the pyramid first assumed the base *AB*, the perpendicular *BC*, and the hypothenuse *CA* of a right angled triangle, also the width of room *BD*, and then, inclining the triangle so that its apex should touch the side wall at *C*, ascertained the height *DC*. He thus produced the design of the King's chamber having four integral dimensions. Was not this method one of the secrets of the early geometers?

But if it be asked what values did he give to the sides of the triangle to accomplish this purpose, behold in this triangle the proportions of *three*, *four*, and *five!* This curious fact, namely, that if three lines having the lengths of *three*, *four*, and *five*, respectively, are placed together in the form of a triangle they will give a right angle, is so remarkable as always to fascinate the learner, and was doubtless carefully cherished by the earliest geometers as one of the mysteries of their art.

Here, then, is a motive for the design of the King's chamber, to preserve in stone a record of this curious relation, and, at the same time, so to conceal the record that it might not be discerned except by the initiated. Of this triangle in the King's chamber only the base is apparent, for its perpendicular is a line untraced along the diagonal of the end wall, while the hypothenuse, bearing the sacred number 5, lies untraced and

untraceable, like the track of a spirit in mid-air, from the lower angle at the floor to the upper opposite angle at the ceiling. The surface of this wonderful triangle coincides with no material surface of the chamber—else had its proportions been obvious to every one who measured—but it hangs, suspended like an invisible veil in the midst. How many heedless thousands have visited this room and declared that it contained absolutely nothing but a stone box. Even the indefatigable Professor Smyth, who, with praiseworthy zeal, took many and repeated measures in every part of this room, as he thought, failed to measure, even once, this solid diagonal, or to discover, at least while there, its beautiful relations to the other dimensions. He noted the five spaces over the portal, and emphasizes the five equal courses of stone of which the room is composed, yet he failed to note the "fiveness" of the solid diagonal, although admitting that five is a characteristic pyramid number. How subtle, therefore, was the skill of that ancient architect, who could so disguise the prized secrets of his craft in the very monument constructed to perpetuate them; so that, though the granite portcullis were passed by force, the ascending passages climbed, the grand gallery and the ante-chamber traversed, and the very sanctuary penetrated, yet the mysteries there enshrined should still remain undiscovered.

We now know, however, that the width of the chamber is 2, the end diagonal 3, the length 4, and the solid diagonal 5, and by solving the several right triangles we find the height is $\sqrt{5}$, the floor diagonal is $\sqrt{20}$, and the side diagonal $\sqrt{21}$. These numbers represent the proportions of the chamber in all its parts. If it be asked by what unit is the chamber designed, I reply, by the length of the granite floor of the ante-chamber, taken as unity.

By means of the above numbers and diagram we may solve any of the propositions that have been stated in respect to the King's chamber. Thus, page 16 of Mr. Dow's paper, we have the propositions of Mr. James Simpson, as follows:

(11) $\overline{AB}^2 + \overline{BD}^2 + \overline{DC}^2 = 16 + 4 + 5 = 25.$

(12) $\overline{AD}^2 + \overline{BE}^2 + \overline{BC}^2 = 20 + 21 + 9 = 50.$

(13) $\overline{AC}^2 = 25.$

(14) Sum of all = 100.

(15) $\overline{DC^2} = \frac{1}{5}\ \overline{AC^2}$, or $\sqrt{5^2} = \frac{5^2}{5} = 5$

Prof. H. L. Smith's proposition given by Mr. Dow, page 20, is:

$\frac{DC}{BD} = \frac{\sqrt{5}}{2} = 1.1180340$ and

$\frac{8}{10}\left(\frac{DC}{BD}\right)^3 = \frac{8}{10} \cdot \frac{5\sqrt{5}}{8} = 1.1180340.$

Again, on page 24, we quote, and take our figures directly from the diagram Fig. 2:

$\frac{DC}{BD} = \frac{\sqrt{5}}{2} = \frac{AC}{AD} = \frac{5}{2\sqrt{5}} = \frac{AD}{AB} = \frac{2\sqrt{5}}{4} = \frac{\sqrt{5}}{2}$

or $AC : AD :: AD : AB$. Hence the floor diagonal is a mean proportional between the solid diagonal and the floor length.

Also (5) and (7).

$\frac{AC}{DC} = \frac{5}{\sqrt{5}} = \frac{AD}{BD} = \frac{2\sqrt{5}}{2} = \sqrt{5}$, or,

$AC : DC :: AD : BD.$

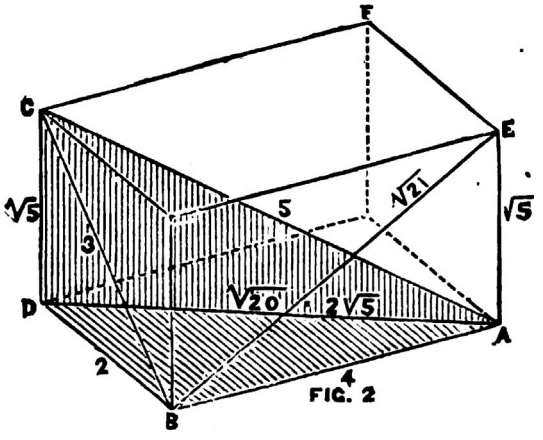


FIG. 2

Hence (which has not heretofore been shown) the two triangles ABD and ADC are similar, and the angles BAD and DAC are equal; the value of this angle is $26°33'54''.1$, while that of the descending passage is $26°27'$, according to Prof. Smyth, vol. 11, p. 148. The solid diagonal has a slope of 2 horizontal to 1 vertical precisely. May not the slope of the entrance passage be intended for the same?

Finally we have for the sixth formula (6) $\frac{DC}{AB} = \frac{\sqrt{5}}{4}$ at once from these figures.

Other curious relations may be derived from the diagram; thus,—

The height is a mean proportional between the width and one-half the solid diagonal; for

$$BD : DC :: DC : \tfrac{1}{2} AC \text{ or}$$

$$2 : \sqrt{5} :: \sqrt{5} : \frac{5}{2}$$

Again: The product of the length by the solid diagonal is equal to the square of the floor diagonal, or $AB \times AC = \overline{AD_2}$, since $4 \times 5 = 20$. [To which Mr. Searles might have added: The perimeter of the floor equals the perimeter of the 3, 4 and 5 triangle; for $4 + 2 + 4 + 2 = 3 + 4 + 5$. Also, the perimeter of a side wall equals the sum of the solid diagonal, the floor diagonal, and a diagonal of end wall; because $4 + \sqrt{5} + 4 + \sqrt{5} = 5 + 2\sqrt{5} + 3$.—ED.]

Since the proportions which have been indicated really exist in the King's chamber (and this is now generally admitted) they will be made manifest by any accurate measure of the room, whatever be the unit adopted. The same ratios will be developed whether the dimensions are expressed in inches or metres. But among all these *ratios* the value of π is not to be found, nor the analytical unit in any of its forms.

I understand the claim of Mr. Dow to be that when the several dimensions of the room are expressed in *British inches*, the same numbers will also express some definite part of *radius* divided into seconds of arc; and that, since this is true of the diagonals as well as of the edges of the room, the concurrent evidence of all these lines is in favor of the theory that the chamber was designed to represent circular relations in terms of the unit now known as the British inch.

But since every line of the chamber may be expressed in terms of the length of the granite floor of the antechamber, which we may represent by the letter G, it follows that if G happens to measure so many British inches as there are seconds in some definite part of the analytical unit, then the same

must necessarily be true of the several lines of the chamber, since they are simply different multiples of G. There is therefore no concurrent testimony in these lines to a circular design, since they all possess the quality named by virtue solely of the unit G upon which they are formed.

The whole question, therefore, turns upon whether the value of G, expressed in British inches, has the quality specified. Now the formula for any line of the chamber is G multiplied by the number set opposite that line on the diagram. Thus, the width $BD = 2G$, the solid diagonal $AC = 5G$, etc.; hence, solving all these formulæ for G, and substituting the values of the different parts as given by actual measurements, we may deduce the probable value of G from a general average of results. We have then

$$G = \frac{\text{Width}}{2} = \frac{\text{End diag.}}{3} = \frac{\text{Length}}{4} = \frac{\text{Solid diag.}}{5} = \frac{\text{Height}}{\sqrt{5}}$$
$$= \frac{\text{Floor diag.}}{\sqrt{20}} = \frac{\text{Side diag.}}{\sqrt{21}}$$

All of these parts have been measured except the solid diagonal and the side diagonal. There are considerable discrepancies in the measurement of the height, due, as we are informed by Professor Smyth, to "so many of the floor stones, from which the heights necessarily had to be measured, being disturbed, and, to some extent, risen up (like the drawing of a tooth) as though in consequence of earthquake disturbance."—*Our Inheritance*, p. 194. It is, therefore, preferable to omit the height from our investigation, and to determine the value of G from the other measured dimensions.

Our best authorities on measures are Professor Piazzi Smyth, "Life and Work," vol. II.; Mr. E. W. Lane, quoted *Ibid*, p. 333; Professor Greaves, quoted *Ibid*, p. 335; and Colonel Coutelle, "*Antiquities*," vol. IX., p. 266. I omit, at this time, the measures of Colonel Vyse, because they were evidently not taken with precision, or, in the words of Professor Smyth (*Our Inheritance*, p. 136), "Colonel Howard-Vyse did not lay himself out for very refined measurements." I exclude also the measures of Messrs. Aiton and Inglis, quoted in "Life and Work," vol. II., because they did not measure the whole

chamber directly, but the dimensions of the several stones in particular, giving the size of the chamber by a summation only; and there were evidently some errors in their work, notwithstanding the totals agree well—almost too well—with one another.

INVESTIGATION OF THE VALUE OF G.

Line.	No. of measures.	Sum of measures.	Divisor.	Quotient.	G British inches.
Prof. Smyth's direct measures.					
Width	3	618.9	2	3 G= 309.450	
End diagonal	3	928.6	3	3 G= 309.533	
Length	7	2887.78	4	7 G= 721.925	
Floor diagonal	2	923.3	$\sqrt{20}$	2 G= 206.455	
				15 G=1547.363	103.151
Prof. Smyth's measures by joints.					
Width	12	2475.5	2	12 G=1237.75	
Length	8	3299.5	4	8 G= 824.875	
				20 G=2062.625	103.131
Mr. Lane's measures.					
Width	1	206.25	2	G= 103.125	
Length	1	412.50	4	G= 103.125	103.125
Prof. Greaves's measures.					
Width	1	206.28	2	G= 103.14	
Length	1	412.56	4	G= 103.14	103.140
Col. Coutelle's measures.					
Width	1	206.10	2	G= 103.05	
Length	2	824.37	4	2 G= 206.092	
				3 G= 309.142	103.047
Total of all	42			42 G=4331.660	103.1348

Colonel Vyse gives 2 measures: 2 G= 205.250
Messrs. Aiton and Inglis 23 G=2368.

Total . . . . 25 G=2573.25 102.95

So that if these measures had been included with the above, the result would have been:

67 measurements. 67 G=6904.91 103.058

But with our present information the probabilities are in favor of G=103.1348.

Now, the analytical unit expressed in seconds, or the length of radius in terms of seconds of arc, is

$$\frac{648000}{\pi} = 206264.81$$

and dividing this by 2000 we have 103.1324. Comparing this with the value of G as above determined, we find a difference

of 0.0024, or say 1-400 of an inch, which is almost inappreciable, compared with the errors in measurement in the above data, so that we would seem to be warranted in at once adopting the value $G = 103.1324$ British inches.

An investigation of these measures was made by Mr. James Simpson (see Our Inheritance, p. 196), who deduced for the value of G 103.0329 pyramid inches = 103.1359 British inches, differing only .0011 of an inch from the average found in the above table. Professor Smyth has adopted this value in support of his theory of the pyramid, but expressing G in terms of the pyramid inch, of course.

We see, then, that the two theories rest on two assumed values of G, differing only .0035 of an inch in a length of over 103 inches. We shall not be able, therefore, to decide between them, so far as the measures of the King's chamber are concerned; and that theory is likely, ultimately, to prevail which finds the greater confirmation in other parts of the pyramid.

Having determined the value of G, we may derive the values of all parts of the King's chamber therefrom in a *consistent* scheme. The following table presents these values for $G = 103.1324$, also for Mr. Simpson's value $G = 103.1359$ British inches, also the average of all measures by Professor Smyth, and selected values of actual measurements.

TABLE OF THEORETICAL DIMENSIONS OF THE KING'S CHAMBER.

Line	Formula	Values in British inches	Simpson's values in British inches	Average of measurements by Professor Smyth.	Actual measurements by Professor Smyth
G	.....	103.1324	103.1359	.....	.....
Width	$2\,G$	206.2648	206.2718	206.30	206.3
End diagonal	$3\,G$	309.3972	309.4077	309.53	309.4
Length	$4\,G$	412.5296	412.5436	412.48	412.5
Solid diagonal	$5\,G$	515.6620	515.6795	.....	.....
Height	$\sqrt{5}\,G$	230.6111	230.6188	230.10	230.8
Floor diagonal	$\sqrt{20}\,G$	461.2221	461.2378	461.65	461.3
Side diagonal	$\sqrt{21}\,G$	472.6120	472.6282	.....	.....

The value of G is supposed to be exhibited in the granite floor of the ante-chamber, and also in the height of the east wainscot. The length of the granite floor, as given by Professor Smyth, is 102.6 on the east side, and 103.20 on the west

side of the ante-chamber. The height of the east wainscot is 103.30 above the floor generally, or 103.00 above the raised stone under the granite leaf. The average of these four measures is 103.025, all in British inches. But more measures, taken with great care, are required to settle the real length and height of this granite.

Does the value of G indicate the real unit of measure employed by the pyramid architect?

If we divide 103.1324 by 4 we have $25.7831 = \frac{648000}{8000\pi}$ a probable value of the sacred cubit.

If we divide 103.1324 by 5 we have $20.6265 = \frac{648000}{10000\pi}$ the cubit of Memphis.

Both of these express an exact part of the analytical unit, the latter cubit an exact decimal part of it.

I have said that the π ratio is not found in the King's chamber; but we have only to go a few inches below the floor to find it. The base of the granite walls being about 5 inches below the surface of the floor, the actual height of wall is, by so much, greater than the height of the chamber. We gather from "Our Inheritance," p. 200, that if we add the height of the *wall* to the length of the chamber, and divide by the chamber width, we shall obtain the value of π.

Let X be the depth of the base below surface of floor to give this result. Then, according to the above statement and our diagram

$$\pi = \frac{4+\sqrt{5}+X}{2}$$

whence $X = 2\pi - 4 - \sqrt{5}$ in terms of G or in inches $X = [2\pi - 4 - \sqrt{5}]\ G$, and giving to G our value 103.1324 we find $X = 4.859$ British inches.

We may well suppose the floor to have been originally laid at this height above the base of the wall; and the present height of any stone of the floor in excess of this to be due to subsequent disturbance.

WILLIAM H. SEARLES, C. E.

STANDARD TIME.

By SANFORD FLEMING, C. M. G., etc., Engineer in Chief, Canadian Pacific Railway.

The reckoning of time is a question which, in a greater or lesser degree, concerns every race and every individual on the face of the globe. The question affects races and individuals generally in proportion to the degree of advancement in civilization, or in the higher activities of life reached by them. Savage races do not place much value on time. Man in a wild condition does not concern himself greatly about the regulation of time or its measurement with precision. The diurnal successions of daylight and darkness; the appearance and reappearance of the sun and moon, more than suffice for all his purposes. When the world was younger and the human family was in an infantile state, the system of chronometry was of extreme simplicity. The crowing of the cock proclaimed the approach of the period when men should labor. Cock crowing, sunrise and sunset were the three epochs to govern men in their daily affairs. The civilization of Greeks and Romans rendered it necessary to divide the intervals of daylight between sunrise and sunset into two parts, to denote midday or noon. Noon was announced by sound of trumpet, and for ages it was the only period publicly noticed by the Romans; it was manifested by the time of the sun shadow along the forum, and led to the introduction of the sun dial. The sun dial divided the intervals of light before and after midday, each into six parts, known as forenoon and afternoon hours. The hours thus divided, varied in length day by day as the seasons changed. In the northern hemisphere they were longest in summer, and shortest in winter. The period of darkness remained undivided until mechanical contrivances were employed to extend the forenoon and afternoon hours back and forward until they met at midnight, and this led to an entire revolution in the system of time reckoning and the gradual abandonment of sunrise, sunset and cock-crow as standard periods. No mechanical means could be devised to show the continual variations in the length of the hours caused by the changes in the seasons, and it became necessary, therefore, to make the hours invariable; but old

habits are so strong that this practice was long stoutly resisted as an unwarrantable innovation. For many centuries after the Christian era, the artifices for dividing nocturnal and diurnal time were extremely rude, and required constant attendance. Water clocks, sand glasses and candles were employed; the latter made so as to burn a known number of inches per hour, were chiefly used in monasteries. The pendulum clock was not invented until the seventeenth century, although toothen wheel-work was employed at an earlier date.

Thus may be traced the varying stages of chronometry up to a few years ago, when steam and electricity were brought into use as means for the advancement of the human family. These marvelous agents of civilization have established conditions in every-day life which previously never existed, and which in turn must lead to important changes in time-reckoning, just as the introduction of mechanical clocks rendered sun dials obsolete, and compelled the abandonment of ruder systems which had previously prevailed.

Clocks and watches are now constructed with much greater accuracy than in past generations; the best of them are made to measure not only the hours, but also the minutes and seconds with unfailing precision. Yet the majority of persons have grievous difficulty very frequently with regard to the proper time of the day. From one end of the country to the other we have every conceivable variety in the times indicated by even the most exact time-keepers. As a matter of fact, there is no such thing as true time in common use; everywhere arbitrary standards are employed, and theoretically, as well as practically, it is impossible to answer correctly the simple question—what o'clock is it? without qualifying the reply by some sort of reference to one of the innumerable arbitrary standards. The confusion and the inconvenience have been silently endured by the community, because they have been gradually produced and seem unavoidable, but rapid communications are continually multiplying, and the evil is daily increasing. Telegraphs and railways are spreading like a great spider's web over the face of the continents, and the aggregate inconvenience is becoming so inconceivably great, that a remedy is imperatively demanded.

There is already complete unanimity in every section of the country as to the absolute necessity of some change which will remove the evil. The obstacles in the way of reform in our time service are, however, serious. The universal importance of the question renders it one of more than ordinary difficulty to deal with. As it concerns every person everywhere, no single individual, or body or section of the community, can solve the problem. The simple fact that the regulation of time affects the whole people, points to the necessity of consulting them. In some way or other the people assist in solving the problem, or they should generally acquiesce in its solution.

A good deal of attention has been given to the subject by individuals and societies on both sides of the Atlantic. Scientific societies in London, St. Petersburg, Paris, Cologne, Madrid, Geneva, Berlin, and Venice, have had it under consideration. On this continent it has been investigated by the Canadian Institute and the Royal Society of Canada, by the American Metrological Society, and the Association for the Advancement of Science. It has been earnestly taken up by the American Society of Civil Engineers, and the International Institute is now directing its attention to it. One step of very great importance has already been gained. Scientific bodies and others, who had examined the question, arrived at the conclusion that we should not wait until the natives of Europe arrived at a decision in the matter. It was felt that the necessity for some system for regulating time more satisfactory than the present was even more urgent in America than elsewhere, and that therefore the people on this side of the Atlantic should take the lead in the matter. It was equally obvious that the first step in any system of time reform is the establishment of a zero; that it would lead to harmony of action, and render ultimate uniformity throughout the world possible if a zero was selected which would be common to all nations.

The matter was accordingly brought before Congress, and the Senate and House of Representatives have passed a joint resolution "to authorize the President of the United States to call an international conference to fix as, and recommend for universal adoption, a common prime meridian to be used in the

reckoning of longitude and the regulation of time throughout the world."

Thus the Congress of the United States has taken the first great practical step in the movement of time reform. The determination of a time zero, by the international conference, will establish the key to complete uniformity of system everywhere, and will greatly promote the efforts to secure, on this continent, a standard system for regulating time for railway, telegraph and civil purposes generally. Referring to the question, the special committee of the American Society of Civil Engineers, at the last annual meeting, held on the 17th ultimo, concluded their report in the following words, with the spirit of which we cordially agree:

"The interest of the public will be best consulted by the calling of a convention to examine into all the considerations bearing on the question of time reckoning, and to determine and recommend a system for regulating time, which will secure the greatest advantages to all interested, in every locality in North America. In the opinion of the committee, the convention should consist of delegates representing railway, telegraph, and transportation corporations, scientific societies, chambers of commerce, Department of State, and other bodies interested, in the United States, Canada, and Mexico."

Ottawa, Canada.

REPORT BY S. F. GATES,

A MEMBER OF THE COMMITTEE APPOINTED ON THE PERFECTING OF OUR PRESENT WEIGHTS AND MEASURES.

At a special meeting of the International Institute for Preserving and Perfecting Weights and Measures, held in Cleveland, Ohio, on the 19th of November, 1881, a resolution was passed as follows:

Resolved, That a committee be appointed for "perfecting our present system of weights and measures."

In compliance with the above resolution the undersigned

will in part review the basis (unit) and scale which we are accustomed to use. The language of the resolution implies that we have an imperfect system of weights and measures. The real question should be: can we improve, and can we use only one scale or system? By and with the avoirdupois ounce we have the first or primary unit,—ounce in weight, ounce in capacity (cube), and its equivalent in length, the one-tenth of the foot. There can be no doubt about the decimal scale with the ounce. With this fact the committee are requested to perfect the present system—which is not an easy matter to do—and suit every convenience with but one scale.

Proportions are unyielding. The popular desire is for the decimal, and no doubt by the majority of our people. The undersigned has taken a position on "Weights and Measures Decimal." See the Journal of the Franklin Institute, volume CIV., No. 2, August, 1877, page 121. This will be the first or principal reply to the request of the Institute.

The desire to find an arrangement that would answer the purpose, in a decimal ratio, and be agreeable to the English foot as a substitute for the metre, prompted me to look about and see what could be done, and (after I had in my mind the basis or formation of what appeared to be a good arrangement) I found reference made to the way I had in view, in the lecture of Sir John Herschel, on the pendulum, the yard, and the metre.

In this lecture the subject is examined from the standpoint of exact science, and in this regard it is well worthy of attention.

The lecturer says: "If we are to legislate at all on the subject, then the enactment ought to be to increase our present standard yard (and of course all its multiples and sub-multiples) by one precise thousandth part of their present lengths, and we should then be in possession of a system of linear measure the purest and most ideally perfect imaginable. The change, so far as relates to any practical transaction, commercial, engineering, or architectural, would be absolutely unfelt, as there is no contract for work, even on the largest scale, and no question of ordinary mercantile profit or loss, in which one *per mille* in measure or in coin would create the smallest difficulty. Neither could it be doubted that our example would be very

speedily followed both in America and Russia, so soon as the reason of the thing and the trifling amount of the change came to be understood."

There are other reasons in favor of the arrangement.

The foot should be slightly increased in its length, as proposed or arranged by Sir John Herschel, as the scientific unit of length instead of the yard.

Divide the foot into ten parts or decimals, as well as into twelve parts or inches. This will give us the advantage of two divisions or scales of the foot; both are of service.

Subdivide the foot into tenths, hundredths, or thousandths, or carry the decimal divisions to any extent that is desired for the finest measurements or calculations, as now in use to some extent.

Take for measure of capacity and solid unit, the cubic foot, and for the smaller unit, the cube of one-tenth of the linear foot (cubic decimal inch, one-thousandth part of the cubic foot), and equivalent to one ounce avoirdupois weight.

For measure of surfaces—unit, the square foot.

LIQUID MEASURE.—This part of the old system is where the difficulty is, or has been, and there is the want of a correct proportion or harmony of weight, length, and capacity, in the modern or extremely scientific way of proportioning the whole system to a certain amount of distilled water, under the present admitted or agreed upon conditions, and in conformity with the French measures or system.

The probability is, at the time the system of weights and measures used by the English was discovered or arranged (many centuries ago), chemistry and the science of distilling water were not known, or carried to that extent that they are at the present time, and a certain kind of spring water or sea water was made use of as a basis.

The variation or increased density of water can be very easily effected, and the required specific gravity to the cubic foot realized without increasing its capacity, and the value of the avoirdupois ounce sustained. Taking this into consideration it leaves one to believe that the French system (without the metre), as a system, existed, and may yet prove to have been

in use before the metre was presented to the National Assembly of France with so much pomp and ceremony, less than one hundred years since.

The decimal unit of capacity or liquid measure in the English system is wanting; there may be more than one way of making it, but the gallon is not the proper unit of liquid measure.

Sir John Herschel, in his lecture referred to, says:

"As regards our measures of capacity, the connection would be equally consecutive, as a decimal one, between the cubic foot and the half-pint, which, for the purpose in view, ought to have a distinct name (such as a 'tumbler,' or a 'rummer,' or a 'beaker'), and which would contain exactly 1-100 part of a cubic foot, with whatever liquid or solid matter it might be filled."

Sir John Herschel proposes to call the half-pint measure, or unit of capacity (containing 1-100 part of a cubic foot), the "beaker."

In appearance, the unit of capacity, or liquid measure, should conform to the ounce or 1-1000 part of the cubic foot.

The "beaker," or cup, of ten ounces avoirdupois, would conform to the unit of length (the foot). Both may be used, but the decimal divisions of the ounce, as a unit for chemists and for fine measurements, would be best.

The bushel should be made up of a certain number of ounces in capacity or weight.

There appears to be a need of net and gross weights, and to some extent with the liquid measures, and to bear a similar proportion to the wine measure that the gross ton does to the net ton, this to be allowed as a custom to wholesale purchasers —say ten or twelve per cent., or such per cent. as the substance may justify, in addition to the net weights or measures for gross, as well as in numbers or count.

The avoirdupois ounce of 437.5 grains, instead of the pound, should be the unit.

The ounce to be the unit or basis of every weight—the pound, the net and gross ton, the gallon, or the bushel.

The liquid avoirdupois ounce decimally divided.

In making up or compounding a prescription or formula, the

grain or the ounce, decimally divided, can be used, and conform to the old or proposed system.

The application of the Greek and Latin terms is in conformity with the French system, and as an illustration;—they would naturally be dispensed with in common or everyday use,—there is no need of anything more than to enumerate the units of each weight or measure.

SCIENTIFIC REVISION OF ENGLISH WEIGHTS AND MEASURES.

Kilo ounces (1000) equal 1 cubic foot.
Hecto ounces (100) equal .1 of a cubic foot.
Deca ounces (10) equal .01 of a cubic foot.
Ounce (1) equals .001 of a cubic foot.
Deci ounce (.1) equals .0001 of a cubic foot.
Centi ounce (.01) equals .00001 of a cubic foot.
Milli ounce (.001) equals .000001 of a cubic foot.
One ounce equals 437.5 grains.
Deci ounce (.1) equals 43.75 grains.
Centi ounce (.01) equals 4.375 grains.
Milli ounce (.001) equals 0.4375 grains.

Graduated test tubes, glasses, or any instrument for solids, liquids, or elastic fluids, are to be made correctly from the above scale. The cubic foot of atmospheric air, its assumed gravity being 1, is the unit of elastic fluids (at present enumerated or represented by grains, in weight), to be decimally divided.

The graduated scale beam, or the notches on the edge of the steel-yards, should be divided and made one ounce, or the decimal portion of the ounce, apart. The poise to be the ounce or its equivalent. On one side of the beam should be made long divisions of 16 ounces, or pound; on the other side of the same beam, long marks or divisions of ten ounces to conform to the decimal divisions. This conforms to the decimal system of weights and measures, in connection with the foot and avoirdupois ounce. To enumerate or arrange the measures of weights, liquid measures, coin, apothecaries' weight, etc., under their various headings, would be to repeat the decimal divisions of the ounce, or the foot, in the form of the French metric tables, by changing the names of the units.

On page 4 of the report of the Secretary of the Treasury, on Construction and Distribution of Weights and Measures, dated Washington, D. C., December 31, 1856, is found the following table of the decimal division of the avoirdupois ounce: "Those States to which the balances have been delivered have also been furnished at the same time with a set of avoirdupois ounce weights, in addition to the above, consisting of the following pieces:

One	8	oz.	avoirdupois.		0.02	avoirdupois of silver wire	
	4		"		0.01	"	"
	2		"		0.005	"	"
	1		"		0.004	"	"
	0.5		"		0.003	"	"
	0.4		"		0.002	"	"
	0.3		"		0.001	"	"
	0.2		"		0.0005	"	"
	0.1		"		0.0004	"	"
	0.05	avoirdupois of silver wire			0.0003	"	"
	0.04	"	"	"	00.002	"	"
	0.03	"	"	"	0.0001	"	"

Coins, in their weight and diameter, should harmonize with the foregoing weights and measures.

It would hardly be worth the while to go into more of an explanation so far as the decimal scale is concerned. Every one will agree that a complete and perfect system can be effected if it does not exist. We have evidence that the Greek measures were decimal, and the Roman duodecimal, and that the Roman common measure of land was the ten-foot pole—a measure that is now in existence and in common use, evidently derived from the decimal scale. Is it not probable this scale existed previous to the Christian era, and that we are going over this question or issue again, aggravated and in contest with our opponents? If there can be an improvement in the scale, let us fully and carefully consider it.

Unfortunately the French decimal scale does not suit all divisions and proportions. The Hon. John Quincy Adams, in his report on the Metric System, February 22, 1821, says:

"The French System has the advantage of unity in the weight and the measure, but has no common test of both. Its measure gives the weight only of water. The English system

has the inconvenience of two weights and two measures: but each measure is at the same time a weight. Thus the gallon of wheat and the gallon of wine, though of different dimensions, balance each other as weights. A gallon of wheat and a gallon of wine, each, weighs eight pounds avoirdupois. This observation applies, however, only to the original principle of the English system, and not altogether to its present condition. There is a difference between the troy and avoirdupois weights, but not between the wine and corn gallons.

"The experience of France has proved that binary, ternary, duodecimal, and sexagesimal divisions are as necessary to the practical use of weights and measures as the decimal divisions are convenient for calculations resulting from them; and that no plan for introducing the latter can dispense with the continued use of the former."

In the report on weights and measures by Alfred B. Taylor, Philadelphia, Pa., read before the Pharmaceutical Association at their eighth annual session held in Boston, September 15, 1859, the author says:

"Decimal arithmetic thus appears to be coeval and coextensive with the human race. It is, indeed, perhaps, the most universal of human institutions—at least as universal as language itself. From this universality, most writers have called it the 'natural' system, but on examining the question whether the number ten possesses any intrinsic excellence or convenience to recommend it—any peculiar fitness as a ratio of geometrical progression, we find but one answer—it has none. It differs from any other number only in quantity, not in quality. So far from its presenting any merit or advantage over its compeers, it is almost the last number which a true science of arithmetic would have selected for the important function of a radix of numeration. Its universality flows simply from the fact that the necessities of man impelled a selection, in the very earliest infancy of the race, long before the invention of letters, and while yet a language was but slowly being formed; and the selection comes to us stamped with the crude impress of a most irrelevant accident. Had the six-fingered giant slain by Jonathan (II Sam., xxi., 20), lived early enough to be the father of the first unreasoning tribes, we should have had a duodecimal arithmetic; or if, like the fowls of the air, we had usually but four toes to our extremities, we should now have been able to calculate only octavally, and in either event we should have been much more skillful as computers than we are at present.

"Decimal numeration is 'natural' then, only in the sense that

ignorance is natural. The fingers have no more real or 'natural' relation to the properties of number, than have any other organs or divisions of the human body; and mathematically or philosophically considered, the digit is, therefore, no more a typical unit than a tooth (of which there are thirty-two), or the leg of a spider (of which there are eight), or the petal of a flower (of which there are or may be any number). Nor have any but the most ignorant races—those without a literature and an alphabet—ever occasion to group and tally by their fingers. Only from unlettered savages could such a scale, therefore, have been derived."

With these statements, both from different reports and by men of undoubted ability, the decimal scale must take with it other scales or associates—although it may be considered to be first in order.

The number "8" is pre-eminently the fitting number for giving law to the distribution of weights and measures.

This may be, but does it meet or answer all the requirements of linear measure?

Most people take and make use of the inch—one-twelfth part of the foot—as the unit.

This inch is the convenient division of the foot—very much made use of as a standard measure for small things and plans, and with the machinist (from custom) almost indispensable. In considering this question of English units—that of linear measure is secondary, and the inch is not as convenient as the ounce—1-10 part of the foot = 1 2-10 inches.

If a scale of 8 should be arranged agreeably to the resolutions, should it not be with the ounce units? 1 2-10 inches $\times 8$ equals 9 and 6-10 inches to the foot. The one ounce 1×8 equals the ½ pint, also one foot.

What necessity then is there for dismissing our duodecimal scale, unless it does not contain or conform to the sixteen ounces to the pound,. which is, with us, a convenient weight, and makes up the pounds of water to the cubic foot—as well as the ounces—but not the unit. The duodecimal division gives equal aliquot parts of the unit, of two, three, four, six. By giving the third and the fourth, it indirectly gives eighth and sixteenth, and gives facility for ascertaining the ninth, or

third of the third. Decimal division, in giving the half, does not even give the quarter, but by multiplication of the subdivisions.

There evidently has been, if there is not now, an extensive system to our weights and measures; not, perhaps, in the multiplying 10 by 10, or 8 by 8, or 12 by 12—but in the divisions and proportions.

TABLE OF LINEAR MEASURE

made up from or with 8 points to the line, 8 perches to the furlong, and 8 furlongs to the mile. The scale produced by 8×8 equals 1,820 yards, 1 foot 4 inches,

Equals 65,536 in.; this divided by 2 equals 32,768 inches
65,536 in. divided by 4 equals 16,384 inches
65,536 in. divided by 8 equals 8,192 inches
65,536 in. divided by 16 equals 4,096 inches
65,536 in. divided by 32 equals 2,048 inches
65,536 in. divided by 64 equals 1,024 inches
65,536 inches divided by 3 equals 21,845⅓ inches
65,536 inches divided by 5 equals 13,107 1-5 inches
65,536 inches divided by 10 equals 6,553 6-10 inches

This is the extent of the comparison—2, 4, 8, .16, 32, 64, without a fractional remainder.

It will be observed that the mile, 5280 feet, can be divided and measured

By 2, 4, 8, 16, 32, 64, and 128;

By 3, 6, 12, 24, 48, 96, and 192;

By 5, 10, 20, 40, 80, 120, and 160 and more. Is this not a remarkable combination of figures?*

The foot, with the scale of 12:

12 divided by 2 equals 6.

12 divided by 3 equals 4.

12 divided by 4 equals 3.

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*[The number 5280 is divisible by 46 integral numbers besides itself and unity. The following is the full list: 2, 3, 4, 5, 6, 8, 10, 11, 12, 15, 16, 20, 22, 24, 30, 32, 33, 40, 44, 48, 55, 60, 66, 80, 88, 96, 110, 120, 132, 160, 165, 176, 220, 240, 264, 330, 352, 440, 480, 528, 660, 880, 1056, 1320, 1760, 2640.

No number below 5280 has a larger number of integral divisors, although at leas three others have as many, viz: 3360, 3960, 4620.—ED.]

12 divided by 6 equals 2.
The foot or scale of 10:
10 divided by 2 equals 5.
10 divided by 5 equals 2.
The foot scale of 8:
8 divided by 2 equals 4.
8 divided by 4 equals 2.

The foot or the scale of 16 has, to appearance, no better divisions than that of 8—anything for a foot or unit of length, longer than this or even longer than 12 inches is not convenient, and is out of the question.

The convenience of the various measures of length is probably what has brought them into existence and thus far sustained them in common use. [Not that they mean anything more than a convenient measure, and a multiple of the unit not expressed.]

The foot (and now the steel scale), with the two foot rule, are the measures for mechanics.

The yard (a standard of length but not a unit), being the householders' and storekeepers' convenient and constant companion; the fathom (the mariner's double yard), the ten-foot pole, the surveyors' and mechanics' first, or long measuring rod—all of these are established by their convenient use, and no scale or system should violate them.

We should complete and perfect the decimal scale or system, and with it we should harmonize the duodecimal scale, which is to some extent decimal.

LETTERS

FROM PROFESSOR SMYTH, AND THE DISTINGUISHED FRENCH AUTHOR AND SCIENTIST, ABBÉ L. MOIGNO.

The following letter was written by Professor Smyth, astronomer royal for Scotland, in answer to one from Mr. Latimer, giving a number of important formulæ from Mr. J. H. Dow's paper, entitled "A Restored Leaf in the History of the

British Inch," and also his own discovery of June 2d of formulæ for finding the true parallax of the sun, a synopsis of which papers are published in this number of the INTERNATIONAL STANDARD:

No. 15 ROYAL TERRACE, EDINBURGH,
(temporarily at Buxton),
July 2, 1882.

Yours of June 8th has reached me still here. Your letter's grand burden is what you find you can do in and by pyramid propositions and sizes in British inches. By the same post I have had a letter of largely similar findings by Dr. W. F. Quinby, Wilmington, Delaware, but with still quite enough of difference to make it a case of original independent discovery with each of you. But he has already published; wherefore let me counsel you to publish immediately as much as you have sent me from your original paper, with date attached, both for manuscript and print; and then put yourself into communication with him, and induce him to come out as a member of the International Institute; then both work on for the common good. You bring out such a series of cosmical numbers that he would be very rash who should attempt off hand to say there is nothing but chance in it, or on the other side, that the numbers and proportions are all in the solar system, and each have been equally got at without any reference to the Great Pyramid. Yet this has been said by Proctor and others. However, I doubt whether he, or anyone else, ever heard of them until you and others were led to them by the Great Pyramid, and if the Great Pyramid is found to give these numbers and proportions equally with the solar system in this present age of intellectual man upon earth—why, that is just the point we want to prove, viz: that Divine Providence has especially interested itself in intellectual and Adamic man upon earth: that he has only existed upon it as yet for so short a time in the whole history of the nebular original and slow growth of the solar system—that his age, a period in time, can be marked in eternity by where the earth's axis has such a length, and the sun's parallax such a value, and the day and the year such relative measures as are marked out in the built monument of Divine inspiration, viz: the Great Pyramid; and man need not trouble his head about what the young Darwin has been teaching, that in one hundred millions of years the earth's day and night will be 800 times longer than they are now, and that the length of time that a man will have to go without sleeping will require a power of adaptation of the man to his then circumstances which we

can form no idea of now. For the fact is that God will, in mercy, take the whole responsibility on himself, long before there is any visible change from the present length of day, and night, and year, and polar axis, and sun-distance. However, write also to Abbé Moigno a paper for printing in *Les Mondes*, giving the solar parallax you find per Pyramid, and which man is groping for; for yours comes between the two last printed and approved of by the Royal Astronomical Society, London, viz: in 1881 and 1882. But by the time you receive this you will probably have read the Abbé's own grand letter to you, and have commended it to your Institute; and who knows what openings there may not be presently in the land of Eygpt for those who are on God's side? I remain, yours very truly,

PIAZZI SMYTH.

BUXTON, England, June 22, 1882.

MY DEAR SIR: This morning there has arrived a most glorious letter for you from the Abbé Moigno. It is spirit-stirring to a degree, and for all mankind with any spark of true religion in them.

I prefer to make a copy of it to keep here, or rather in Edinburgh, until you advise me of the safe receipt of the original.

. . . . . .

Picture to yourself a noble old man, confining himself entirely to his working room, with strength to wield a quill, and blowing a trumpet blast in the Pyramid, Bible, and Metrological cause, fit to wake the dead, and blowing with such power, because he blows with faith.

So, I shall hope to send you this valuable letter by the mail following this. I remain yours very truly,

C. PIAZZI SMYTH.

The following is the letter referred to by the professor, written in English. The reader will notice that here we have in Paris, in the very midst of the enemy, a staunch and vigorous opponent to the French metric system. The Abbé is an able scientist and writer, and is author of the following work: "The Splendors of the Faith, or the perfect harmony between Revelation and Science, Faith and Reason," 5 vols.; also founder, editor, and director of the weekly scientific journal, *Cosmos-les-Mondes*—for over thirty years one of the first scientific journals of Paris—and Canon of Cathedral of St. Denis.

PARIS, France, June 19, 1882.

It is already a long while since I promised our illustrious common friend, Mr. Piazzi Smyth, the revealer of the Great

Pyramid of Ghizeh, to address you my congratulations, not only sincere, but also enthusiastic for the now well secured success of your society, as I stand most fully convinced of your brilliant campaign in behalf of the antique lineal measures, both human and Divine, viz.: the inch, the foot, the cubit.

Should the metre—absurd in principle (the ten-millionth part of the meridian which varies in every part of the globe), wrong in its valuation or mensuration, expensive to an excess in its making, unmanageable without being deformed, tyrannical and barbarous in its introduction,—have been imposed on all countries, my sorrow would have been inconsolable.

But you rose, and not satisfied with barring the way to the intruder, you claimed, with an admirable energy, the imprescriptible rights of the old and traditional standards monumentalized in the Great Pyramid of Ghizeh, which, as everything unquestionably leads to show, was built under the superior direction of Melchizedeck, the Priest, by way of eminence, of the Most High, the Priest of the Priests, since Christ himself wished to become a priest according to Melchizedeck's order, and at the same time according to the ancient traditions, still alive among the wandering or settled Arabian tribes, the great geometrician, the great astronomer, the great architect, the mightiest figure of the times of old!

I share with my whole soul in your courageous apostolate. Mr. Piazzi Smyth had shown me the way; I followed it as best I could; you came after us, and you entered the career like a giant. Now I want to rush again after you, with the strong resolution this time to take the bull by the horns and throw him down, for I had dealt a violent blow. But the revolution has again resumed the command over France, and the metre is the mouse brought forth by the mountain. The metre which, in its way, is the negation of holy traditions and of God, will obviously be swept away with the revolution.

My efforts would only have succeeded in causing a terrible excitement without any hope of seeing a salutary crisis; therefore I stopped.

In your country the commonwealth is not the revolution. It is religious and Christian.

You could act, agitate, and have acted and agitated: and your providential agitation has turned aside the fatal issue.

Thanks, a thousand thanks! We may henceforth await for better days, and triumph will be complete. The final success of what remains to be done is reserved for France to accomplish. When she is again the France of God, and of her Christ, she will repudiate the metre, and adopt the standard and

first units of mensuration—the cubit of the Great Pyramid, the cubit of Moses, the cubit of Solomon, the cubit of God, the ten-millionth part of the semi-polar axis of the earth—a mysterious fraction which imposes itself even on the revolution.

Till the glorious day, which, thanks to you, will shine upon us, let us all work together and strive to preserve the Great Pyramid, whose flanks still conceal so many treasures of inspired science, to the end that it may become an international monument, placed under the protection of all the Christian and civilized powers, who will preserve it from further damage, who will repair it, who will restore its primitive casing in polished calcareous stones, and will adopt this pillar of witness for the world's meridian, unless they prefer to it Jerusalem, the holy city. . .. . .

That is not all. You know, vaguely at least, the chivalrous project whose programme I have already formed, and welcome both in Germany and America, to organize an undertaking for the search of Pharaoh's army, swallowed up in that region of the Red Sea which constitutes to-day the salt marsh.

How many archæological and other riches will be drawn from their depths, where they have been buried for above three thousand years, and providentially preserved, perhaps, in thick beds of salt! How many chariots, horses, warriors, standards, weapons, documents, etc., and who knows, perhaps, with his helmet on his head, will be found the Pharaoh Merepheles the first, the vanquished of Moses.

Well, now, all these riches, it is hoped, will come and adorn a vast museum, to be built opposite and around the Great Pyramid! and that museum, to be visited by crowds of pilgrims coming from every country in the world, especially from your rich and curious America, and become a source of abundant revenues which will secure forever the keeping in repair of the peerless monument that hides in its prophetic flanks even the mystical date of the last judgment.

In sight of that conspicuous and tangible manifestation of the most solemn, most gigantic of miracles in the Holy Bible, we shall all have but one soul, one heart, one mouth, and will exclaim together: Glory unto God Almighty; glory be to His Great Pyramid, to the splendor of the splendors of His Providence over all the history of man. Hurrah! Hurrah! Your faithful servant,

ABBÉ F. MOIGNO.

Canon of Cathedral of St. Denis, Editor and Director of the Weekly Scientific Magazine, *Cosmos les Mondes*.

St. Denis, 19th June. 1882.

JAMES A. GARFIELD.

We have chosen the portrait of General James Abram Garfield, our late honored, and greatly lamented, President and Chief Magistrate, to face the first number of our magazine, because he was chosen the first president of the Institute, and only declined to accept because he concluded that, as member of Congress, he could not properly occupy that position where he might be called upon some day to sit as a judge, should the question of a change in our system of weights and measures come up in Congress.

The vacancy was not filled until after his death.

His interest in the subject of our Institute was greatly awakened by the act of his election, and he gave, as he promised to do, ever after, more especial attention to our work.

He was born on the 19th day of November, at 2 o'clock in the morning, of the year 1831, near Solon, Cuyahoga county, Ohio.

The same stars which looked upon the last moments of George Washington, the patriarch of liberty, shone upon the moment of the birth of James A. Garfield; and the constellation whose type he was, with sword uplifted, was the one claimed by Nimrod and Napoleon Bonaparte. Orion,* the constella-

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*Dr. Joseph A. Seiss, D.D., in his work entitled The Gospel in the Stars, or Primeval Astronomy, says of Orion:

This is one of the grandest of the constellations, and so beautifully splendid, that when it is once learned it is never forgotten.

When it comes to the meridian, a very magnificent view of the celestial bodies presents itself above the horizon. It is especially celebrated in the book of Job, and is mentioned in Amos and in Homer.

And because of its great magnificence, the flatterers of conquerors like Nimrod and Napoleon, selected it for association with the names of these men.

The figure is a giant hunter, with mighty club, or sword, in the right hand, in the act of striking, and in his left the skin of a slain lion.

"First in rank,
The martial star upon the shoulder flames;
A rival star illuminates his foot,
And in his girdle beams a luminary
Which, in vicinity of other stars,
Might claim the proudest honors."

tion of the measuring rod, and of just weights and measures—which shone in meridian splendor, in the place of honor, at his advent, appeared in the east at his birth into the heavenly mansions, whereto he was translated by the act of a human scorpion, at 10:55 P. M., September 19, 1881, bearing on his arm the trophies of his work on earth.

As a child he was dutiful, loving, and useful; as a man he was brave and true, and earnest; as a friend he was faithful; as a teacher he was unexcelled; as a husband and father he was as a patriarch of old; as a Christian and a preacher of righteousness, in precept and example, he was as one of the sons of God; as a statesman, soldier, patriot, president, he lived as unto God, and died without fear, but full of hope of a blessed immortality, of which, in every station in life, from the cradle to the grave, he was eminently worthy. He was an eminent example for the youth of our country and of the world, and an ever-living proof that God looks not upon the condition but upon the heart.

His left foot is in the act of crushing the head of the enemy. He wears a brilliant, starry girdle, to which hangs a mighty sword, the hilt or handle of which is the head and body of the lamb. Concerning the idolatrous and the wicked, God hath said: "Behold I will send for many fishers, and they shall fish them; and after I will send for many *hunters*, and they shall hunt them from every mountain and from every hill and out of the holes of the rocks; for mine eyes are upon all their ways; they are not hid from my face, neither is their iniquity hid from mine eyes. I will recompense their iniquity and their sins double."—Jeremiah 16: 16–18. And here is the great captain and prince of these hunters in full and mighty action. His name is Orion, he who cometh forth as light, the brilliant, the swift.

The book of Job speaks of him as invincibly girded, whose bands no one can unloose. Betelguese, a star of the first magnitude, flames on his right shoulder; and Betelguese means "The Branch Coming." Rigel, another star of the first magnitude, flames on his lifted foot; and Rigel means "The foot that crusheth."

In his belt are three shining brilliants called "The Three Kings," also "Jacob's Rod"—Isaiah 11:1: also "The Ell and Yard," giving the rule of celestial and righteous measurement, just as it is said of the Rod and Branch from Jesse's roots. "Righteousness shall be the girdle of his loins, and faithfulness the girdle of his reins."—Isaiah 11:5.

In his left breast shines a bright star, Bellatrix, which means swiftly coming or suddenly destroying.

The Arabs call him Al Giauza, the Branch; Al Mirzam, the Ruler; Al Nagjed, the Prince.

He is but another figure (or forerunner) of the same invincible Avenger represented by the Enraged Aurochs. The horn of the Messiah exalted into the horn of the terrible Aurochs. . . .

A Scorpion sprang up out of the earth, and gave him a mortal wound, but at Diana's request he was raised to immortality and placed in the heavens over against the Scorpion.

As a man he was magnificent, finely formed, about six feet in height, with large head, and massive, broad shoulders, deep chest, thoroughly well-proportioned, symmetrical, though large throughout, grand brow, blue eyes, finely-formed nose, light or blonde hair, curling whiskers, in fact, a strong, earnest physique and nature of the Anglo-Saxon type.

Such was the man whom we hoped to have as our leader as he was our friend in our work. Such was the man we are thankful to have known, and delight to honor.

THE GREAT PYRAMID.

"OUR INHERITANCE"—OR, OUR "CONCEIT?"

God is not vague,—extemporaneous:
He is not Lord Almighty by caprice:
Though all be fluent to immediate touch,
And all obedient to instant thought
Of Power and Will that in Him are the Life;
Yet o'er the floods of possibility,—
The rolling waters of the world to be,—
Moved that great Thought in pondering of Law;
And held, as left hand in the grasp of right,
The waiting act: His awful Infinite,—
Space without space, and Time that hath no term,—
He put in measurement; made definite:
Sent forth creation from a dread reserve,
Causing sweet order to be slowly born,
Instead of ruin from unstinted Force.

So in the waters laid He the great beams
Of fair and solid chambers; so He weighed
The separate grains of each considered earth,
And in His measure comprehended them;
Meted the heaven with an accurate span;
By the pure scale and balance of His truth
Portioned out hill and mountain; held the drops
Of seas and rivers in His hollowed hand
Before he let them fall to find their way
In seeming of their free sweet wanderings.
Wherefore took He such counsel in that day?

Because He was to be the Lord of Hosts;
Because His creature was to live, and know

How absolute and righteous was His plan;
Because there should be truth 'twixt God and man,
And right 'twixt neighbor and the neighbor so;
Because the perfect way the child must see,
That as the Father he might perfect be.
From such necessity,—to such dear end,—
God wove in dust the wordless parable,
And by calm hindrance of omnipotence,—
Wonder of number,—miracle of line,—
Set in each work His secret and His sign!

If, in this temple of the universe,—
This builded revelation of a pile
So reared and stretched that none may scan the whole,
Or lay, as this to that, by utmost thought,
Proportion to proportion, or convey
Impression to impression, till he feel
Any faint shadow of its sense complete,—
If so, with eager, yet inadequate feet,
We stand in entrance-ways of awful aisles
That open through the eternal distances,
What word have we, if somewhere in its gates,
Or grand foundation, or on corner stone,
We find a graven rule and diagram
So clear-compared with each initial known
That none may doubt the unknown in it waits?

Because the finished pillars rise in light,
The lines severe blossom with sculptured grace,—
Because the arch is vast, and blue the height,
And the great tides of music sweep the place,—
Shall we the vouchsafed verity pass by
That doth the whole compel and underlie,—
DARE to deny before we understand,
And spurn the witness of the Builder's hand?

A. D. T. WHITNEY.

Milton, Massachusetts, August, 1882.

REVIEW

OF PROFESSOR PROCTOR'S NEW WORK: THE GREAT PYRAMID OBSERVATORY, TOMB, AND TEMPLE.

This book is an interesting and valuable contribution to literature. Its author, eminent as an astronomer, a writer, and an Egyptologist, ably, though briefly, reviews the information which has been gathered concerning its builders. He then proposes a theory, and supports it by the best arguments which

Egyptologists have yet produced, maintaining that the Pyramid was built by Cheops, an Egyptian king of the fourth dynasty, for the purpose of an astronomical and astrological observatory, to be used during his lifetime for reading his destiny in the stars, and for ruling them, in the sense of taking advantage of their aspects to insure his good fortune, and finally, at his death, for a tomb in which his body might lie undisturbed forever.

Archæology and history, Professor Proctor declares, sufficiently establish the fact that certain wise men, shepherds from a country east of Egypt, by means now unknown, obtained great influence over Cheops, and were employed by him to superintend the building of the Great Pyramid, at least so far as its astronomical and astrological arrangements were concerned. These shepherds were Chaldeans, monotheists, of the family of Terah; and the author says concerning them: "It was a distinguished member of the family, the patriarch Abraham, who said: 'I have lifted up mine hand unto the Lord, the most high God, the possessor of heaven and earth, that I will not take from a thread even to a shoe latchet, and that I will not take anything that is thine, lest thou shouldst say, 'I have made Abraham rich.' Vain would all the promises and all the threats of Cheops have been to men of this spirit. Such men might help him in his plans, suggested, as the history shows, by teachings on their own conditions, and those conditions would most certainly include the utter rejection of idolatrous worship by the king in whose behalf they worked, as well as by all who shared in their labors."

This is Professor Proctor's explanation of the historical fact recorded by Heroditus, that the idol temples of Egypt were all closed during the building of the Great Pyramid; yet in the face of all this admitted testimony, the author declares concerning the pyramid; "a tomb, and nothing else it has been ever since Cheops died."

Very possibly the ambition and object of the Egyptian king reached no farther than this. Those wise shepherds might not have revealed to him their deeper purpose; but a deeper they had; for the purpose of such a gigantic work, requiring the

best years of their lives for its fulfillment, must have been paramount to all others; and with men who became voluntary exiles from their country because of their religion, that paramount purpose was surely a religious one. Fortune-telling, and the building of a magnificent tomb, "and nothing more," though their customer were the greatest king on earth, could not have tempted them.

Just here, we think, is the great mistake in Professor Proctor's book. He does not yet understand how it is possible that men of great learning may make religion paramount to mere human science. His own reversal of this order is apparent. Take for illustration his marginal note, page 253: "He [Moses] showed considerable skill, if Dr. Beke was right, in his application of such [astronomical and astrological] knowledge (combined with special knowledge acquired during his stay in Midian), so that his people should cross part of the Gulf of Suez during an exceptionally low tide. For though the Egyptians may have been acquainted with the general tidal motion in the Red sea, it may well be believed that the army of Pharaoh would be less familiar than Moses with local peculiarities affecting (in his time) the movements of that sea."

This quotation shows that the author, like many other prominent scientists of the present age, is inclined to deify natural law, and to reject the doctrine of special providence. Indeed, it is a notorious fact that modern scientists are the framers and supporters of modern skepticism, and their teachings have so far tainted society that multitudes, nominally Christian, have no real faith in the power of prayer. So great has been the progress of this spirit of skepticism, that many sincere believers have almost come to fear its triumph. But the stability of God's government never knows crisis. Even now is beginning the development of a plan, deep laid, and grand, and sure, which will completely overthrow this skepticism.

The builders of the Great Pyramid, who, says Professor Procter, were of the family of Terah and worshipers of the true God, (and be it remembered that all of the inspired writers of the Bible were of this family) recorded, with immense labor, the best of modern science in that structure, expressing it,

through the medium of modern measures, which equally yield a double interpretation, one mathematical, the other religious; then sealing up the pyramid, they left it to remain concealed till earthquake, and vandalism, and avarice, and other forces, under God's providential control, should strip off the covering, and, in the fullness of time, should reveal the secrets which he had inspired those workers to record for the discomfiture of modern skepticism.

Far be it from us to go about to establish a new religion, as Professor Proctor insinuates that we do. The Great Pyramid does not record a new religion; it is but a witness to the perfection of the old; and if it shall bring *mathematical* demonstration that true science and true religion are coördinates in God's universe, it will but show to the intellect that which the heart of every true Christian already knows.

Poor arguments are often used in support of a good cause, and ours has received very much of such bolstering. We therefore acknowledge the force of much of the author's criticism, which we may review at a future time. On the whole we like the book for its interesting style, its valuable information, its ingenious and often probable theories, its criticisms, and the beautiful manner in which it confirms that which its author designed to refute. J. H. D.

The correct pronunciation of the Abbé Moigno's name will be found in the biographical department of Webster's Unabridged Dictionary.

The next issue of our Magazine will contain an important letter from Rev. H. G. Wood, of Sharon, Pennsylvania. Mr. Wood proves that 1′ of a degree of longitude at the Great Pyramid is *very nearly*—he claims exactly—5,280 feet, or one statute mile.

THE PYRAMID THERMOMETER

COMPARED WITH FAHRENHEIT, RÈAUMUR AND CENTIGRADE.

The Astronomer Royal for Scotland discovered in the Pyramid the symbol of a thermometric scale. Taking 0 or zero as freezing point, the same as Rèaumur and Centigrade, and taking 50° as the temperature of the King's chamber, which, being on the 50th course of masonry, symbolizes that degree—a most interesting result is obtained, as seen by inspection of the following diagram:

Fahrenheit	0	32°	68	176	212	180	752	1832	2552	2912	3632
Reaumur		0	16	64	80	288	320	800	1120	1280	1600
Centigrade		0	20	80	100	360	400	1000	1400	1600	2000
Pyramid		0	50	200	250	900	1000	2500	3500	4000	5000

To pass from Fahrenheit to Centigrade, subtract from Fahrenheit 32, and multiply by $\frac{100}{180}$. To pass from same to Réaumer, subtract 32 and multiply by $\frac{80}{180}$. To pass from same to Pyramid, subtract 32 and multiply by $\frac{250}{180}$.

By the suggestion of Jesse H. Jones, of Massachusetts, seconded by S. F. Gates, of the same state, a Pyramid thermometer was constructed for the Institute by J. S. F. Huddleston, of Boston, under their direction as a committee. It has engraved upon it three scales—Centigrade, Fahrenheit and Pyramid. It is 20 inches long and 2½ inches wide.

Mr. Huddleston also manufactures a smaller thermometer with the two scales—Fahrenheit and Pyramid.

There will be noticed a very curious decimal relation in the Pyramid thermometer. Commencing at 0 for freezing, we have 50 or 10 times 5 for the degree of Perfect Health, as Jesse Jones terms it—equal to 68° Fah. At 250 water boils, that is, at 5 times 50: at 10 times 50 or 500, we have point of water boiling at 15 atmospheres; at 18x50, zinc melts; at 20x50, iron is visible in the dark; at 50x50, silver melts; at 70x50, steel melts; at 80x50, wrought iron melts; at 100x50, platinum melts.

Extract from a letter from Piazzi Smyth, of May 26, 1882:

"Next, came a neat little box, so innocently laid on my table one morning after breakfast, that I thought it could not have come further than from London, or perhaps not so far, by rail; yet it had traveled all the way from Cleveland, Ohio, and what is more, had brought the Messrs. Huddleston's capital Pyramid and Anglo-Saxon thermometer safely with it. After putting it up to take the air for an hour or two in my library, I found its stem beautifully clean, the scale easy to read, and the height of the mercury not more than 0.2 of a degree from a standard thermometer here. I compared it also, for general treatment as a Pyramid thermometer, with one I had had prepared several years ago for the South Kensington scientific collection; and was happy to confess that that one legend by the Boston makers of "Perfect Health," even against 50° of the Pyramid, was the most admirable condensation I had yet seen of the pages of argument that others, as well myself, have written in elucidation of the innate anthropological excellencies of the Great Pyramid temperature scales."

☞ The proper limit of each number of the magazine is 64 pages, but by accident this first number has extended to 72.

THE

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This is the title of the society under whose auspices this "magazine" is sent forth to an intelligent, thinking and scientific world. In its principles, no personal, selfish, sectional, or political aims are included. It purposes only the good of man —the best interests of the nation and the world at large. It believes in the authority and high antiquity of our Anglo-Saxon standards of "*weights and measures*," which have come down to us through the ages, designed for perpetuity to the latest generation. Its investigations into the origin and inspiration of these *standards* are without a parallel in the history of the races. Many of the best minds in the world are contributing to these objects, without compensation or hope of reward beyond the consciousness of good performed.

Its real work, however, cannot be accomplished without incurring expense. Its workers come from the professions, and other walks of life, not endowed with wealth. No appeal for its financial support and encouragement has ever been made to the public. No one has been taxed or assessed for this purpose. It is, nevertheless, evident that its vast and important work cannot be carried on without money. It is not now in debt. Institutions of minor importance have been liberally endowed, by possessors of wealth and lovers of knowledge. No emblazoned monument could so perpetuate a name—no liberality secure a fame more enviable, than would crown the act of endowment of the "*International Institute.*" Somewhere the name is to be found—some time so glorious an act is to be recorded. It may be by one, it may be by many. Who will inaugurate the proceeding? Who will be its *patron saint?*