Hawke's Bay Research Lodge
No. 305

No. 13. HASTINGS NOVEMBER, 3rd. 1936

SOME THOUGHTS ON GEOMETRY AS APPLIED TO MASONIC TEACHING. -

Lecture delivered by Edgar C. Hurdsfield, P.M.

On many occasions I have met Freemasons who have expressed a desire to make advancement in Masonic knowledge, but who have been handicapped because they have never been fortunate enough to obtain an elementary knowledge of Geometry.

They therefore find it difficult to act upon the recommendation in the final change of the F.C. degree, viz – "The Study of the . . . . . art."

For that reason I have chosen the subject for this evening's lecture, in the hope that those who have previously had little knowledge will find aspiration and encouragement to enter on a course of study.

What is Geometry? To explain its meaning in a short paper such as the present is hardly possible. To understand its meaning really necessitates a personal study, and, when the wonder of the achievements which have been made possible by it are even dimly comprehended, the study of it is no longer a task but a pleasure.

The Rev. John P. Gulliver, said to Abraham Lincoln, "I want very much to know how you got 'this unusual way of putting.' It must have been a matter of education. No man has it he nature alone What has your education been?"

"Well," said Mr. Lincoln, "as to education the newspapers are correct. I never went to school more than six months in my life. But, as you say, this must be a product of culture in some form, and I have been putting the question you ask me to myself, while you have been talking. I can say this, that, among my earliest recollections, I remember how, when a mere child, I used to get irritated when anybody talked to me in a way I could not understand. I don't think I ever got angry at anything else in my life. But that always disturbed my temper, and has ever since. I can remember going to my little bedroom, after hearing the neighbours talk of an evening with my father, and spending no small part of the night walking up and down and trying to make out what was the exact meaning of some of their, to me, dark sayings. I could not sleep, though I often tried to, when I got on such a hunt, after an idea, until I had caught it, and when I thought I had got it, I was not satisfied until I had repeated it over and over, until I had put it in language plain enough, as I thought, for any boy I knew to comprehend.

This was a kind of passion with me, for I one never easy now, when I am handling a thought, till I have bounded it north, and bounded it south, and bounded it east and bounded it west. Perhaps that accounts for the characteristic you observe in my speeches, though I never put the two things together before."

"But let me ask," Mr Lincoln, "did you prepare for your profession?"

"Oh yes! I 'read law' as the phrase is . . . But your question reminds me of a bit of education I had, which I am bound in honesty to mention. In the course of my law reading I constantly came upon the word **'demonstrate.'** I thought at first that I understood its meaning, but soon became satisfied that I did not. I said

to myself, ‘what do I mean when I DEMONSTRATE more than when I REASON or PROVE?’ How does this demonstration differ flow does this demonstration differ from any other proof? I consulted Webster's Dictionary. That told of ‘certain proof,’ ‘proof beyond the possibility of doubt;’ but I could form no idea what sort of proof that was. I thought a great many things were proved beyond the possibility of doubt, without recourse to any such extraordinary process of reasoning as I understood ‘demonstation’ to be. I consulted all the dictionaries and books of reference I could find, but with no better results. You might as well have defined BLUE to a blind man. At last I said, ‘Lincoln, you can never make a lawyer if you do notunderstand what DEMONSTRATE means;’ and I left my situation at Springfield, went home to my father's house, and stayed there till I could give any proposition in the six books of Euclid at sight. I then found out what DEMONSRATE means and went back to my law studies.” Anglo-African - No. 6, Vol. IV.

It is almost safe to say that not one of he wonderful inventions which have made the lot of man more happy and comfortable could have been accomplished without the aid of Geometry. This exact science is indeed “Truth” It is frequently mentioned in our ritual and we are recommended to its study.

Masonry has been described as it peculiar system of morality, veiled in allegory and illustrated by Symbols. Most of these symbols are used to illustrate Masonry because the morality of craft members is strictly enjoined. .Morelity is defined as ‘the doctrine of moral duties; the quality of right or wrong. A kind of drama among our forefathers in which the personages were abstractions or allegorical representations of virtues, vices, etc’

Allegory is a figurative discourse in which the principal subject is described by another subject resembling it in its properties and circumstances.

So the very truths of mathematics, which are proved by Geometry, have been used in our rituals to prove the value of morality and to apply these teachings to our lives and actions.

In the greatest of all books, the V.O.S.L., we read some wonderfully instructive lessons imparted by Jesus Christ during His sojurn on earth. So that the least educated of His audience could understand without the slightest fear of doubt, he spoke in parables.

Who has not read and marveled at the simplicity of the teaching involved in “The Good Samaritan,” "The Pharisee and the Publican,' "The House on Rock and Sand," "The Lost Sheep," "The Prodigal Son," to mention but a few of these gems of literature?

Geometry in its simple truths serves as a similar means to educate and to encourage Right to triumph over Wrong.

Biblical references in our rituals point out where the G.A.O.T.U. Himself has used the symbols of Geometry because of the force with which its teachings would he brought home to the operative masons, whose constant use of these very tools would enable them to more readily

assimilate the meaning. “And the Lord stood upon a wall . . . .more.” (Amos)

Is it too big a thing to say that ‘Masonry os Geometry? I think not. If Geometry is Truth and Masonry is Truth then Masonry is Geometry

Since writing the above I have been privileged to read a paper “Masonry was heretofore termed Geometry” by Bro. W. England, Auckland. In this paper he stated " The first printed Constitutions of the Operative Masons is that known as the 'Roberts Old Charges' which was published in London during the year 1722." In this edition, Geometry is referred to in this way – ‘It's Geometry that teaches Mett and Measure of everything, and from thence cometh Masonry.'

And so, it came about that the works of "Masonry" and "Geometry" were used as interchangeable terms, and in the Old Charges that is emphasised ita second note: - ‘That Masonry was heretofore term'd Geometry’ ”

Geometry is defined in the dictionary as 'the science of magnitude : than science which treats of the properties of lines, surfaces. and solids.'

Our lectures on the ritual state that: - 'Geometry treats of the powers and properties of magnitude in general where length breadth and thickness are separately and collectively considered. By this science the architect is enabled to form the plans, the General to arrange his soldiers, the Engineer to mark out the ground for the encampment, the Geographer to give us the dimensions of the world, to delineate the extent of seas and specify the divisions of empires, kingdoms and provinces. By it also the Astronomer is enabled to make his observations, calculate and fix the duration of times, seasons, years and circles ; in fine Geometry is the foundation of Architecture and the root of Mathematics.

All mathematical reasoning is founded on certain simple principles, the truth of which is so evident that, they are accepted without proof. These self-evident truths are called axioms: e.g., “Things which are equal to the same thing are equal to one another."

By application to the common operations in Arithmetic, viz., Addition, Subtraction. Multiplication and Division. the truth is extended.

In order to draw geometrical figures certain instruments are needed. These are :— (1) a straight ruler. (2) a pencil, (3) a pair of compasses.

The "postulates" or requests which claim the use of these instruments and assume that with their help the processes mentioned may be performed are: —

(1) A straight line may be drawn from any one point to any other point.
(2) A finate straight line may be produced to any length in that straight line.
(3) A circle may drawn with any point as centre and with a radius of any length.

The subject of Geometry is divided a number of separate discussions called "Propositions." which may be either "Theorems" or "Problems."

The Theorem proposes to prove the truth of some geometrical statement.

The Problem proposes to perform some geometrical construction such as to draw some particular line or to construct some particular figure.

The term Geometry is mentioned directly in our second degree where in the final charge the candidate is exhorted to especially study it `as it is established as the basis of our art.'

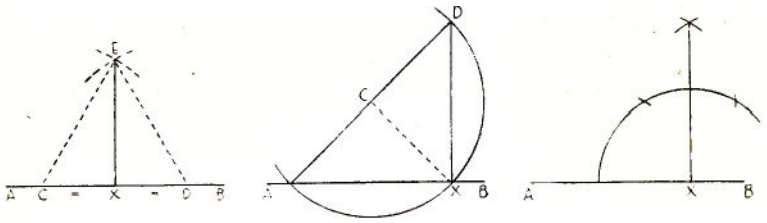
How true this is, is shown by the many references made to it in every degree and an enumeration of some of them will not here be out of place as it will serve to emphasise the point.

In the general instructions are three.

(1) All true and proper signs by which to know a Freemason are s.s , t.s., and p.p.t.s. Circular and oval or irregular perambulations by deacons in charge of candidates are highly improper.

This may be illustrated by Problem 3 in Geometry.
"To draw a straight line perpendicular to a given straight at a given point in it."

This is equivalent to a mason setting an upright course among his fellows. "We meet upon the level and we part upon the square. Since it can be done by various methods so each freemason uses his own methods for solving this problem.



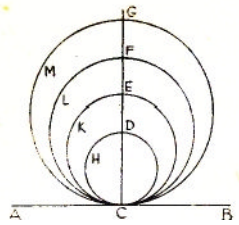
(2) Brethren should always proceed up the N and down the S side of the lodge.
(3) The G should be suspended in the centre of the building.

In opening, reference is made to the sun in its regular movements as the centre of our earthly system and we are exhorted to look to God as the centre of our spiritual system.

The advance to the altar, the position taken dining the O.B. are references to Geometry. Others are made in the three great emblematical lights ; the three lesser lights; in the NE we are taught meet on the level and part on the square.

This is stated in Geometry as follows :

> "The locus of all centres of circles which touch a line at a given point lies on a perpendicular drawn to the line at that point."

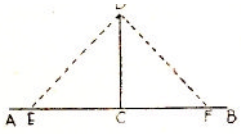


Here each circle may represent one person—one works in a big circle C.M.G., another in a small circle CH.D. All (when they face a common centre G) meet on the level AB and part on the square.

We are presented with a 24 inch guage in the WTs and in the final charge our duty to our neighbour is to act on the square.

In Geometry this is stated as follows :

> "If a straight line fall on another straight line so as to make the adjacent eagles equal then these adjacent angles are right angles.



The TB of this degree is probably more crowded with references than any other portion. Note the references to:— (a) the form of the lodge. (b) the situation, (c) the furniture. (d) the jewels, (e) the TB, (f) the perfect ashlar. (g) point within a circle (h) two great parallels.

The second degree is full of references: -

In the opening the JW tells how he may be proved (S), and the following, ceremony brings out quite clearly the reasons for the same.

The candidate is admitted on the S; he advances again on the S. After investiture he is councilled to study the Liberal Arts and Sciences. These are Grammar, Rhetoric, Logic, Arithmetic, Geometry, Music and Astronomy. He is presented with the tools of Geometry, S.L.P.R., in which the application is clearly defined. The 2nd TB contains references to the Hebrew characters depicted by the "G." referring to the G.G.O.T.U. Here we find that the craftsman is fully equipped for his work.

In the 3rd Degree the tools are put to an improper use for by their aid our Master H.A. was killed.

Are we as masons using the tools improperly? Throughout the ritual we have been told to apply these tools to our morals. Used rightly they can bring only happiness and harmony, thus promoting truth. Used incorrectly, as when in spite of OB's and vows that mercenary motives are not held, business matters, politics and religion are allowed to intrude, then hypocrisy kills the whole spirit of Masonry.

In the 3rd Degree the tools are put to an improper use, for by their the Sk.. P and C's.
At the installation of the WM, allusion is made to the discovery by Pythagoras, Prop. 1.47. one peculiarly appropriate to Freemasonry as it deals with the it. L triangle.

A simple proof for this theorem is as follows:

(1) Construct any right angle triangle BCE.
Extend CB to D making BD = CE.
On hypotenuse BE construct the square A.
On DC construct the square DCFH.

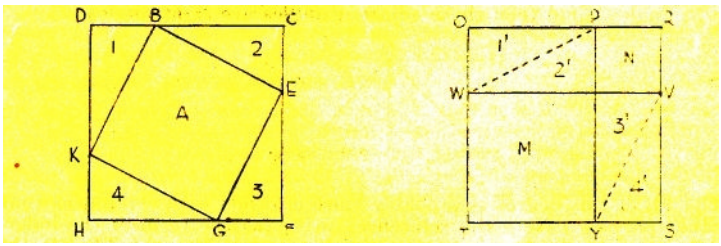
(2) Draw TS = HF.
Mark off SY equals CE, equals PR. equals RV = OW.
Join VW and PY.

Proof :
By superposition it is obvious that 1 and 1^1; 2 and 2^1; 3 and 3^1 4 and 4 are congruent.

Therefore Square A = Squares M + N.

And A is the square on BE; M is the square on BC ; N is the square on CE.

Therefore $BE^2 = BC^2 + CE^2$ Q.E.D.



Geometry is a progressive science based on the simple accepted truths. As progress is made from simple to harder propositions nothing is left to chance; there are no loose statements ; everything is prove by reference to something which has been already tried and proved. Masonry is also a progressive science. Note the reference to this in the charge at the SE corner.

"When you . . . science" and again in the 3rd Degree before the final trial is undertaken which admits the candidate to the secrets, the whole position is summed up in a retrospect of the former degrees.

In beautiful language the candidate has again placed before him the meaning of these degrees—the first Birth—the second Life.

We come into the world equal, helpless and uninformed; we live for a time gaining knowledge, becoming more helpful, more `informed and thus more able to assist others and finally we die. Death is the teaching of the 3rd Degree.

Birth! Life! Death! Which of these claims most of our attention? In which can we mortals do the greatest good? Some apparently leave it until Death has claimed them, and the wealth which they have accumulated, often acquired by devious means, is distributed to charities which will ensure that `he who is placed on the lowest spoke of during the fulness of life we should attempt to maintain those equalities which will ensure

that `he who is placed on the lowest spoke Fortune's wheel may be equally entitled to our regard as the one of the highest.' The symbols of Geometry have been used throughout the ritual to point toward that 'temple not made with hands eternal in the heavens.'

As it is in the "Blue" so it is in the higher degrees of Masonry. Geometry still is used as an effective guide.

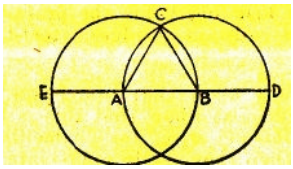
In the "Blue" the ceremonial is based on the circumstances attending the erection of K.S.T.

In the "R.A." it is based on the circumstances attending the erection of the 2nd temple on the ruins of the old.

In the former we deal with right angle triangles.
In the latter the equilateral triangle plays an important part.

The first proposition in Euclids Elements is:

"To describe an equilateral triangle upon a given finite straight line."



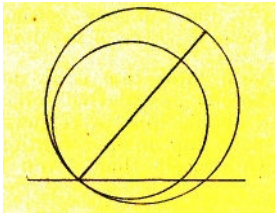
In this problem we are reminded by the division, into 3 equal parts, of the two circles, and by the construction of the triangle itself of the symbol of Deity.

So the simplest proposition is used to prove that he who is worthy an be accepted as a workman.

Life is a cycle or a circle with a central point and our teachings tell us that we hope to find the lost secrets on the centre that being a point from which a MM cannot err. It behoves each one of us as we move round our circle, however small it be to look always towards the centre for there we will find help and guidance from our brethren whose eyes are likewise directed and from Him to whom we must all give an account of our actions.

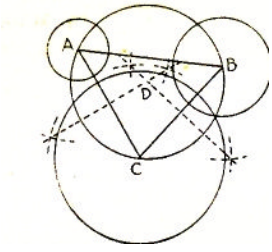
Any deviation to the right or left renders it impossible to regulate our lives and actions according to Masonic line and rule.

We fail to meet on the level and part on the square.



This is stated geometrically— "A circle may be described through work from the same centre.

Brethren in different walks of life may have a common interest and any three points which are not in the same straight line.



A. B. C. represent the centres the three circles.
D is the common centre.

Only under special cireumitances can a circle pass through none than .3 points.

Pupils in schools now-a-days learn much of the marvels of science through simple experiments. Often, however, the experiment is simply performed, but the true lessons to be drawn from it are never applied and the student is left in darkness.

It is correct to show by experiment that metals expand when heated, but if the work finishes there the educative value is small. The greatest value is achieved by bringing home the practical uses to which this is put in the making of railways, bridges. steel-framed buildings, engines, etc.

Pupils should not only know that iron rusts when in contact with moist air, but they should also know that this is the reason for galvanising roofing iron and fencing wire, for enamelling baths. ducoing car bodies and painting. When they really appreciate the fact that without these protective covers, our mighty iron structures, massive in their strength, would soon crumble into powder devoid of tenacity. then the knowledge that iron rusts is a truly valuable possession.

So it is with Geometry and Freemasonry. In the schools the pupils learn the truth of problem and theorem, the proposition and the converse. These to him are mathematical problems but Masonry through Geometry applies these to our daily lives and so improves our outlook that we should be always Right, Square, True, Upright, Level.

History informs us that some of our greatest forbears owe their greatness and therefor their influence for good to the study of Geometry.

Abraham Lincoln has already been quoted.

Dr Whewell, a former master at Trinity states: -
"Mathematical truths have this recommendation that they have always been referred to by each successive generation of thoughtful and cultivated men as examples of truth and demonstration ; and have thus become standard points of reference, among cultivated men, wherever they speak of truth, knowledge or proof. The recollection of the truths of Geometry has in all ages given a meaning and reality to the best attempts to explain man's power of arriving at truth. Other branches of Mathematics, have, in like manner become recognised examples, among educated men, of man's power of attaining truth.

The object of a Liberal Education is to develop the whole mental system of man; to make his speculative inferences coincide with his practical convictions : to enable him to render a reason for the belief that is in him, and not leave him in the condition of Selouron's sluggard, who is wiser in his own conceit than seven men who **can** render a reason."

H. J. S. Smith, M.A., Savilian Professor of Geometry in the University of Oxford says :

I should not wish to use words which may seem to reach too far, but I often find the conviction forced upon me, that the increase of Mathematical knowledge is a necessary condition for the advancement of Science, and if so, a no less necessary condition for the advancement of mankind. I could not argue well for the enduring intellectual strength of any nation of men, whose education was not based on a solid foundation of Mathematical learing, and whose scientific conceptions, or in other words whose notions of the world and of the things in it were not braced and girt together with a strong framework of Mathematical reasoning. It is something for men to learn what proof is, and what it is not; and I do not know where this lesson can be better learned than in the schools of a Science which has never had to take one foot-step backwards, which has never asserted without proof, nor retracted a proved assertion; a Science which while ever advancing with human civilisation is as unchangeable in its principles as human reason ; the same at all times and in all places; so that the work done at Alexandria or Syracuse two thousand years ago (whatever may have been added to it since) is as perfect in its kind, and as direct and unerring in its appeal to our intelligence as if it had been done yesterday at Berlin or Gottingen by one of our contemporaries. Perhaps also it might not be impossible to show, and even from instances within our own times, that a decline in the Mathematical productiveness of a people, implies a decline in intellectual force along the whole line ; and it might not be

absurd to contend that on this ground the maintenance of a high standard of Mathematical attainment among the scientific men of a country is an object of almost national concern."

Plato placed the following inscription over the door of his house.

"Whoso knows not Geometry let him not enter here."

In conclusion brethren, let me reiterate that these "thoughts" have been presented in an attempt to throw further light on the reason why Geometry is established as the basis of our art, and why a knowledge of it will enable us to apply more practically the teachings of our great institution, so to use our lives, that we shall, starting from the center, steadily climb Jacob's ladder, practising Faith, Hope ant Charity and finally be acceptable to Him who will neither deceive nor suffer deception