The triumphal chariot of friction, or a familiar elucidation of the origin of magnetic attraction. &c.; &c; / by William Pope ... ; with plates from drawings made by the author.

Contributors

Pope, William.
Still, Alfred, 1869-
Burndy Library.

Publication/Creation

London : Printed for the author & sold by him ... & may also be had of every respectable Bookseller, 1829.

Persistent URL

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The
TRIUMPHAL CHARIOT
OF
Friction,
BY Wm HOPE.

The Triumphal Chariot of Friction,

OR A

Familiar Elucidation of the Origin of

MAGNETIC ATTRACTION &c. &c.

J.C. Hunter sc.

BY WILLIAM POPE,

Inventor of the Patent Dipping Needle, Mariners Compass &c. &c.

With Plates from Drawings made by the Author.

LONDON.

Printed for the Author & Sold by him at 11, Ball Alley, Lombard Street,
& may also be had of every respectable Bookseller.

1829.

PREFACE.

THE subject of the Mariner's Compass and Local Attraction on board of Vessels, having engaged the attention of several eminent practical Navigators and Philosophers, induced me to attempt the improvement of the Compass, and also to the development of the cause of the Local Attraction, which had been so recently discovered to exist.

It is a well known fact to all persons conversant with nautical affairs, that the common compasses are in a state of great imperfection. This will appear, when it is considered, that all the compasses are constructed under the erroneous impression, that the magnetic poles of the earth are situated on the surface of the earth; therefore, the cards of the compass are necessarily loaded at the south end, to prevent the dip of the needle, and to make it horizontal the better to steer by, which loading renders them partial in their application, being scarcely of any use whatever in high north and south latitudes; because they stand oblique to the real magnetic poles and the meridional line of the magnetic effluvia, or stream of virtue, that guides or directs the needle. This being the case, in some latitudes, they are but little better (as the north country navigators say) than a man's hat put upon the finger to steer by.

After a close investigation of the subject, I discovered that the principal cause of the sluggishness of the common mariner's compass proceeded from the needle being confined to the card, as well as the card being loaded at the south end, in order to make the needle point to the *supposed poles on the surface of the globe;* whereas, the *real place* of the poles is found by examples of the Dipping Needle, which dips 71½ degrees in its own circle in 51½ degrees of latitude. The Dipping Needle points out most satisfactorily that the magnetic

poles of the earth are not situated on, but at 50 degrees beneath, the surface. This fact of the real situation of the poles was never even glanced at until my discovery, which fact is clearly demonstrated in the following pages.

This imperfection in the common compass, called for a Dipping Needle, in place of the horizontal needle, to be used in the Mariner's Compass.

The difficulty, however, was to invent a Compass Card which would stand parallel with the horizon, while the needle of it would be free from the Card, and be at liberty to dip according to the latitude of the place it should be used in.

After much labour, study, expense, and a voyage to sea, (viz. to Lisbon, Tangiers, and Gibraltar,) for the entire purpose of nautical experiments, I at length completed my Patent Dipping Needle Mariner's Compass; and, for the degree of success which has attended that invention, I refer the reader to the description of the article itself, which description is accompanied by the testimonials that have been transmitted to me by the most able commanders in His Majesty's Royal Navy; and also from some of the most distinguished officers in the Honourable East India Company's Service, &c. &c.

The patronage which I had been favoured with for this invention, inspired me with confidence, and stimulated me to pursue the mysterious subject of the Local Attraction on board of Vessels.

But, in stating my opinion, though founded on conviction and indubitable testimony, I saw opposed to me almost insurmountable difficulties in attacking the hypothesis of the great and learned who had already published works upon this subject.

The circumstance of a bounty having been given by the Board of Longitude, for the supposed remedy for the cause of the Local Attraction was almost sufficient to deter me from giving credit to the adverse opinion I had formed; the subject, however, seemed so clear, that I could not suppress the inclination of constructing a model to demonstrate my position. The model succeeded

far beyond my most sanguine expectations; and it has not only been a source of great gratification to me, but has clearly pointed out the Local Attraction to every person who has witnessed its operation.

I have been induced by the solicitations of many of my friends, to select a few reflections which naturally arose from the subject of the Dipping Needle, &c. and to offer them to the consideration of a generous public, under the title of THE TRIUMPHAL CHARIOT OF FRICTION. This title (which may appear singular) I have purposely selected; because magnetism, as it now exists in general as well as in the virtue of the magnetic poles of the earth, was originally produced by friction.

The leading features of this Treatise are the development of the origin of Magnetic Attraction, the Mariner's Compass, and the Local Attraction on board of Vessels. I have also been induced to glance at a few other particulars, which I have conceived (although novel) to be a source of instruction, and acceptable to the reader. If I have not spoken much concerning things already known, yet I have ventured to say a little of matters never before treated of; and as no one has satisfactorily proved what Magnetism really is, I have attempted a definition, although in a different way to my predecessors; yet I hope, that my definition will largely contribute to settle the question of so important and mysterious a subject.

I do not consider it necessary to enter into a minute analysis of the contents of the work, save to apprize the reader that I have not wholly confined myself to the few heads just mentioned. My attention has been imperceptibly drawn to subjects on which the Light of Reason has but partially reflected; I have, therefore, selected those subjects which have long been veiled in obscurity, and around which much ignorance and prejudice have been collected. In the result, I imagine that my ideas will be found serviceable to the Philosopher, the Divine, the Botanist, the Chymist, the Geologist, the Mineralogist, and the Navigator.

I. For the Philosopher; the manner of generation of animalculæ and

animal life.—II. For the Divine; the longevity of the ancients explained, and the churning of the universe.—III. For the Botanist; the revivification of plants from their respective native salts, and the principal ground of colours.—IV. For the Chymist; the perpetual lamp, the manner of the ignition of iron or steel, and the production of magnets—V. For the Geologist; the nucleus of the earth, and the stratas which wind from the surface to the nucleus.—VI. For the Mineralogist; the nature of mine-works.—VII. For the Navigator; the true place of the magnetic poles of the earth, nature of magnetic tides and cause of inundations, the variation of magnetic poles, and cause of local attraction on board of vessels.

I cannot conclude without expressing my grateful acknowledgments for the flattering manner in which my inventions have been honoured by the Nautical Profession, and the most distinguished Philosophers and Mathematicians of the present age. I am inclined to flatter myself, that those gentlemen and the public boards will feel satisfied that I have made the best use of my humble views on the various intricate subjects herein treated of.

In conclusion, I am willing to hope, that however deficient the Work may be in its arrangement, it will be approved of for its design.

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TRIUMPHAL CHARIOT OF FRICTION,

&c. &c. &c.

"All hail, Britannia! queen of isles!
Where freedom dwells, and commerce smiles:
Where fair religion burns her brightest flame,
And every virtue consecrates her name:
Where still undaunted tars, with sails unfurl'd,
Ride in bold triumph, conquerors of the world."

SIDNEY.

SECTION I.

Observations on the Atmosphere.—Origin of Magnetic Attraction.—Nature a full Medium.—The four Elements came out of each other.—Magnetic Poles of the same Name repel each other.—The Virtue, called Magnetism, is found to lodge principally in Iron.—Iron Bars become Conductors, not Magnets.—Magnetism, as it shews itself in the Earth, exists in two flowing Streams.—The Dip of the Magnetic Needle proved to be 71½ Degrees in the Latitude of 51½ Degrees, which is the Degree of Dip belonging to the Latitude of London.—Conjectures why no one has ever yet discovered the Origin of Magnetism.—Magnetism produces the Equinoxes.—On the Diurnal Motion.—The Globe of the Earth suspended in the Air by Attraction.—A Vacuum in Nature prevented, in the first Instance, by the magnetized ferruginous Atoms.

ON THE ATMOSPHERE.

That our atmosphere is, in part, composed of magnetism, or magnetic matter, or a fluid flowing from magnetic matter, (for this virtue of magnetism, being a stream, is more properly the case,) as well as of Air, Earth, Water, and Fire, there can be but little or no doubt. These properties are different in their natures, in some degree, to each other; yet, they were at first but one, and then separated from each other as from a comprising one whole: but no two things have so great an affinity to each other as the electric and magnetic fluids.

It is said, that the electric fluid is of two qualities, viz. positive and negative. Here, also, it is observed and found, that qualities or poles of the same name in magnetism, repel and oppose each other; and that poles of a different name attract and embrace each other. It is also asserted, that positive and negative electricity cannot be produced separately. In magnetism, one pole cannot be produced without the other; for one ever produces the opposite without the effort of any person. This virtue in magnetism is found in, or will exist in, one thing more than another: amongst metals, iron has the preference. Iron or steel, therefore, is the best conductor for saving buildings, as well as persons, &c. from the effects of lightning; for if the body or ball of fire, which is in motion at the time, be within the sphere, or breath, (for iron, being volatile, sends forth from its substance an atmosphere or breathing stream,) of the magnetic conductor, it will be drawn by the vortex of the magnetic fluid (being of one nature) that environs the iron wire to the conductor, and discharged into the earth, if its end point toward the earth; for so it should be worn, if intended as a conductor, in the pocket for protection. In nature it is sympathy, or like unto like, which causes things to unite.

Although many authors strongly recommend copper wire, in preference to iron, for the purpose of conductors, I presume they do this from the circumstance, that lightning has frequently been seen to run along bell-wires which were composed of copper; but this phenomenon would have appeared much more visible if the wire had been composed of iron. But iron is not so generally used for bell-wires, because it so soon rusts, and is otherwise not so well adapted for the purpose. In a subsequent part of this work, a striking instance will be presented, that persons are protected, and not endangered, (as is the vulgar opinion,) by having steel about their persons, from the effects of lightning.

Poles of the best magnets are very easily changed; a single stroke will frequently derange them. Iron bars, of which it is said they have gained a polarity by standing in a vertical position, and seem to change their poles as often as their points are removed or changed from that position; but this notion is erroneous, as will appear by the following experiment, for the same end of any bar of iron becomes both north and south alternately, as it may be held at the time of the operation, in either of the magnetic streams, either over the needle or under the needle.

This I have discovered, which I consider of great consequence, and have thought proper not to pass it by unnoticed. In the year 1827, I had been trying some experiments with bars of iron and magnets, under the vulgar im-

pression, that all bars of iron, which have stood in a vertical position for a series of time, became magnetised. But this error was soon corrected, by placing a bar of iron over the end of the mariner's needle, and, at the same time, taking care to hold the bar behind the south end of it in a sloping direction, which is the proper elevation of the dipping needle, (that is, 71½ for dip of 51½ degrees of latitude, which is the dip of London,) the bar was found, in that case or position, to attract the south end of the needle; but, upon dropping or lowering the upper end of the bar, keeping the same elevation below the needle as I had held it before above the needle, it did then, in that direction, repel the needle, notwithstanding I was careful to keep to the same end of both the bar and also of the needle: this I took to be an useful discovery, as it described the existence of a flowing magnetic stream, of which the bar became the conductor.

I shall here state another example, and it may be said to be a very surprising one; this I do with the design further to prove, that there really does exist a magnetic stream flowing from the magnetic needle. By the following case, if you attend closely, you will be fully convinced; although I think the first example of the bar of iron shews it very clearly, and puts it beyond doubt, yet, I will state the following, as it is quite to the point: viz. a person took a vessel, and put a portion of quicksilver into it, then he placed a magnet below the vessel of mercury, with its south end uppermost, so as to touch the bottom of the vessel; and he also placed another magnet (without touching the face of the mercury) above or over the vessel, with its north end pointing downwards over the face of the quicksilver, to stand in a line with the under needle, when instantly there appeared, under the end of the upper magnet, and on the face of the mercury, a pit, dent, or dimple, which continued as long as the magnets remained in those positions. Now, I ask, what power of pressure on so dense a body as mercury could cause this striking effect? And what pressure so probable as that of the invisible stream, flowing from the end of the upper magnet to the lower one? As it was kept free from touching the face of the mercury, what else, but as I have observed, could cause this wonderful phenomenon? Here, then, is proof upon proof to shew that magnets send forth a stream, which is fully elucidated in the facts herein stated.

The human mind is slow, and can but seldom overtake the true sense of any thing at the first start; and it may, with propriety, be said, we do well to lay up all the odds and ends which can be drawn from every experiment, as they may, at some future time, be put together to advantage. This new experiment, I presume, proves to demonstration, that the bars of iron are conduc-

tors, not magnets, as hitherto supposed to be; and, also, this infallible demonstration of the bar of iron shews there are two separate and distinct streams of magnetic effluvia passing through every part of space. It also appears from the bar of iron, that these streams of magnetic virtue ever cross each other; (further illustrated in plate 9, letter F;) the stream of the meridian of one coming upwards from the earth, and the other flowing downwards to the earth, (and, in its course, wraps round the nucleus of the earth, and forms the dip,) in the elevation of 71½ degrees and some few seconds, which is the dip of the needle, which ever corresponds in 51½ degrees of latitude; for they differ in their elevation in different latitudes. These two streams cross each other in the form of the letter X. Now, observe, and take special notice, that the centre of these lines, where they cross each other, forms, by their continual crossing, a third line, called a magnetic line of the plummet; and the earth is here supposed to be the lead thereof, as the bob of a plumb-line.

I may here venture to anticipate that this particular and wonderful discovery of the real existence of two active and energetic magnetic streams, (which ever flow through the solar system, and constitute the two lines of no variation on our globe,) will lead us forward, with increased delight, far into the field of science, and gain an advanced ground to place the natural philosopher's feet upon; a discovery never even glanced at before, although it is a first feature, and one of nature's greatest secrets; yet, it is better late than never.

You may understand, by the above discourse, that the iron bars become conductors, but not magnets; and, also, mankind are no longer to look at the points of the north and the south poles, as described to exist on the surface of the earth, as that which attracts the needle; for then, if that were the case, an horizontal mariner's needle would be as good to steer a ship by as a dipping needle, as there is always a straight line between two of any thing; but, by loading the needle at the south end, to bring it horizontal, a third point is brought into action. But it is the magnetic fluid which flows to and from these points at the nucleus, that is the poles; and it takes the stream of the needle, (for the needle has also a stream belonging to it as well as the magnets of the earth, being ignited by friction on the magnets in the process of magnetising them,) in a line with these principal points respectively. The example of a bulk of timber anchored in a stream of water is a fit simile for this subject, as here the stream cants the timber to become parallel with the banks that stand on either side; so, after this example, the magnetic stream cants the needle, so as to avoid the west and east, and to stand in a line with the poles of the earth at

north and south, whereunto it ever flows, and thereby guides or directs the needle to the poles.—Mercury is a mineral water that will not wet the fingers, and the magnetic effluvia is a directed flame or fire that will not burn the skin.

This opinion may differ much from those who contend that iron bars, standing in an upright position, become proper magnets; I do not desire to oppose any one who thinks differently from me in this particular; I must here, however, take leave to say, that facts are stubborn things, and that the truth should sometimes be told, although the maxim is against me. This phenomenon of bars of iron being conductors, holds good in every part of the world; for, on any point of the globe, if a bar of iron be held in such a position in the line of the dipping needle, which belongs to that latitude the operator stands in above the needle, it will attract; but if the same end of the same bar be held under instead of over, in the contrary line of direction, that is reversely, it will then repel: we cannot here, in this case, suppose the bar of iron has changed its poles in this quick or short time and small movement; therefore, with the above example of the dimple on the face of the mercury, &c. we must conclude that iron bars become, or that they are, in themselves, conductors (and not magnets) of the north effluvia of one position, and of the south in the other, according as they fall in a line of the two streams, which constantly flow from and to the poles of the earth, and thereby conduct and guide the stream of the magnet; and by this means the magnet is turned to the true poles of the earth. It is necessary to remark on this head, in order to prevent a seeming contradiction, that the names of the poles of the magnetic needle were given according as they severally pointed to the poles of the earth; the north because it stood to the north, and the south for a like reason: but, if the names had not been arbitrary, and been given according to their nature, the north would have been called south, and the south north, because poles of the same nature repel, and poles of the opposite attract.

As many amateurs may wish to exercise themselves in experiments of this sort, I have inserted a rule to prepare magnets. The best way to harden and temper steel for magnets is as follows: first, make your steel hard by heating it to the colour between red and white hot, then plunge it into water. Be careful to hold the steel upright or perpendicular in dipping it into the water; let it be dipped carefully, or slowly, or the steel will become crooked, when you draw it out of the water. The next operation is to brighten the two ends of the steel, so as to distinguish the colours in tempering; then take a pair of smith's tongs, a salamander, or any piece of iron which will retain a strong heat; lay

your steel on the hot iron, beginning at the centre, draw it slowly towards the end, as you perceive the colours of the rainbow to pass over the steel; (observe, the straw colour will leave the steel too hard to take a good magnetic touch, but a blue or violet is the proper colour for the magnetic temper;) then immerse the steel in water as soon as you have gained the right colour, and it will be perfect. Prepare the other end in the same manner.

As nothing has yet been established to shew to satisfaction what magnetism is, my presumption may be pardoned in offering a few remarks on this important and hidden subject, as it is a theme which has engaged my attention for some considerable time; and having been induced, by the repeated solicitations of many of my friends, I now venture to present the same to a generous Public, as it is, without dress or ornament, and hope they will give me credit, at least, for possessing a good intention; and, as they are strong, I hope they are equally merciful, in censure. I call this a simple way of investigating the subject; but I am encouraged the more to persevere in this plan, as the wise manner of my predecessors, with all their advantages, have never been able to draw the veil from the face of the enchanted island.

It is a fact, that many sound philosophers have desired to satisfy themselves of the nature of this hidden, although visible, phenomenon, as well as the world at large; but hitherto in vain. But the difficulty, with them, to account for this particular, it is presumed, is, that they have gone on multiplying effects, without considering the first cause of such effects. Again: this failure perhaps has been occasioned by taking into the account too circumscribed a view of the subject, extending their researches no further than the limits of the solar system, instead of to creation at large. Add to this, their looking on things as they now are, and not viewing or contemplating them as they were in their original chaotic state, at the time when this magnetic principle was, in a natural way, first acquired or produced; in which state and condition of chaotic things we have reason to believe that all things were composed or comprised in embryo; for all the creation, as it now stands, we are taught, were formed of chaos. This, I believe, no one will gainsay.

Now, to follow the idea in the text: "darkness was upon the face of the deep." (Genesis, chap. i. verse 2.) And, also, it is certain, that all creation was situated in this same extent of dark space, wherein was contained ample matter to form innumerable systems upon systems of worlds, besides this of our solar system. And as it was formed of one, (for chaos was then but

one,) all nature is still but one nature: one body and one soul, both put together, make up one creature of the production of the great First Cause of all things; this soul, belonging to this natural body, is the working influence of the stars, (that extends even to this lower world,) in which God has implanted a principle to good, to counteract the evil that, for the time being, is sown by some enemy, as tares in the field of physical matter: as one proof of this, there is both good and evil in every thing. Now, as all is but one, and as some part thereof is intelligent, how not the whole of this stupendous composition, falsely called infinite space? I say falsely, because it is only finite, and limited in its extent, as will hereafter be explained.

What is called universal nature (notwithstanding it is beyond all comprehension in magnitude) is not to be accounted infinite, as some have supposed; but it extends only so far as the second circle in deity. (See plate 8, letter A.) This point of doctrine will be fully explained in an intended work on the Moral World. First, I offer, as a reason, that it cannot be infinite, for very good considerations; if it were so, then it would be eternal, and to be eternal it should be constant and fixed; whereas, physical matter is ever changing, growing from one stage to another, waxing old and dissolving. To confirm this statement, I refer my readers to a work of the learned Ferguson, that sound astronomer of our own day. It appears that he ascertained, by correct observations, and publicly stated in his astronomical work, that the moon is situated much nearer to the earth than she formerly had been. Then, if this be admitted, the whole planetary system must be changing place; if so, it follows all creation is under a state of change, because all space is full: if one move, all must move; in this view of the subject, nature cannot be supposed unchangeable; neither, therefore, infinite or eternal.

Thus mankind, who view nature as seen in this stage, if I may be allowed the expression, is not much unlike the animal with his darling cub, ever staring at it; they look at nature, as seen at this present time, but not as she was when in a state of embryo, when magnetism first took its birth, or its impression on ferruginous matter. Suffer me to say, if the wild untamed horse be not taken by the forelock, he cannot be caught; so, in searching into this hidden subject, we must begin at the very beginning of the thing, or it will give us a light heel. My readers will forgive any quaint expression they may meet with in the account of my researches, (as I am confined to one source for the selection of my materials,) which must begin at ancient chaos, spoken of in the first chapter of Genesis: there we are informed, that in the beginning of creation

there was no form; and I suppose, in transcribing the text, the word particular was left out in the copy, or it would have read, the earth was without particular form, and void. This we are sure, there was motion; (Genesis, chap. i. verse 2;) for "the spirit of God moved," &c. Now, it is well known, that matter in motion ever produces, in a full medium, friction; and this friction, which seems the most apparent trifle and solitary effect, consequent on the being or existence of creation, nevertheless becomes the most multifarious agent in nature; (for this reason, I have given to it a Chariot for the title of my Treatise;) and although this is so evident, it has hitherto escaped the most diligent research of the ancient and modern philosophers.

To proceed: we must look to the time of creation for our fabric. It is not like any other subject or speculation: we cannot expect to find the least light on this important matter, either from men or books: if we were to expect it in this case, it would be like searching for a thing where it was not. But there still remains one, and only one, source of information, which is the Book of Moses. This Book, in all times the worst and the best, has run down, and stood the strongest test; although the Jews at this time are scattered in all the world, I suppose, to serve as a visible witness, as relates to Revelation. We are greatly indebted to them, for unto the Jews were committed the Holy Oracles, which are as a treasure house; rich is the man who has the key, for therefrom he may bring forth things both new and old. Without further digression, we will return to our subject.

We are informed that darkness and the matter of chaos was without (particular) form; we are, also, further instructed by the same historian, there were at least two particulars, viz. motion and matter; for water is matter, although it is fluid. And here mention is made of the face of the water, and the spirit moving thereon. Now, to reason the point fairly, by way of induction, let us proceed, step by step, as follows: motion in a full medium (for all was full, as nature abhors a vacuum) ever produces friction; and friction produces heat, which is, in a sense, fire, and fire is light; so, then, friction produced in nature the heat, the light, and the electric fire, even that of the great and glorious luminary, the sun; and which are by the same simple means at present kept up: it is, also, the origination of magnetic attraction, sometimes termed or called natural magic. All these are produced from the simple circumstance of the existence of matter and motion, as a fact of imperative necessity, the invariable effect from cause. So much for a brief account of the production of light, electric fire, and magnetic attraction. It may be objected,

that this is too easy a process for such great and arduous things; therefore, we cannot receive it; we must have it in the wise way or not at all. I hope, however, there are some yet to be found that are not so disposed, but will stoop to pick up a jewel from any place, and in what vessel soever imported, so that it may at last be polished, and set in ornament.

Magnetism, which is produced by the aforesaid friction, suspends the orbit of the earth, draws it up and lets it down once in the year, from the constellation of Cancer to Capricorn; therefore, it is not correct to say the earth hangs in the air upon nothing. (See plate 9.) By this magnetic virtue, the equinoxes are produced, even by the power of attraction; by an effort of the first motion of an angle of the universe, whose influence extends to our earth, and keeps it in place, and gives its motion, as shall more fully appear.

The sun's motion acts on our globe, vortex to vortex, (for each has got a proportional vortex,) and turns its own vortex of air; which air touches the vortex of the air of the earth, and thereby carries the earth round from west to east, and produces the diurnal motion.

In this system of accounting for things, the earth may be considered not unlike a plummet in the hand of a builder, held up by the string attached to it; the line supposes the magnetic virtue, (see plate 9, letter F,) which, according to the zigzag motion of the orb, situated at an angle of the universe, unto which the upper end of the magnetic line is fastened by attraction, lets it down and draws it up, from one constellation to the other, according to its own motion, thereby producing the annual motion, and while turning round itself (by means of the vortex of the sun,) produces the diurnal motion. The line of the upper end being placed in the hand, or attached to a sphere which is situated at an exterior circle of the universe, (called here an angle of the universe,) whose motion gives laws of motion by attraction to all its dependent or relative parts of that angle of creation, as the sun does to the orbs of the solar system, which in the same manner depends on him, operating and effecting his parts according to the necessary requirements of one of the angles of the universe, all the circle being divided into angles, which parts fall to his principal lot; all whereof is performed by magnetic attraction, and not by attraction of gravitation. And the attraction here spoken of, was originally produced by friction, as will be further explained in the sequel; (see plate 5;) where is represented the particles of ferruginous matter rushing into the two poles of the young nucleus of the earth; which it did, it must be admitted, to prevent a vacuum in nature. Here was motion, (according to the account of the sacred historian,) and that

motion caused friction amongst the atoms, because they were acting in a full medium, and chafed each other; and this friction produced magnetic attraction. But the volatility of the iron ore, or ferruginous matter in the chaotic mass was first in order of action in creation, save astringency, which astringency acted first by the way of cohesion, and caused the water to assume a petrifying disposition, and to come into action on itself; then it began to churn and thicken, changing the fluid to solid: hence rocks, mountains, &c.

Here we enter more closely into the subject, and must, of necessity, leave the beaten path, viz. that of considering the matter of the earth, as it, at this time, proves to be in its finished state, or, as nature at present remains; we must stretch our course backward, beyond the bounds of the present time, and extend our views retrogade, even to ancient chaos, where we contemplate dark and confused matter, void of forms, a one stupendous matrix, which was its condition until it was divided, and the light brought forth; (Genesis, chap. i. verses 3 and 6;) viz. "God said, let there be light; let there be a firmament in the midst of the waters, and let it divide," &c. Consider for a moment. I well know the human mind is not capable of the whole extent of this subject; yet, nevertheless, we will go as far as we can, and regard, in the first place, how deep it was at the time, before the little heights, the spheres, were gathered up: indeed, they are but little in comparison to the whole, which were formed in so immense a space. And, secondly, consider that the whole was without (particular) "form, and void." (Genesis, chap. i. verse 2.) How amazing dark and gross the whole extended space must have been at that stage, without the presence of that glorious luminary, the sun. However, this idea, as to its extent, I leave for my scientific readers to think of at their leisure; they may reap a fruitful harvest; what I have presented is only as a first fruit.

This darkness, therefore, must be considered as it is first mentioned in the account, before we proceed. How can men work but on the materials they have afforded them? and this chaotic darkness is all that was in existence, in this stage of the creation, when the magnetic attraction of the sphere was produced. If we neglect this, we are then lodged fast and destitute.

In this condition of formless confusion, God took pity, and said, "let there be light; and there was light;" (for I think it was permitted, rather than chosen, by Him.) Here I have quoted the Holy Word again; it is but reasonable, when the effect is treated of, the cause should not be left unregarded, that great First Cause, God, the creator of both heaven and earth.

SECTION II.

The Sun not inhabited.—Of Fermentation and Putrefaction being the Beginning and the Ending of Animal Life, &c.—The Production of Light by Friction.—Of Vacuum.

Having, in the former Section, treated upon the subject of darkness, chaotic matter, &c. and gleaned from the brief account what might be serviceable to our present purpose, we are now naturally led to the consideration of its opposite, viz. the production of light, supposing light to have been produced in the natural way.

To consider the word light, we remark, in the first place, that it is a very comprising expression, let it be observed, in order to produce light in a natural way; for this is the manner in which we should consider the subject. It is a fact, that although Omnipotence works, in the first instance, in a way infinitely beyond human comprehension; (making a great one, as in the instance of the chaotic mass, all ready for division;) yet, in the second instance, He works in physical matter, in the way of producing one thing out of another, as effect from cause,—and as relates to this, chaos and creation: it may be said the thing is constructed to work itself.

The light, being an effect of a cause, is a thing that is produced between two. God is the first cause of all things, and often works by natural means, (as may appear to us,) to the production of miracles. We are informed, by the sacred author, that in the chaotic matter, there was motion; and motion fully declares the existence of matter. This motion, in physical matter, produced (by friction) light. So we are to consider it; for although the worker was Omnipotence, yet, He chose, in this instance, to have a natural order, particular time, and progress, in His work; as, for example, the six days of the creation, not one, although to Him it were equally easy.

God first exercised His Almighty fiat, saying, "let there be light;" which alone permitted the existence of things to be, and to continue, for a certain period of time. This matter, nature and creature, a one great fertile womb, of which (in a natural way, but magically) one thing opened out of another twins, called effect and cause.

All things were contained in one inconceivable great chaotic matter. There was, in this case, no necessity for adding, or of making use of the

greater, nor the multitude, when the less and the few would do; for when the one, comprising all, was created, the great variety proceeded afterwards from each other. It is not to be imagined, that the Creator is excluded from creation; neither is it requisite that He should be ever mending or repairing His work, to keep it in order; as though He had made it, and, in His absence, the work got out of repair. We can never be absent from Him, because the creation, of which we are a part, is of Him, and not by Him, as will presently more fully appear. I hope this distinction will be kept in view; for I repeat it, that the creation is made of Him most strictly and mechanically: hence it is properly said, that "in Him we live and move, and have our being." Is it not more honourable to think that God first made nature, and, from this nature, all variety in nature proceeded according to His wisdom, than to think that mankind, &c. were made in a mechanical manner, as a person would finger up and form a thing out of a body of wax? Not quite so; for the comprising one, being first produced, all things proceeded out of each other, and came round to the same point of design in some way, as represented by the emblem of the serpent with his tail in his mouth, shewing where it begins it ends, and where it ends it begins.

This short and compendious way was like himself. All wisdom and power must be attributed to Him, who is the first cause of all things; and so great was that power, that, by the uttering of one sentence,* the worlds came into existence.

I trust that the information I here offer to the reader, of the simple manner of the production and variety of natural things, will be clearly understood: if this simplicity be acted upon, we probably may easily glide into the true knowledge of the moral world from the contemplation of the natural world. There is a moral world as well as a natural world, alike in all particulars, with the exception of the difference in the mode of its existence. There are two modes, and one is fellow of the other; the moral is the right, and the physical is the left: these make up the pair; (as a pair of gloves;) for every thing has its opposite which constitute a pair.

As the knowledge of the truth is intended for the many, and not for the few, the learning of the few scholars of Greek, Latin, or Hebrew, (if they be ignorant themselves of the nature of things,) is easily dispensed with; but simplicity and ingenuousness are indispensable to all. Let it not be imagined,

* This word is one of the seven attributes of GOD, and is the word that was said to be made flesh. John, chap. xxiv. verse 14.

that I have any desire to speak against classical acquirements; I only condemn the too frequent practice of substituting those attainments for what they are only intended to be a guide towards.

Here is a door open for the understanding to enter, in order to view the first great mystery of nature's secrets. Heat draws moisture; heat and moisture ever create fermentation: these two are the beginning and the ending of animal and vegetable life, &c.: (this applies closely to creation, as will be hereinafter explained.) Again: when the earth, the water, and the rest of the elements, were in one another, (as they were before the division,) as a mixture, you are to suppose the mass then fermented; and, in consequence, the matter enlarged or puffed up, not unlike flour when put together with yeast, in the process of making bread. As this constantly takes place in a little matter, under these circumstances, how not with the whole? In regard of this article, if the curious reader take this superficially, he will no doubt form a very mean opinion of it; but, on the other hand, if he consider it solidly, he must confess, that the fact could not have been otherwise. I hope the deep searcher into nature will be able to turn this manner of considering the subject to good account.

This fermentation the more readily took place in the chaotic matter, as, at that time or stage of creation, the marine salt (the water of the sea) was not pressed out of the mineral substance (for it was got as solid as it before had been fluid by the inherent power of astringency) from the seven native salts of the earth; hence, as the matter of the waters in the great mass were, at that time, fresh, and not salt, fermentation was inevitable.

As I do not wish to perplex my readers, or lead them astray, by involving the subject with words without meaning, or to make a vain attempt to shew off my knowledge instead of informing their understanding, I shall endeavour, in a few words, to render it as plain and simple as I possibly can; at the same time, assisting my meaning by short comparisons, which are familiar to every person: viz. such as fermentation, putrefaction, friction, hatching of eggs, baking of bread, &c. &c. My readers will perceive why I have adopted this familiar style; it will, possibly, more easily elicit the truth of this hidden subject; however, this is certain, that the high and lofty manner of philosophers has never been able to accomplish the desired object.

Fermentation naturally produced ebullition; ebullition ever attends and succeeds fermentation. By fermentation and ebullition, the atmospheric air was caused and produced, after the example of the bursting of any thing inflated.

(This comparison is meant to be applied to the matter of the whole creation in its early stage.) When the air was released from its confinement, it took its residence aloft, on the outside; it being, in its disposition, to form concave, and the earth, (its companion,) in its disposition, to form convex: these two, when together, therefore, are at rest as counterparts. The place the air possesses in space is called firmament, from the corruption or application of the word ferment—from the act of fermentation to firmament; which fermentation had just before preceded the ebullition of the astonishing great mass. This was a wonderful phenomenon. How simple; and yet I may be permitted to say, how clearly true, and apt as to its description!

So, then, to recapitulate: the astringency (which is native in the earth) drew up the terra of the chaos; hence came the earth, (as being one of the four elements,) and pressed out the aqueous, (water,) from whence proceeded the seas, or element of water. In order to produce fire, the pressure of the air (in its natural disposition to penetrate every thing) corroded the ferruginous matter, which was contained in the adamantine body of the sun; the body of the sun, however, being so dense, it foiled the attempt of the air, and a contest was produced: each opposed its power against the other, and by the consequent friction of the two, (although it was yet dark,) light was struck up. Observe it well: thus were produced the fire or heat of the sun and its light by the simple act of corrosion, in its effort to penetrate the adamantine pores of the body of the sun, and which act of corrosion is friction. Here are, therefore, all the four elements brought out of one inconceivably great chaotic matter, as natural effect of cause.

The body of the sun, being all heart, or all its parts of the same kind as our nucleus, composed of ferruginous matter, has no stratas of light earth around it; our globe, or the nucleus of the earth, is clothed with these stratas, and which stratas make up the complement of size from 40° to 90°; this deficiency of light earth on the body of the sun is caused by the great velocity of its motion, which throws off all superfluous matter from its surface. Now, for want of light earth to form these stratas, there can be no fermentation or putrefaction; therefore, there is no creation of animalculæ in the body of the sun; from which we may justly infer that it is not inhabited as the other planets are supposed to be.

It appears plain, that by the effect of corrosion, (which is, in this case, friction on the ferruginous body,) fire is in the event effectually struck, as between flint and steel. First, a motion is produced from the volatility of iron

ore, or iron mineral, which is ever moving. Secondly, a friction: as all space is full, if the parts move there must be chafing. Thirdly, heat from friction; then light from heat. So that, by the Almighty command, "let there be light," it created matter, and also brought the four elements, that belong to the matter of this world, out of each other, by separating and dividing them, without adding, mending, or making; and so perfect is it in itself, that it scarcely needs superintending: hence all the forms visible in prolific nature. Thus much for the division of matter. As for the creation of the matter itself, the great and inconceivably stupendous chaotic birth, this, indeed, has a very deep ground for speculation, as it embraces transactions, and the manner of entity, &c. prior to creation!

Many examples might be brought forward, elucidatory of the production of light; a few, however, shall suffice. The scales of fish and rotten timber give light in the dark; so, also, does phosphorus. Let me inquire, from what is the light in these bodies produced? It cannot be by reflection; for it is most apparent in the dark; it must be by the corrosion of the air on their various surfaces. Suppose, after this manner, the fish, being in the process of dissolution, send forth particles of their substance into the four elements, and each of them greedily receives its own element, in proportion to the degree of separation and dispersion of its parts. The air rushes in on the volatile matter; for the constant practice of nature is to prevent a vacuum, which would inevitably be the case but for this provision. This is the first moving cause of action in this case. The particles meeting each other, the dissolving parts of the fish ascending, (perceptible to the smell,) the particles reach the senses of smell and sight through a portion of air, at no greater distance from their substance than they have power, by their volatility, to produce a continued chain or stream of atoms, as perfectly as if they were in a continued tube from the fish to the nose. If the stream of the effluvia were confined within the tube, the ascending particles of the fish would become united and confined; but, without the application of the tube, the stream of effluvia, by means of its volatility, does exist every where round the substance alike; and the pressing in of the descending air creates as much friction as produces the light seen on the subject matter. That it is the friction or corrosion of the air which causes the light, is evident, from the example of the light of phosphorus, which instantly vanishes and disappears when the air ceases to operate upon it. It is the corrosion of the air that both creates and maintains the heat and light of the sun, and is the first cause; this I conceive to be manifest, and, consequently,

consider that I have good foundation for my supposition, that the heat and the light of the sun are produced after the same manner as those things on the earth which give light without the aid of any reflection of the sun.

It is said by Mr. William Davis, in his excellent Treatise on the Use of the Globes, that "the sun, which was reckoned among the planets in the infancy of astronomy, should rather be counted among the fixed stars. He only appears brighter and larger than they do, because we keep constantly near the sun; whereas, we are immensely farther from the stars. But a spectator, placed as near to any star as we are to the sun, would probably see that star a body as large and as bright as the sun appears to us; and, on the other hand, a spectator, as far distant from the sun as we are from the stars, would see the sun as small as we see a star, divested of all its circumvolving planets, and he would reckon it one of the stars in numbering them.

"According to the Pythagorean and Copernican hypothesis, which is now generally received, and has been demonstrated to be the true system, the sun is the common centre of all the planetary and cometary system, around which all the planets and comets, and our earth among the rest, revolve in different periods, according to their different distances from the sun. But the sun, thus eased of that prodigious motion, by which the ancients imagined he revolved daily round our earth, is not a perfectly quiescent body; for, from the phenomena of his maculaæ or spots, it evidently appears that he has a rotation round his axis like that of the earth, by which our natural day is measured, but only slower; for some of these spots have made their first appearance near the edge or margin of the sun; from thence they have seemed gradually to pass over the sun's face to the opposite edge, then disappear; and hence, after an absence of about fourteen days, they have re-appeared in their first place, and have taken the same course over again, finishing their entire circuit in twenty-seven days, twelve hours and twenty minutes; which is hence inferred to be the period of the sun's rotation round its axis; and, therefore, the periodical time of the sun's revolution to a fixed star is twenty-five days, fifteen hours and sixteen minutes; because, in twenty-seven days, twelve hours and twenty minutes, after the month of May, when the observations were made, the earth describes an angle about the sun's centre of 26° 22′; and, therefore, as the angular motion 360° + 26° 22′ : 360 : : 27 days, 12 hours and 20 minutes : 25 days, 15 hours and 16 minutes.

"This motion of the spots is from west to east; whence we conclude the motion of the sun, to which the other is owing, to be from east to west.

Besides this motion round its axis, the sun, on account of the various attractions of the surrounding planets, is agitated by a small motion round the centre of gravity of the system. Whether the sun and stars have any proper motion of their own in the immensity of space, however small, is not absolutely certain; though some very accurate observers have intimated conjectures of this kind, and have made such a general motion not improbable. The density of the sun's heat, which is proportional to its light, is seven times as great as Mercury is with us; and, therefore, our water there would be all carried off, and boil away. It has been found, by experiment of the thermometer, that heat but seven times greater than that of the sun-beams in the summer will make water boil.

"The quantity of matter in the sun is, to that of Jupiter, nearly as 1000 to 1; and the distance of that planet from the sun is in the same ratio to the sun's semi-diameter. The sun's diameter is equal to 100 diameters of the earth; and, therefore, the body of the sun must be 1,000,000 times greater than that of the earth.

"If you divide 360 degrees (the whole ecliptic) by the quantity of the solar year, it will give 59′ 8″, &c. which is the medium quantity of the sun's daily motion; and if this 59′ 8″ be divided by 24, you have the sun's horary motion equal to 2′ 28″; and if this last be divided by 60, it will give his motion in a moment. And in this way are the tables of the sun's mean motion constructed, as placed in the books of astronomical tables and calculations."

"Ye seeds of being, in whose fair bosoms dwell
The forms of all things possible;
Arise, and your prolific force display;
Let a fair issue in your moulds be cast
To fill, in part, this empty waste.
He spake. The empty space
Immediately in travail was,
And soon brought forth a formless mass;
First matter came undress'd, she made such haste t' obey.

"But soon a plastic spirit did ferment
The liquid dusky element.
The mass harmoniously begins to move;
'Let there be light,' said God; 'twas said and done,
The mass dipt through with brightness shone.
Nature was pleas'd to see
This feature of Divinity;
Th' Almighty smil'd as well as she;
He own'd his likeness there, and did his first-born love."

NORRIS.

Here my readers will bear with me a little, and permit me to go over the ground again, to make all things plain, and be content to take the medium as it is: odd subjects must have odd definitions. I am anxious to make myself clearly understood. Here I again make a quotation from the sacred historian: (Genesis, chap. i. verse 2:) "The spirit of God moved upon the face of the waters." This word face, here mentioned, must be understood as referring to, or describing, the outside or face of creation, or the exterior, within which you must suppose a full medium. Here we are informed "the spirit moved upon the face of the waters." In this stage of creation all and every part was as water, which was so before the astringency operated, and which is natural and hidden in matter. This astringency bound up the mineral and the terrene, and made them distinct from the marine water into solid mountains and rocks and stones, &c. The volatility of iron ore also moved (for that which is volatile will ever move and ascend) in this full medium, which moving was ordered for the express purpose of making a separation or division of parts; viz. "let it divide the waters from the waters." (Genesis, chap. i. verse 6.)

I argue there must of necessity, in this case of a full medium, be friction amongst the atoms; because, if any one move, the whole becomes in motion, (for we suppose that they had become, in that stage, corporeal; see dotted lines, plate 5,) in the act of passing each other through that immense journey, even from the centre to the circumference of creation, and back, repeatedly, to the present place of the orb of the earth. By its passing through this gross medium, it increased its magnitude, by attraction from the matter of the unworked up atoms of chaos; and by the said moving through immensity of gross space, magnetized every atom that was ferruginous, as it moved by the act of friction; those atoms, when magnetized, rushed into the hinder part of the nucleus by the pressure and by attraction, and thereby prevented a vacuum in the place the nucleus last moved from.

So we find that the single act of moving produced the increase of the bulk of the young earth; and, also, gained the magnetic virtue in the nucleus of the earth, constituting it, when completed, a great spherical magnet in the heart of the earth, of 80 degrees diameter; it also produced the electric fluid and the light of the sun, which light is still kept up and maintained by nothing more than the friction of the air on its immense cylinder, as an electric machine. The order of process, to produce the present condition of things, was as follows: 1st, motion; 2d, friction; and 3d, electricity and magnetic attraction. Suffer me here to remark, (as most properly I should,) all things

of creation are justly attributed to the Great Creator. Different persons, however, have various opinions upon the same subject: some think the creation was never made at all, but that it is eternal; others suppose that a fortuitous concurrence of atoms brought it into its present state; whilst most are of opinion that the creation was made by God, as a mechanic would construct a building, in which he might reside or not, according to his pleasure. But I maintain that all creation was made of Him, and which I can satisfactorily explain.

Hence, of necessity, the Creator is every where, in all things, as relates to the corporeality of those things, in a very different sense than a mechanic can be said to be in any thing he makes; because the mechanic does not make a thing of himself, he is no where in it, but the material of the article made is every where in that thing respectively made; so is God in all creation.

When creation had a birth there was nothing added to infinity, or there would be two infinities: time is only a part of the circle of eternity. Creation was of Himself, and not by Himself; and He wrote the forms of the very emphatic letters of His name in all the possible forms of creation. (See plate 3, and the explanation thereof.)

Ere fell dark chaos, in confusion stood, or earth receiv'd its form:
From everlasting truth is God, to endless years remains the same.
" Let there be light," Omnipotence pronounc'd, for all was dark and void;
Then huge celestial bodies roll'd, but not without their guide.
Thy power, Omnipotent, ever is,—so bright a Majesty:
But time, and space, and earth, they change, and all return in mode of magicry.
So it is; and man is deceiv'd; he sees, by slow gradations,
Awhile remains, and knows not that nature's all an incarnation*.

* That is to say, part of the moral world was rendered corporeal by means of the simple admixture of two morals. If one of the morals were either removed or converted, so as not to be, the physical world would cease to exist. The moral world is constructed only to continue for a short period, for the purpose of exhibiting part of the endless wonders of eternity.

SECTION III.

On the Firing of the Salt of Iron, called here the Ignition of Mars, (♂) which produced Magnetic Attraction in Nature.—Every Thing is composed of Three, so compacted in a natural State.—Of the Revivification of Plants from their respective Salts.—The Seven Metallic Salts are the Ground and Cause of Colours.—The perpetual Lamp of the Ancients glanced at.

Some of the foregoing arguments may be considered as hypothetical; we will, however, come to demonstrations, proofs, and visible facts, which are as so many columns whereon to support the premises. First, by way of explanation, and with an intention to elucidate that it is nothing but friction, on a fit subject, which produces magnetism as it is found in nature, I will proceed in the following order:—Example I. Friction is the forerunner of electricity, which may be seen even on the common highway on the wheels of carriages; indeed, it is well known, that they are frequently set on fire by friction, if neglected to be greased.—Example II. is exhibited by the electric machine. Here, again, the friction caused by the pressure against the proper parts of the machine, together with the motion produced by turning the winch, creates the electric fluid which fills the jar of the electric machine. These examples certainly shew that heat or fire is produced by the same means.—Example III. will fully prove that the electric fire produces magnetic attraction, which will more fully appear from the following narrative, extracted from a work of Mr. Ralph Walker, entitled "A Treatise on Magnetism," published in 1794. I give the extract in the author's own words.

"In the island of Jamaica, in the month of September, 1792, one end of my house was shattered to pieces by lightning, which killed one young woman and very much hurt another. In the part of the house that had received but very little damage, a girl, who at that time had stood close to the one that was killed, but was not in the least hurt, took out her needles, soon after, to assist in making a dress for the one that was dead; the needles stuck altogether so strongly, that she took the points of her scissors to separate them; and so powerfully were the needles and scissors magnetized, that part of the needles stuck to them in different directions, and they lifted up the remainder like a

thread, each needle hanging by the end of another. This phenomenon happened within my own knowledge," says Mr. Walker.

But we can come still closer to the point of the production of magnetism by electricity and friction. Here I refer to general observation. Is it not a well known fact, that the same cause always produces the same effect? Instance the example of iron filings, which are perfect magnets, so caused by the friction between the iron and the steel file. This simple example is a clear elucidation of the manner of the production of the magnetic poles of the earth.

We now come to the consideration of the nature and internal composition of things; at least, so far as relates to the firing of the internal salt of iron, in order that we may arrive to the knowledge of the production of the natural load-stone, as it is in the earth.

Understand, that every natural tarine substance, in its hidden composition, is composed of a sort of trine, a three-fold association, called, by the wise ancient chymists, mercury, sulphur, and salt. But to explain what is here meant by those terms: when philosophers and chymists wish to be acquainted with the internal composition of any natural thing, they set about it as the experimental anatomist: the anatomist skilfully opens the parts with a dissecting knife, and the philosophers and chymists dissect the metalline kingdom with the instrument fire; and the anatomist, the philosopher, and the chymist, find, at last, by a close inspection, that all things are possessed of mercury, sulphur, and salt. To explain further: in the beginning of the process of fire, that element which evaporates is termed mercury; and the philosophers and chymists called it mercury, because it proceeded from the internal mercurial salt contained in the subject when ignited. That element which burns, and ever ascends, (second in order,) they styled sulphur; but that which remains, and hangs about the vessel, they named it salt.

Here is the point: although this radical salt in appearance may be the most unseemly, yet, its virtue and hidden properties are of the most surprising nature. With a fit process, you may obtain the salt of many things; which different salts, to the common observer, would look all alike. When, however, these salts are put to work, it will soon be perceived, that they have no more resemblance in their effects, than they had in their native unseparated states and appearance. The salts of different plants contain their several skeletons: this is a thing of great admiration, and much to be wondered at, for these respective salts are the great limbs or skeleton of nature. To illustrate this position, I will introduce an example from the botanical kingdom:

viz. the salt of a tulip, and the salt of a rose, will produce a wonderful effect; for you will have the real appearance of the original plant, in a magical way, springing up, by degrees, out of the bare salt of the plant contained in the glass vessel. To make all exceeding plain, I refer to a learned work, "Sibley's Occult Philosophy," wherein is recorded a very striking example, that will fully prove the statement I have made, and which is done in order to shew the process of revivifying any vegetable, and, finally, to illustrate magnetism. The author I refer to states it thus:

"Take any whole herb or flower with its roots; make it very clean, and bruise it in a stone mortar quite small; then put it into a glass vessel, hermetically sealed, but be sure the vessel be two parts in three empty; then place it in a gentle heat or balneary, not more than blood warm, for six months, by which it will be all dissolved into water: take this water and pour it into a glass retort, and place a receiver thereunto, the joints of which must be well closed; distil it in a sand heat until there come forth a water and an oil, and in the upper part of the vessel will hang a volatile salt; separate the oil from the water, and keep it by itself, but with the water purify the volatile salt by dissolving, filtering, and coagulating. When the salt is purified, imbibe it with the said oil until it is well combined; then digest them well together for a month, in a vessel hermetically sealed; and by this means will be obtained a most subtle essence, which being held over the gentle heat of a candle, the spirit will fly up into the glass where it is confined, and represent the perfect idea or similitude of the vegetable whereof it is the essence; and in this manner will that thin substance, which is like impalpable salt, stand forth from the bottom of the glass, in manifest form of whatever herb it is the menstruum of, in perfect vegetation, growing by little and little, and putting on so fully the form of stalks, leaves, and flowers, in full and perfect appearance, that any one would believe the same to be natural and corporeal, although, at the same time, it is nothing more than the spiritual idea endowed with a spiritual essence. This shadowy figure, as soon as the vessel is taken from the heat or candle, returns to its *caput mortuum*, or essence, again, and vanishes away, like an apparition, becoming a chaos or confused matter."

To illustrate this process with better effect, I have subjoined a plate, (No. 4,) setting forth a laboratory, where the chymist is in the act of producing the appearance of plants and flowers. In which plate, Fig. 1 represents a stone mortar, wherein the herbs, &c. are to be bruised before they are placed for putrefaction. Fig. 2, a dry glass vessel, hermetically sealed, containing the

bruised herbs for putrefaction. Fig. 3, an empty glass retort. Fig. 4, a retort filled with the essence of an herb, and put into a sand heat for distillation. Fig. 5, a glass receiver jointed to receive the oil and spirit. Fig. 6, a stool, upon which rests the receiver. Fig. 7, the furnace, made of different conveniences, either for a sand-heat, or for a balneary. Fig. 8, the furnace hole, where the fire is placed. Fig. 9, a table whereon is placed the glass vessel, hermetically sealed. Fig. 10, a vessel containing the representation or similitude of a pink in full bloom. Fig. 11, the representation of a sprig of rosemary. Fig. 12, the representation of a sprig of balm. Fig. 13, a candlestick, with a candle lighted for the purpose of heating the spirit. Fig. 14, a chymist in the act of holding the glass vessel over the lighted candle. Fig. 15 represents the idea of a rose in full bloom.

By this experiment, we shall discover the virtue and the form of the plant to reside in their respective salts. Salt being, indeed, the frame of the plant, as that of all other things; and thus every being in creation is formed according to the respective salt that enters into his composition. This is remarkable. This salt, in its own virtue, or elementary quality, is a fire as well as a form: as to its process, heat ever draws moisture, so it is with this production. The native heat of the salt, when excited by an additional heat of the lamp or candle, attracts the moisture contained in the vessel, and clothes (as with flesh) the whole skeleton of the plant that rises up from the bottom of the glass, until it arrives to its full image in appearance.

I have here described to my readers the great virtue that is inseparable in the precious salt of all earthly and natural things. I do not suppose that this virtue is confined merely to plants; for who knows where it ends, if the opinion be true that it equally applies to the animal kingdom?

By this step many may be inclined to climb the ladder of science, and probably set themselves to work, and not wholly trust to their books.

One example more, which is introduced principally for the illustration of the salt of iron relating to magnets and the loadstone, which is the point we aim at: I bring in these examples for no other purpose; and I will pass over the various properties of the other six metalline salts, save a short account of their effects in the article of colours, which are characterized as follows: ♄ (Saturn) lead; ♃ (Jupiter) tin; ♂ (Mars) iron; ☉ (Sol) gold; ☿ (Mercury) quicksilver; ♀ (Venus) copper; ☾ (Lunar) silver. The seven salts, in the seven metals, are the whole ground and variety of colours; and as their several salts enter the composition of the dye respectively, so are the colours varied: and

these colours most beautifully exhibit themselves in the botanical kingdom. For instance: Mars or iron gives the red; so, that when you see a bright red stripe in the leaf of a flower, you may conclude that the salt of iron was the cause of it: and so on of the rest of the colours, which the salt of the several metals give when they enter the composition of any substance. Saturn, or lead, gives black; Jupiter gives red and green mixed; Mars gives red; Sol gives yellow, or yellow purple; Venus gives white, or purple; Mercury gives sky colour, or bluish; and Lunar gives white or mixed colour.

We shall leave unnoticed, for the present, (though nearly related to our subject,) that chymical production of animal substance, on whose salt the air strikes fire spontaneously by corrosion, and by which phosphorous obtains its light to appear as a lamp. If phosphorus were fixed, and not fugitive, it would be lasting and perpetual; then, indeed, it might be justly termed a perpetual lamp.

Now take one example more: what is said of the perpetual lamp itself, which never requires trimming or replenishing, but continues to burn or give light by the only means of the corrosion of the air on the ingredients of its composition, bears a strong affinity with the ignition of steel, for the production of magnets, the salt of which is ignited by friction. The manner of manufacturing the perpetual lamp is reported to have been in the possession of the ancients, and has been found burning in the pyramids of Egypt, which was placed there to give light to the burying-places of the rich and the great: their bodies, also, were embalmed so as not to perish by lapse of time. This would be as little credited as that of the lamp, were there not so many proofs of the fact; indeed, we have only to go to the British Museum to satisfy ourselves on the subject. The knowledge of the process of embalming is said to be lost to the present age. Although the lamp bears so hard upon our subject, I shall glance at it here but briefly. Now, the principal substance of the lamp would appear to be contained in the salt of man's blood, which was managed in the manufactory somewhat after the same manner as the salt in the revivification of flowers, &c.; but, it is stated, that the chief difficulty is in the proper manner of lighting the perpetual lamp more than in the previous production of the salt for the lamp.* As there is much iron or ferruginous matter contained in man's blood, the salt of that blood appears capable of being fired, after the example of steel for magnets, and to become a perpetual lamp; the blood being stripped

* What is most probable to have this effect, is the augmented solar rays by a burning-glass.

in the manufactory of its volatility, it becomes fixed as the salt of iron, which iron, we find, is possessed of a magnetic flame, gained or produced by friction, called here the ignition of the salt of Mars, or iron. The magnetic virtue, it is true, cannot be seen, yet we must believe in its existence, seeing (by a foregoing explanation) that this stream of magnetic fire directs the mariner's needle.

Having glanced at the extraordinary virtue contained in some natural things, let us now return to the point in hand, and apply it to the present subject, and speak of warlike Mars, or iron, which breaks all things to pieces, of whose salt the native load-stone is composed, as well as that of all iron in general: the magnet, and also the mariner's compass, is composed of the same salt of the same metal.

The real case is, in iron that is magnetized, the salt of it is fired by the act of friction. The flame of the magnet and the load-stone cannot be seen, because it is so pure; that of the phosphorus may be seen, because it is more gross, like the moon, which is seen to appear largest when the atmosphere is most dense. The pressure and corrosion of the air produce the light or flame; as a proof thereof, exclude the air, and you will see no fire, nor even a vestige of flame.

These examples have been brought together for the purpose of elucidating the subject of Magnetism.

SECTION IV.

Of the natural Loadstone.—Of Iron in its Mines.—A Right and Left in the natural Heavens.—The great World rules the little World, viz. that is the Human Body, called the Microcosm.—The Cause of the diurnal Motion of the Earth.—Dr. Halley vindicated.—But for the Existence of the Nucleus in the Earth, the Orb itself would instantly be thrown into Atoms, and return to ancient Chaos.—The Pressure of the Air is the whole Cause of Gravitation, save what relates to the Nucleus, which holds together by Attraction.—You cannot produce to the Magnetic Needle one Pole alone, so true it is, that every Thing has its Opposite.

The natural loadstone is a rich fat mineral ore, which possesses the remarkable property of attracting iron or steel. The virtue or power is said to have been first discovered by one Magnes, a shepherd, on Mount Idia, in the island of Crete, in the Mediterranean, who found it to adhere to the soles of his shoes, which were shod with iron. It is supposed that the present appellation of the magnet was derived from its discoverer. No mention is, however, made of the country in which Magnes was born; I imagine it was France, and that the natural love of country induced him to mark the magnet with the fleur-de-lis, a part of the French arms; which mark is continued by every country (except the Chinese) to the present day. If it be not conceded, that Magnes was a Frenchman, it may naturally be concluded it was a native of France who first applied the magnet to the mariner's compass card to steer by, a circumstance that took place subsequent to the discovery of the loadstone.

This natural loadstone is composed of ferruginous matter, and obtained its attractive qualities by friction. Local pieces of loadstone (such as attached to the shepherd's shoes) we may conclude are one in nature with the matter of the nucleus of the earth, which is here stated to be one solid mass of loadstone of 80 degrees of diameter. (See plate 5.) This nucleus extends (as demonstrated by experiment on the dipping needle) 40 degrees each side the centre of the earth, as one solid compact mass of ferruginous matter; which nucleus, from its near resemblance, may be compared to the kernel of a nut; and the stratas of earth, that make up the complement of its bulk, may also be compared to its shell.

From the 40 degrees to 90 is as the shell, and is composed or made up of

stratas of earth; (see plate 5, letter L;) where the lightest particles of earth are most decidedly the lowest under ground, as shall be fully made to appear.

I shall here make a short quotation from that sound philosopher, Basil Valentine, (chap. vi.) for the purpose of describing the nature of iron, which forms so large a portion of this Treatise on Magnetic Attraction. In it the reader may apprehend a particular which is worthy attention, concerning the properties of the loadstone, its power of shewing the time or hour, either by day or night, and by sea as well as on land.

On this interesting subject this distinguished scholar speaks as follows:— "Iron-stone and iron ore are wrought in its mine stone, according to the heavenly influence* of Mars; for he is *trinus magnus*, the great lord of war, and an instrument whereby others are forced and compelled; of a hard, an earthy, and an impure sulphur of putrified salt and gross mercury, which three principal pieces, in their juncture, mix much of earthliness; therefore, it is a difficult labour to mollify iron in the fire, carrying much of impurity, by reason of its sulphur; and, above other metals, it hath a deep red quick spirit, which, if it be taken from Mars, then is the iron gone also, leaving again a putrid earthliness. Iron is not easily mixed or joined with other metals, or united in the casting. Iron hath a threefold partition, and several parts in its earthly ore, namely, a magnet, a quick metalline ore, which hath its quality from quick mercury, and must hold communion and affinity with iron; must be quickened and renewed with iron filings, in which he lieth like an hedge-hog, and is endued by the sun of nature with glorious gifts and adamantine virtues; at one place and side it attracteth, and at the other side it repelleth, which virtues may be augmented and increased in it: it plainly typifieth or demonstrateth (like unto the sun in the heavens) the true hour in the body of the compass, by water and by land.

"Secondly: steel, the hardest, purest, and most malleable iron, of its proper light draining place, wherein it lieth close, tied and knit together, in all its parts most compactedly, which in all iron work is usually put to the edge and point.

"Thirdly: there comes the common iron ore, ordered together by its earthly sulphur, which three ministered good thoughts to the first expert naturalist, that master of mine-works, Tubal Cain, who made his three principles

* My opinion is, that it is here meant, that it is the astral heavens which are natural, and not the heaven of heavens which is moral.

in all things, and made his dimensions in the mines in three distinct parts, in which such metalline ore he found at first the iron-stone, wrought in several ways, namely, upon standing passages and floats, fallings and proper pieces tinged, after the four elements and colours of the rainbow. Then he considered exactly its floors, according to the condition of each stone work, how and out of what the iron-stone may most conveniently be melted, and what manner of instruments may be used thereunto, where it may best and most firmly be wrought; for its ore affords a threefold society and wildness, which are useful, as namely, glass-heads, which is like a sharp bloodstone breaking in the manner of a skull, are scaly and brown *spissia*, some whereof are white thorns, like the wood upon which Abraham purposed to offer his son Isaac. Secondly: the brown-stone, out of which is made glass and iron colour. Thirdly: granulate iron-filings in the float-work, which is so hard that it can scarcely be forced to be gotten off, or be brought to right; and when the iron-stone is come to its perfectness, then it breaketh off by piecemeal through the stone and rock: that there are found whole mines of iron-stone, such is the iron ore in Styria. The best iron-stone is black, or red brown; sometimes it inclineth to a yellowness; some is of a cherry brown in the floats and stocks; some are a black and small *spissie;* some yellowish, which glittereth among the rest, like a copper stone, of a brown black marble, and of a fair glass; some look like separated float-work throughout the whole mine; some are cloddy and hoary in clayish fields, which only is called the driving, is as the sand-stone, most hurtful unto gold, because it affordeth most of the stacks, and very little of iron. Some stick in the gray clay, which affords most malleable iron, but is of a brownish colour. There breaks, also, good iron-stone in tartareous and limy-mines; and the most running is on the standing passages, in cristy sandy dalk-stones. The gross clift-stones break some in their slats. It usually breaks, also, in the fore and after mine works, where some of it lieth off washed among the roasts, like a brown arch; and on the day there is no ore so common as the iron-stone, because it assumeth and taketh in other ores, and setteth it thorough, thus often it changeth its colour and nature, after it there ensues glass-heads, emasites, brown stone, osemund, bolus, together with the red oker and iron shell, all those assume the nature of iron; and the iron-stone receiveth the highest metals, gold, silver, copper, tin, lead, whereby it groweth untoward, but gold and silver are not hurtful unto it, they make it malleable. That which is mixed with copper, or with other poor metal, easily falls asunder, is brittle, of the same condition is iron-flint, producing out of many passages an huge

flint, partly porous like unto a black slat, which, besides the iron-stone, yieldeth another grosser or subtiler iron. By this exchanging, Tubal Cain, the great and first mine-master, did perceive that the stones have their activity: he looking about and finding that the limestones, which contained iron ore, are of such mixtures, which may be burned to lime or calx, to raise walls with them, and no other sorts of tapff-stones, as also calx-stones are fit to be burnt, and found them to be helpful for his melting. Thus the iron-stone is associable unto other stones, be they metalline or mineral. At Musbach, there is copper shot iron, which hath a lead joining thereunto. Founders must be expert to deal with such ores in their melting, and magistrates do wisely that train up their subjects in such ways, for the good of the Public. Thus is the iron, the first and last minework, a chief metal which many creatures cannot want it, being of a most necessary use, whereby things within and above the earth can be forced: no man is able to remember all the uses it may be employed unto; for every day things fall out to which there is need of the use of iron. Iron easily receiveth a malleableness in a transmuting way, of which some of the ancient philosophers have spoken. Our iron is drawn from the magnet, performeth many useful works in the affinity with copper, which it is near kin unto, as also unto the gold and lead, for thereby are made the most glorious alcali, which appear helpful in many things unto other creatures, as poets write of, and attribute many strange qualities by way of parable unto iron; and if in writing all the virtues thereof should be comprehended, it would rise to a great volume. Its stones have, in many countries, decreased; all other metalline stones are upon their decay; only gold, silver, copper, and lead, keep their multiplying condition all the world over."

I will here remark, that formerly the name of iron was spelt differently to what it is at present. The old mode was far preferable to the present, inasmuch as it not only gave the name but pointed out the nature of its substance: (in all new names this ought to be a leading principle:) for instance, the word yarn, which denotes an useful article of manufacture, will stretch, spring, &c.; so does iron, from which the best springs are made for mechanical purposes; and it is, I presume, from the corruption of that word, the term iron has been derived.

Let me detain my readers, in the way of exordium to the doctrine of the nucleus, to perform a duty which is due to that excellent scholar, Dr. Halley; who, for one miscarriage, (although the literary world are so greatly indebted to him,) is to this day stripped of his reputation; but I have now found his ornament, and hope the learned world at large will permit me the

honour of putting it on him, as it falls alone to my lot, having fully discovered the solution of his despaired of problem of the existence of a nucleus in our earth. This I shall do with the respect his merit demands, observing, when a man is deceased and robbed of his reputation, (which is frequently more dear to him than life,) he is said to have lost his winding-sheet.

Dr. Halley fell under as much abuse for asserting the truth, concerning the existence of a nucleus, as a renowned philosopher has gained credit for his erroneous assertions of the tides being governed by the attraction of the moon; which assertions, however, will be subsequently fully disproved and explained by simple but incontestible proofs.

On this article I beg to remark, that from the great obloquy Dr. Halley fell into in consequence of his hypothesis of the existence of an inner globe, it was not very probable any author would be induced, after the failure of so great a man, even to attempt the development of the fact. The idea, however, forced itself on my mind from the circumstance of the dipping-needle steering mariner's compass, for the invention of which I take the credit. On perceiving the different dips the needle assumes on the globe, inspired me with Dr. Halley's notion; for how can any one divest his mind of the persuasion, that where the needle (when left to traverse freely on its centre) points to, certainly there and there only is the place or point of attraction: and we are bound to believe, that at that place there must contain some peculiar matter to have this magical influence on the magnetic needle.

Here I consider it requisite to make a quotation from a work on magnetism, by Mr. John Churchman, in order to give the reader a proper view of Dr. Halley's accidental knowledge of the existence of a nucleus in the earth; but which notion, by the learned world, has been entirely scouted, in consequence of his being unable to elucidate his subject. It appears, by the present discovery, that the north and south poles are not situated at the surface of the earth, but it is about 50 degrees beneath the surface. This position will be demonstrated in a subsequent part of this work.

Mr. Churchman, in his Introduction to "The Magnetic Atlas," says,— "Although Dr. Halley's first theory was favourably received at home and abroad, he was soon sensible of several insurmountable difficulties in it. It is plain that the magnetic poles are not fixed, but moveable, as appears by the great changes of the needle's direction. In England, where this discovery was made, the direction of the needle has changed no less than 33 degrees in two hundred years. Dr. Halley, probably considering the difficulty of forming any

system without a number of observations, made application to government, in the reign of William and Mary, when this matter was considered in so favourable a point of view, that the command of the Paramour Pink, one of the ships of the royal navy, was given to Dr. Halley, with orders to seek, by observation, the discovery of the rule of the variation of the compass. He set sail, the first time, on the 20th of October, 1698, for the southern hemisphere, and continued the voyage with great spirit until a disposition for mutiny was discovered by the commander among his men; he then bore away for Barbadoes, in order to exchange them; but this being impossible, at that time and place, he returned to Great Britain, where he arrived in June, 1699.

"Having got his lieutenant tried and cashiered, he set sail, the second time, in September following: he now traversed the vast Atlantic Ocean, in which he sailed to the fiftieth degree of southern latitude, and upwards. This voyage deserves to be remembered longer than that made by the ancient Grecian princes, the Argonauts, who, under the conduct of Jason, went to Colchis, to fetch the golden fleece from thence. Dr. Halley made magnetic observations at Brazil, St. Helena, Barbadoes, Bermudas, Newfoundland, and other places on land and sea. He arrived in England in September, 1700, and the next year published a chart on Mercator's projection; which will preserve his name longer than brass or marble. This was done by drawing lines through those parts where the variation was equal; but his observations were by no means universal. Dr. Halley, now satisfied his first theory would not bear the test, communicated his second to the Royal Society under the following appellation: 'An Account of the Cause of the Change of the Variation of the Magnetical 'Needle, with an Hypothesis of the Structure of the internal Parts of the 'Earth.'

"In this paper he says, 'these difficulties had wholly made me despond, 'and I had long since given over an enquiry I had so little hopes of, 'when, in accidental discourse, and least expecting it, I stumbled on the fol-'lowing hypothesis: the external parts of the globe may well be reckoned as 'the shell, and the internal as a nucleus or inner globe, included within ours, 'with a fluid medium between, which, having the same common centre and 'and axis of diurnal rotation, may turn about with our earth each twenty-four 'hours; only this outer sphere having its turbinating motion some small matter 'either swifter or slower than the internal ball: and a very minute difference 'in length of time, by many repetitions becoming sensible, the internal parts 'will, by degrees, recede from the external; and not keeping pace with one

'another, will appear gradually to move either eastwards or westwards by 'the difference of their motions.'

"Dr. Halley supposes the fixed poles are the poles of this external shell, or vortex of the earth; and the other two the poles of a magnetical nucleus, included and moveable within the other; and, finally, Dr. Halley concludes this motion is westward.

"Instead of the motion of the magnetic influence moving westward, as Dr. Halley supposed, the two magnetic points will be found to move from west to east; the northern one quicker, and the southern slower, than the earth; so that the apparent revolution of the northern magnetic point is from west to east, and the apparent revolution of the southern magnetic point is from east to west."

We will now return to our subject and prove, by infallible reasons, that the nucleus of the earth does really exist, and that it is one great spherical magnet, one compact mass of iron ore, of 80 degrees diameter; (see plate 6, letter R;) and, also, that its first motion was not circular, but in nearly a straight line; not having, at its early stage of creation, acquired a diurnal motion, nor as yet being taken into the solar system. Now, to a distant beholder, this would have appeared nothing more than a comet, which it really was, in size of 80 degrees diameter; and is now shewn and proved by the different degrees of dip the dipping-needle assumes in different latitudes.

At this stage of creation, mankind was not created. I must here remark, on the article of the nucleus of the earth, that the necessity and determination of its creation is a specimen of the infinite wisdom and providence of God! in first forming this nucleus before He gave the whole bulk to the earth. For true it is, but, for this provision of the nucleus (aptly timed) to our earth, which holds or keeps compact together by magnetic attraction, (not attraction of gravitation,) the exceedingly swift diurnal motion would undoubtedly, in one revolution, or much less time, have broken up the whole sphere of our earth, and, consequently, would as quickly have returned to confusion and ancient chaos! The nucleus had not as yet received from the motion of the sun its present diurnal circle; for it was only a comet before it had been caught by the influence of the motion of the air, (which is the moving vortex belonging to the sun,) and thereby became one of the planets of our solar system. This new motion and power of the sun, operating against an angle of the universe, which, before this circumstance, carried the nucleus hard by and clear of our solar system, detained the nucleus against his inclination in the port of our system.

This fact of the diurnal motion breaking the sphere of the earth, will appear plain and surprising, after we have digressed for a moment to correct a vulgar error on gravitation. Many people are disciples of attraction by gravitation, and suppose that the most ponderous things have their place in the lowest parts of the earth, or furthest from the surface; whereas, the contrary is found to be the fact. This declaration, when proved, will appear to be another wonder, which will be fully made out by the following incontestible examples; for I wish to support all that I have premised.

The lightest articles are invariably found situated in the most deep parts of the earth; and, on the contrary, the most ponderous nearest the surface of the earth. Take for example the substances of the seven metals, (which are the most ponderous,) as they are found in their native state of place, viz. before they are removed from their natural beds in the earth. These metals, being more heavy than others, are, therefore, found nearest to the surface.

Gold, the most ponderous metal, (save platina,) is found in those mines which are situate on high ground, and the article itself juts through the surface of the most elevated mountains. It would not have remained there, even in that situation, but have proceeded further from the centre into the atmosphere, had it not been for the pressure of the air alone, which gives weight or gravity to every thing. The well-known experiment of the feather and the guinea with the air-pump, clearly shews that when the air is removed from the substance, by the vessel being exhausted of the air, the feather will fall and descend to the bottom of the jar equally quick with the guinea or piece of gold: the cause (the air) being removed, the effect ceases. Here you must not believe there is a vacuum produced, or that the electric jar is empty when the air is pumped out. There cannot be a vacuum in nature; for, as fast as the air is pumped out, electric fire, created by the friction in the act of pumping, comes in, and fills the machine. If the heaviest matters fall deepest, why is not the heaviest matter found deepest in the mines? The effect of the circular diurnal motion is the cause of throwing the most weighty particles of matter from the centre of motion to the surface of the earth, and to the tops or uppermost parts of mountains. For instance: the matter of gold is beat off by the weather from the surface of the mountains, is washed down by the rain, mingled with gravel, and brought to the bottom of the mountains. It is then collected and separated from the sand and rocky particles, by washing in vessels; and, as it has lost the connection of the diurnal motion, by being beat off the mountains, it settles at the bottom of those vessels, and properly receives the name of gold-dust.

Next to gold, silver is the heaviest metal, but which is found deeper in the earth than gold. And so, after this example, the lightest metals are found to be situated in the lowest parts of the earth. I admit, when the seven metals, or any other things, are removed from their natural beds, thereby having lost the connnection of the sphere of the earth, and the influence of the diurnal motion, it would be widely different; then the most weighty thing will ever take its place below or beneath the lightest thing. Here, however, it must be observed, if that thing be put again into sufficient motion, you would invariably find that the result would be, that the most ponderous thing would always be driven farthest from the centre of that motion*.

The example of throwing a stone from the hand, and that of a feather, will demonstrate it most clearly. Try the experiment, and you will ever find the stone will be projected farther from you than the feather, under the same effort. I think these examples render the thing sufficiently plain without adding any thing further.

In the formation of the sphere of the earth, the three following particulars were of great consequence in this stage, viz. the peculiar matter, the motion, and the end proposed.

The nucleus of the earth, which is here stated to have been formed first in order, before the earth received its full bulk, was for a principal motive, to prevent the earth from being broken to pieces by the diurnal motion; which motion would do it every moment, but for the magnetic attraction that holds the nucleus together; but this effectually prevented the destruction of what was to be added, viz. the stratas of earth, that make up the complement of the

* To corroborate this position, and set it in a clear point of view, I will make a short extract from the "First Voyage to explore the North-west Passage," by Capt. Ross, of H. M. R. N. Capt. R. says, he invented a deep-sea clam, for the purpose of taking up articles from the bottom of the sea when sounding: this clam was of an extraordinary weight, with a great length of line, so as to pass through every obstruction. Now, it appeared that this well-constructed instrument, when let into the sea, the deeper it descended, the slower it drew out the line. He was so particular in his observations, as to stand with his chronometer in his hand, and every second of time the line took in running out, he gave a stroke to the line with a paint-brush. Upon hauling in the line, it was found that there was a considerable difference in the spaces between the paint marks; which clearly indicated that the deeper the clam went, the slower was its motion. From this account I infer, that if a clam could have sufficient liberty, it would eventually fall into the diurnal motion; and, consequently, instead of sinking deeper, it would be thrown up with considerable surge by the earth's diurnal motion.

sphere. (See plate 6, letter L.) The compounding it of such a particular substance, as is found to exist in a natural loadstone, was of equal consequence. One more particular: the circumstance of passing the first matter, (the nucleus,) when in the state of the comet, through almost immensity of space, even from the centre to the circumference of creation, in order to render it, by means of friction of the air through which it passes, attractive or magnetic, each particle adhering to each other, thereby forming such an adamantine compact body as to be proof against the diurnal motion, which would otherwise break it up by its own centrifugal force.

All material things are composed of mercury, sulphur, and salt. Now, when one of these things (for instance, the salt of Mars) is ignited or fired, (not in the common way of heating it in the fire, but by friction,) it instantly becomes attractive or magnetic; provided it be sufficiently hardened, and a fit temper given. Artists take pains to prepare iron into steel for the production of magnets; but nature does it for herself below the earth, as is clearly evinced in the mineral of iron, called the loadstone.

There is but one proper operation which will produce this effect of firing steel; there is, therefore, with this as with the perpetual lamp, only one correct manner of lighting it. The proper way to ignite the salt of Mars, or iron, is by friction; for, by this process, the magnetic fire is produced on its surface. It is necessary to state that the magnetic fire is indifferently produced by galvanism and electricity; but these operations are also friction, produced in another way. Recollect the effect of the filings of steel, and it will make all plain; indeed, it is a parallel case. The spherical magnet of the earth, being composed of ferruginous matter, and ignited by friction, became one great and imperial magnet.

To explain in a few words: motion in a full medium ever produces friction; and friction, on a fit matter, produces magnetism. But some persons, while they admit friction will produce magnetism, will demand where is their sufficient friction to ignite such an immense body as the earth? Let me lead the reader to the actual case, and attempt to ascertain the inconceivable distance from the centre of the universe to an angle thereof; a place far, very far, beyond our solar system: add to this, the exceedingly gross medium, which must have been the case at that stage of the creation, and the air which always crosses or rubs by in the opposite direction to the moving matter. Take into consideration the amazing velocity (for velocity is equal to gravitation) of a comet, and you will not long be at a loss for sufficient friction to produce heat, elec-

tricity, light, and magnetic attraction. I think we have now arrived at the point to which we have been aiming, viz. the origin of MAGNETIC ATTRACTION.

I now submit to the reader another idea connected with this subject; viz. although it may appear novel, yet, it is true: the difference of time at that period compared with the present time: for the difference between solar time and prophetic time must be taken into the account. Admit that the six days of the creation, mentioned by the inspired historian, were not common days but prophetic, for the operations of magnetic attraction, they would be, in fact, six thousand years for the six days of creation. Either account of time bears no comparison to that of eternity.

In order to prove this difference of time we will refer the reader once more for an elucidation of days of time: here we shall have it to full satisfaction. St. Peter positively declares that prophetic time, in its comparison, is as a thousand years to one day of common time. I will relate the circumstance that occasioned this definition, or we probably never should have known this fact of the comparison of time. It appears that as God had promised, in His prophetic style, to visit the earth in judgment, the party, to whom it related, supposed the time had passed away. They made this assertion in consequence of their ignorance of the true knowledge or computation of His number in nature; for be it known, every thing has a number to itself as certainly as it has a form: nine is the number of the moon; and, also, nine is the number of a man, as might easily be shewn, and which is confirmed in the book of the Revelations, chap. viii. verse 18, "His name is the number of a man." To continue: this party said, "where is the promise of his coming?" &c. (Second Epistle of St. Peter, chap. iii. verse 4.) St. Peter's reply is very pertinent: he says, "be not ignorant of this one thing, that one day is with the Almighty as a thousand years, and a thousand years as one day." It is true, that God, beyond nature and creature, is infinite; yet, in nature, He also has His proper number.

But upon the subject of time, and the term day, I must further explain, that I may make myself to be understood. Day, as we term it, is not, in the large sense, especiaily prophetic days, confined to twelve hours, but a great variety of application of time is included in the term day. There is the common day of twelve hours; and, also, the astronomical day of twenty-four hours: the word day has many relations of time: the prophetic as well as the diurnal days are, in fact, divisions of time, according to the relation to the subject matter in hand. In the book of Daniel, there is mention made of the time of

one thousand two hundred and ninety days. Abundance of examples might be cited; but I consider that to be needless, as most persons are well acquainted with the prophetic writings. In the compass of the days mentioned by Daniel, it is well known, were comprised the rise and fall of many a kingdom; and actually they extended to the downfall of the kingdom of the Jews, which was many centuries after; and they are, therefore, properly termed prophetic days. If, then, these six days were prophetic*, they contain sufficient length of time for the journey of the atoms of chaos, in their passage, to acquire the magnetic virtue by friction, the distance even from the centre of creation to the face thereof, (that face is the circumference,) to the exterior of the second circle in Deity.

The manner the magnet-needle is directed to the poles is by means of an universal effluvia, flowing from and towards the poles of the earth. This effluvia, or stream, divides itself into two separate lines, forming the two lines of no variation; each line is two-fold, and they cross each other in the form of the letter X, the north flows up, and the south flows down. Electricity is a species of fire with a flame, although it cannot be discerned by the naked eye; so also is the fire of the internal salt of iron in the magnet, when ignited. Yet, who can doubt its existence? The magnet, therefore, has a flame in its volatility, which volatility is a constant stream flowing from the magnet; this has been clearly shewn by the examples of the bars of iron and the dimple in the face of the mercury.

It is matter of consequence to know by what means the universal magnet affects the magnetic needle: the direction which this flame assumes in $51\frac{1}{2}$ degrees (the latitude of London,) is $71\frac{1}{2}$ degrees some seconds: these degrees of dip are to be accounted in a circle drawn round the dipping needle.

On the magnetic north and south poles, the needle points perpendicularly, by virtue of the downward stream; and the south points perpendicularly upwards, by means of the upward stream flowing from the nucleus of the earth,

* It is most certain, that those days could not be natural, but prophetic, days; for the sun (which wholly constitutes natural days) was not in existence until the fourth day of creation. Adam (from whom, it is probable, we have that part of the account of time succeeding his creation) counted time in the natural way, according to the number of a man; but preceding his time, the inspired penman reckoned according to the prophetic style: if we take the six days of creation as prophetic, it involves no contradiction. Adam might have been created at the very end, or at the latter part of the prophetic sixth day of creation; and then, of course, it placed him under the denomination of solar time.

which position is found to be the case by experiments with the dipping needle: but, upon the magnetic equator, the needle being drawn by both poles, they equally counteract each other; the needle, of course, then stands horizontally.

There is as real a stream flowing from the magnetic needle as from the poles of the nucleus; and this stream is ever contrary in direction to the stroke on the magnet, which gives the virtue to the needle. After the example of the tail, or flame of a comet, and that of a torch, which, when moved through the air, the flame always flows behind, opposite to the motion; the same is the case with the flame or effluvia flowing from the magnetic needle: so that a north motion, or stroke on the north end of the magnet, gives a south pole to the needle, (as is well known to all magnetic needle makers,) and a south gives a north polarity. This is but a like of other things in nature; for every thing constitutes its opposite in nature. You cannot, for instance, produce one pole in magnetism alone. If you take a needle, or a piece of steel, that is not magnetised, and only touch one end of it on the magnets to give one pole, you will ever find both ends magnetised with opposite poles; and if you break a needle or piece of steel after it is magnetised, it will instantly possess two poles to each broken piece, without retouching: this may be accounted to be very strange, but it is, nevertheless, a fact, and may be relied upon.

This spherical magnet of the earth, must be looked upon as a principal, and all artificial magnets as subjects to it. They always point to their sovereign, and cast their stream or flame behind themselves, opposite to their motion. It is this flame, or magnetic stream, that guides the needle into the meridional line of the principal effluvia, which constantly flows from the poles. (See plate 6.)

This is a particular of very great account to mankind in many respects: it points out to us the direction in which the face of creation, and the centre thereof, stands to us in space. Who knows in what part of creation the solar system stands in relation to the whole? The proper north is farthest from the the centre, and points towards the great exterior.

To explain the right and left of the heavens: that part over our heads, when the sun is in Aries, is southerly, which place in the zodiac is occupied by Cancer; and that part under our feet is northerly, and occupied by Capricorn. At the time of the year when the sun enters Aries, and you look towards the rising sun, that is east, and is commanded by Aries; and that part at your back, is west, and is commanded by Libra. Those heavens, with the constellations, are termed the great world. In plate 7, the heavens are there divided into the parts

of the human form; which form is termed the microcosm, or little world, being an epitome of the great world. The great world attempts, by its influence, to affect the little world; hence the dominion of the stars. The invisible flame, which magnets send forth, will coincide with the opposite flame of another magnet; but will not do so with one of like name with itself; for poles of the same name repel each other. The reason will appear by the following examples of the rays that is sent forth from the magnets:—

You can run your hand down, without difficulty, over a shell-fish claw one way, but on the contrary direction it puts out forks, which resist and enter the skin of the hand; so do the rays from the two magnetic streams freely pass each other in one direction, but will find great resistance the contrary way. One comparison more will render this sufficiently intelligible:—suppose you thrust the bottom ends of two birch brooms against each other, they will not freely pass or glide by side each other without breaking some of the twigs; but if you turn one of the brooms the other way, they will then pass freely enough. So it is with the two streams or rays of the magnets; for they send out those rays which unite in one case and oppose in the other.

Consider how much mankind is indebted to friction: by its effects, in the production of a needle for the mariner's compass, the navigator thereby boldly trusts himself on the tractless ocean, and explores his way to the most distant parts of the globe. By its wonderful and almost incredible power on the matter of the nucleus of the earth, the equinoxes are produced; and by the magnetic stream, the earth itself is suspended, as a plummet, in the air to an angle of the universe. This magnetic line, which is governed by the amazing property of attraction, leads the vast orbit of the earth round the sun, and also produces the equinoxes.

To understand the production of the equinoxes, according to this system, the difficulty is to find the first moving cause sufficient to draw up or influence the upper end of the line, (the lower end, we know, is fastened to the nucleus by attraction,) in order to carry the earth as a plummet, and also to draw it up and let it down according to the signs of Capricorn and Cancer.

This breathing or heaving of the spheres among each other is abundantly confirmed by the zigzag motion of the moon in her circle round the earth; and it is but to have the same motion for the orb at one of the angles of the universe, (which angle holds the upper end of the magnetic line of the plummet,—the earth,) in order to produce the equinoxes. If there were a line and a plummet attached to the moon, (in consequence of the moon's zigzag

motion,) the supposed plummet would be let down and drawn up every lunation. There is only this difference: the earth is let down and drawn up once in the year, and the moon thirteen times in each year.

The magnetic north and south poles are situated at the nucleus of the earth, and are only apparently on the surface; and which are stated, at this time, to be about 20 degrees to the westward, the point of the present variation.

If the poles were on the surface of the earth, there could be no possible dip for the needle; but the poles which cause the dip are 50 degrees, or thereabouts, beneath the surface of the globe, as is fully demonstrated by the elevation the dipping needle assumes.

On the surface of the earth, there is both a variation and a variation of the variation; but, at the real poles at the nucleus, there is but little variation, or none at all.

If any should argue, that because when the needle is placed directly over the magnetic poles, it equally points to the centre of the earth, (because in that situation the dipping needle ever stands upright, or perpendicular,) and, therefore, (taking the direction of the needle for the guide,) the poles are as likely to be situated at the centre as at 50 degrees from the surface towards the centre; to this I reply, it is only so in appearance; for although the needle points to the centre, yet, at the same time, it points to the poles at the nucleus: in this position, all three places are in one line, viz. the place of observation, the point of the nucleus, and the centre of the earth.

If the needle be supposed to point to the centre, in that case there could be no pole at all to attract. For what is a mathematical point? and, moreover, this point would act contrary to itself, as it must be both north and south. But as nothing acts opposite to its own principle, it would be absurd to suppose the magnetic poles were situated at the centre of the earth.

SECTION V.

Continued Observations on the Variation of the Poles.—On the Dip of the Magnetic Needle.—Reflections on the Variation of the Variation, with Tables of actual Observation to elucidate this Phenomenon.

Dr. William Gilbert, physician in ordinary to Queen Elizabeth and to James I., in his book " De Magnete," published in 1600, gave his opinion on this abstruse matter. He supposed the earth to be in all parts magnetical, and that water was not magnetical; and further, wheresoever there was land, thither would the needle turn as to the greater quantity of magnetical matter. This opinion seems to have been long laid aside by common consent; for, some time after, on the coast of Brazil, the needle, instead of being attracted by the land, turned quite the contrary way.

The following will fully account for the whole of this difficulty:—there are two lines of no variation on the globe of the earth, situated opposite to each other: when the one on the Brazil side of the globe had changed from the land of Brazil, the needle followed it, because the needle ever inclines towards the nearest of those two lines, whilst, at the same time, it points straight to the magnetic poles, having west variation on the east side, and east variation on the west of those two lines of no variation. The needle always points to the magnetic pole in a straight line, and inclines towards the lines of no variation obliquely, according as the vessel stands to those lines of no variation, either to the east or to the west; so, when the needle pointed towards the land, the line of no variation was inland; but when the variation changed, the line of no variation also changed on shore, and the needle accordingly followed it, and pointed off or from the shore. I think this is sufficiently obvious.

It will now be necessary to insert such observations as have formerly been made, and to compare them with what has been said respecting the motion or

change of the magnetic poles from east to west; for which pupose, I have taken the following Tables from Mr. Walker's "Treatise on Magnetism."

TABLE I.

Variations of the Magnetic Needle observed at London.

		°	′	
By Burrows, in . .	1576	11	15	East variation.
	1612	6	10	
By Gunter . . .	1622	6	00	
By Gilbert . . .	1634	4	05	
By Bond	1657	0	00	
	1666	1	35	West
By Halley	1683	4	30	
	1700	8	00	
By Graham . . .	1722	14	22	

TABLE II.

Variation observed at Paris in the following Years.

In	°	′		In	°	′		In	°	′	
1550	8	00	East	1696	7	08	West	1713	11	12	West
1580	11	30		1698	7	40		1714	11	30	
1610	8	00		1699	8	10		1715	11	10	
1640	3	00		1700	8	12		1716	12	20	
1664	0	40		1701	8	25		1717	12	20	
1666	0	00		1702	8	48		1718	12	30	
1670	1	30	West	1703	9	06		1719	12	30	
1680	2	40		1704	9	20		1720	13	00	
1681	2	30		1705	9	35		1721	13	00	
1683	3	05		1706	9	48		1722	13	00	
1684	4	10		1707	10	10		1723	13	00	
1685	4	10		1708	10	15		1724	13	00	
1686	4	30		1709	10	15		1725	13	15	
1692	5	50		1710	10	50		1726	13	45	
1693	6	20		1711	10	50		1727	14	00	
1695	6	48		1712	11	15		1728	14	00	

TABLE III.

Variation of the Compass, inserted in the "Transactions of Leipsic," in the Year 1684.

Places.	Times.	Latitude.		Longitude.		Variation.	
		°	′	°	′	°	′
London . . .	1580	51	32 North	0	00	11	15 East
	1622					6	00 East
	1634					4	05 East
	1672					2	30 West
Paris	1640	48	51 North	2	55 East	3	00 East
	1666					0	00
	1681					2	30 West
Dantzic . . .	1679	54	23 North	19	00 East	7	00 West
Rome	1681	41	50 North	13	00 East	5	00 West
Bayonne . . .	1680	40	33 North	1	20 West	1	20 West
At Sea	1682	43	50 North	31	30 West	5	30
Cape St. Augustine	1670	8	00 South	35	30	5	30 East
At Sea	1675	34	00 South	20	00	10	30 East
St. Helena . .	1677	16	00 South	6	30	0	40 East
At Sea	1676	0	00	64	30	15	30 West
Van Dieman's Land	1642	42	25	142	00 East	0	00
		34	00	1	20	0	00

TABLE IV.

Variation of the Needle observed in 1708.

Places.	Latitude.		Longitude.		Variation.	
	°	′	°	′	°	′
Sardinia	40	00 North	9	03 East	10	00 West
Malta	35	53	14	20	10	25
At Sea	5	49	21	33	0	07 West
	5	24	19	25 West	0	00
	Equator		22	25 West	0	37 East
	2	26 South	23	25 West	1	05 East
	8	04	24	25 West	1	07 East
	20	21	26	50 West	8	11 East

TABLE V.

Declination of the Magnet observed in 1703, described in the History of the Royal Academy of Paris, 1705.

Places.	Latitude.	Longitude.	Variation.
	° ′	° ′	° ′
At Sea	5 40 North	18 25 West	1 30 West
	5 20 South	20 25	1 00 East
	11 15	24 40	1 30
	21 00	26 25	6 30
	34 40	8 40	3 15
	36 20	7 45 East	3 00 West
	36 20	24 35	13 0
	32 50	52 35	25 30
	22 40	80 35	15 00

TABLE VI.

Magnetic Declination observed in the Years 1704 and 1705, inserted in L'Hist. de l'Acad. Roy. Anno 1708.

Places.	Latitude.	Longitude.	Variation.
	° ′	° ′	° ′
	22 00 North	19 25 West	0 00
	16 00 South	22 40	2 30 East
	18 00	22 25	3 08
	23 00	22 25	3 10
	28 00	19 25	6 00
Case Bona Esperenza .	34 22	18 45	9 to 10 West
In 1680			7 30
Mosambique Channel .	15 08	40 53	22 23
	0 00	53 35	16 00
	15 00 North	70 35	10 30
Cape Comorin . . .	7 55	77 20	7 30
Ceylon	8 32	81 40	5 30
Cape Coromand . . .			5 00
Muritii	20 10	57 22	21 00

Places.	Latitude.			Longitude.			Variation.		
	°	′		°	′		°	′	
Island Bourbon . . .	20	50	South	53	35		21	30	
At Sea	25	00		57	35		23	30	
	27	15		56	20		24	30	
	33	10		49	20		14	30	
	0	00		19	20	West	0	00	
Island Ascension . . .	7	57		13	54		0 to 1		East
At Corva	39	41	North	31	00	West	4	30	West
Cape Anguillas, 1672 .	34	44	South	20	32	East	2	00	
Diego Rioz, in 1670 . .	20	00		61	00		20	30	West
From observations in the Transactions of the Society of Jesu. before 1600							20	00	East

TABLE VII.

Variation of the Compass observed in the Mediterranean, in the Year 1638.

Places.	Latitude.			Longitude.			Variation.		
	°	′		°	′		°	′	
Corsica	42		North	9	50	East	7	30	East
Ivica	38	50		1	09		5	00	
Vulcano	38	27		15	13		2	19	
Messina, in Sicily . .	38	07		16	20		0	10	
In Archipelago . . .							0	00	
Constantinople . . .	40			29	00		0	00	

TABLE VIII.

Variations of the Compass, observed by Captain Cook, in the Years 1773, 1774, 1775, 1776, 1777, 1778, and 1779, &c.

Latitude.			Longitude.			Variation.		
New Zealand.								
						°	′	
						14	15	East
°	′		°	′				
43	19	South	157	17	East	11	20	
37	50		149	31		3	07	
36	18		150			10	40	
35	27		150	37		9	50	

Latitude.		Longitude.		Variation.	
°	′	°	′	°	′
35	19	150	18	7	55
34	29	151	15	8	48
34	(or Botany Bay)	151	23	8	00
33	22	151	40	8	25
32	02	152	30	9	10
25	34	153	15	8	30
21	27	149	03	6	45
19	12	Cape Upstart.		5	35
12	38	143	15	4	09
0	46	128	00	0	00
9	45	125	48	1	27 West
11	10	119	22	2	44 West
Island Java				3	West
23	South	65	East	10	00
24	00	58	00	12	00
24	00	51	00	17	00
28	00	46	00	24	20
29	00	43	00	26	10
34	00	27	00	28	15
35	30	23	00	24	00
Cape Anguillas . . .				22	30
Table Bay, C. G. H.				20	30
70	North	163	24 West	30	21 East
69	38	164	11	31	00
66	30	167	55	27	50
65	43	170	34	27	58
63	58	165	48	26	25
59	39	149	08	22	54
58	14	139	19	24	40
55	12	135	00	23	29
53	37	134	53	20	32
50	8	4	40	20	36 West
48	44	5	00	22	38
40	41	11	10	22	27
33	45	14	50	18	07

Latitude.			Longitude.			Variation.		
°	′		°	′		°	′	
31	08		15	30		17	43	
28	30		17	00		14	00	
23	54		18	20		15	04	
20	30		20	03		14	35	
19	45		20	39		13	11	
16	37		22	50		10	33	
15	25		23	36		9	15	
13	32		23	45		9	25	
12	21		23	54		9	48	
11	51		24	05		8	19	
8	55		22	50		8	58	
6	29		20	05		9	44	
4	23		21	02		9	01	
3	45		22	34		8	27	
2	40		24	10		7	42	
1	14		26	02		5	35	
0	51		27	10		4	59	
0	07		27	00		4	27	
1	13	South	28	58		3	12	
2	48		29	37		2	52	
3	37		30	14		2	14	
4	22		30	29		2	54	
5	00		31	40		1	26	
6	00	South	32	50	West	0	06	West
6	45		33	30		00	35	East
7	50		34	20		0	07	West
8	43		34	20		0	15	West
9	01		34	50		0	44	East
10	04		34	49		0	38	West
12	40		34	49		1	12	East
13	23		34	49		1	01	
14	11		34	49		1	09	
15	33		34	40		1	15	
16	12		35	20		2	04	
18	30		35	50		3	02	

Latitude.		Longitude.			Variation.		
°	′	°	′		°	′	
20	08	36	01		5	26	
21	37	36	09		3	24	
24	17	36	08		3	24	
26	47	34	27		3	44	
28	19	32	20		1	58	
30	25	26	28		2	37	
33	43	16	30		4	44	West
35	37	9	30		5	51	
38	52	23	20		2	12	
40	36	173	34	East	13	47	East
42	04	167	32		13	17	
48	41	69	10		27	39	West

TABLE IX.

Declination observed in London at different Times.

Years.	Variation.			Years.	Variation.		
	°	′			°	′	
1576	11	15	East	1717	10	42	West
1580	11	11		1724	11	45	
1612	6	10		1725	11	56	
1622	6	00		1730	13	00	
1633	4	05		1735	14	16	
1634	4	05		1740	15	40	
1657	0	00		1745	16	53	
1665	1	22	West	1750	17	54	
1666	1	35		1760	19	12	
1672	2	30		1765	20	00	
1683	4	30		1770	20	35	
1692	6	00		1774	21	03	
1700	8	00		1775	21	30	

TABLE X.

Variation of the Compass observed by Captain Bligh, in 1788.

Latitude.		Longitude.		Variation.	
°	′	°	′	°	′
20	24 South	31	15 West	0	00
25	56	36	29	3	00 East
29	38	41	44	7	13
East of Terra del Fuego.				21	23
60	24	75	54	27	09
39	51	26	11	3	07
35	30	5	21	11	35 West
Simon's Bay, C. G. Hope				22	28
18	47	18	33 East		
36	28 South	39	00 East	30	34 West
44	16	122	07	6	23
43	56	133	16	1	38 East*
Penguin at Van Dieman's.				8	29 East
43	21	147	33		
47	44	179	07	17	00
40	21	145	West	7	45
24	13	131	43	5	19
17	50	147	36	5	00
Island Maitia.				5	36
18	50	160		8	14

TABLE XI.

Variation observed in 1791.

Latitude.		Longitude.		Variation.	
°	′	°	′	°	′
26	14 North	16	40 West	19	00 West
3	36	17	42	15	30
1	43	20	18	13	30

* Capt. Bligh remarked "That in 1780, on board the Resolution, in latitude 44° 23′ south, longitude 131° 28′ east, the variation was observed 6° 00′ west, which is a remarkable difference.

Latitude.			Longitude.			Variation.		
°	′		°	′		°	′	
37	38	South	25	48	East	27	14	
37	57		66	05		23	36	
38	47		77	15		19	49	
40	27		128	35		12	20	
43	46		144	40		3	05	East
43	21		147	30		4	43	
47	44		179	09		13	39	
44	31		192	07		10	22	
34	42		141	18	West	5	52	
30	45		136	22		5	51	
21	40		143	10		6	00	
18	30		178	36	East	11	20	
13	27		167	20		10	21	
13	43		159	36		10	10	
11	36		149	10		7	10	
9	27		144	46		6	30	

"From these tables of observations of the variation of the compass, it appears that it is perpetually changing; so that what the variation is this year at London, or any other place, will not be the same the next year.

"It also appears that the variation increases for a number of years, and then decreases again to nothing, and then changes from east to west, and from west to east. It is also evident, that there are two lines of no variation, the one originating at the northern magnetic vortex, or pole, and proceeding towards the south, which has west variation on the east, and east variation on the west side of it. The other line of no variation originates at the southern magnetic vortex, and proceeds towards the north, until it is lost in the northern one, and has west variation on the west side of it, and east variation on the east.

"The next thing to be taken notice of from these tables of observation will be, to find where these lines of no variation, or any one of them was when first taken notice of, and to trace it down to the present time.

"In the year 1638, (Table 7,) the line of no variation was observed to be at Constantinople, which is in the longitude of 28° 57′ east from London; at that time there was east variation all over the Mediterranean Sea, as well as at London and Paris; (Tables 1, and 2;) from which it appears, that the line of no

variation with east variation on the east side of it, at that time passed through Constantinople towards the north, keeping to the east of London and Paris.

"By Tables 1, 2, and 9, it appears that this line of no variation was observed to be at London in the year 1657, and not at Paris until the year 1666. If this really had been the case, the lines of no variation at that time would appear to be moving from west to east. But if we take into consideration the variety of observations which prove the contrary, we must impute this mistake to the difference in the instruments, by which the observations were made at London and Paris, at that time; for every man, who is acquainted with nautical affairs, well knows that he can seldom get two compasses that will perfectly agree for any length of time, but will differ sometimes four or five degrees. These instruments at present have got to a very high degree of imperfection.

"To proceed: by Tables 1, 2, 3, and 9, it does appear, that the variation has been increasing at London and Paris, ever since the the year 1666*, (until very lately,) which would not have been the case, if the lines of no variation had advanced from the west towards the east; for at Dantzic, in the year 1679, which is 19 degrees east from London, the variation was observed to be 7 degrees west; and at Rome, in 1681, the variation was observed to be 5 degrees west. At London, in the year 1683, which is two years later, the variation was only 4° 30′ west; and at Bayonne, which is to the westward of London, it was 1° 20′ west, so that it is evident, that the line of no variation, with west variation on the east, and east variation on the west side of it, was at that time to the wesward of London, and that the increase was from the east.

"By Tables 4, 5, and 6, in about the year 1705, we shall find the same line of no variation crossing the equator in, or nearly about the longitude of 20° west. In the year 1776, it appears to the westward of 33° upon the equator. (See Table 8.)

"On the 18th of February, 1791, Captain Bligh remarked, that 'in the course of his day's run, the variation changed from west to east. According to our reckonings, the true magnetic meridians coincided in latitude 20° 44′ south and longitude of 31° 15′ west.

"Also in his narrative, page 44, he says, 'In latitude 44° 16′ south, longitude 122° 07′ east, I observed the variation of the compass to be 6° 23′ west. I had no opportunity to observe it again till in the latitude 43° 56′, longitude 133° 16′ east, when it was 1° 38′ east, so that we had passed the line of no variation.

* These Tables were published in 1794.

"'In 1780, on board the Resolution, in latitude 44° 23′ south, and longitude 131° 28′ east, the variation was observed 6° 00′ west, which is a remarkable difference.'

"As these observations were all made in nearly the same latitude, it will only be necessary to inquire what the same longitude was. Now, if the variation 6° 23′ west be added to 1° 38′ east, it will make 8° 01′ for the quantity of variation contained between the longitudes of 122° 07′ and 13° 16′. The difference of these longitudes is 11° 09′.

"Then as 8° 01′, the quantity of variation, is to 11° 09′, the difference of longitude, so is 1° 38′ to 2° 37′, which being subtracted from 133° 16′, leaves 130° 39′; or if 2° 37′ be subtracted from 11° 09′, the difference of longitude, and the remainder 8° 32′, added to the longitude 122° 07′, it will make 130° 39′ for the line of no variation in the year 1791.

"Then as 8° 01′ : 11° 09′ : : 6° 00′ : 6° 21′; which being added to 131° 28′, gives 137° 49′ east longitude for the line of no variation in that latitude, in the year 1780; which makes a difference of 7° 10′ from the east towards the west, in eleven years, which is a very great difference indeed in such a short period of time, and incontestibly proves that the magnetic poles change their place, and move from east to west, but not with any regularity.

"These irregularities, in the progression of the magnetic poles, may be occasioned by the superior magnetism that all headlands, which are near the poles, are possessed of in proportion to the sea."

These observations clearly prove the fact of the variation, and also the variation of the variation by actual observation.

The cause of the variation is presumed to be produced by the effect of the motion of the orb (unto which the line F of the magnetic virtue which holds up our earth is fixed,) round its primary sphere. (See plate 9, letter B.)

Now, it is very plain what causes the difference of the poles of the earth, from the magnetic north poles:—the geographic poles are produced by the diurnal motion; and the magnetic poles which are much older, and are situated many degrees from the geographic, are produced by the magnetic effluvia which operates as a line or cord, suspends the earth in the air to a satellite D, and carries it round B, (see plate 9,) that is an angle of the universe.

The variation of the compass is an arch of the horizon, continued between the meridian of the place and the magnetic meridian, and is either east or west; or it is the number of degrees the needle-point stands from the true north

or south point of the horizon, reckoned to the eastward; and is readily found either from the sun's amplitude or azimuth.

The variation of the variation is not stationary; but is sometimes moving to the east, and at other times to the west of the meridian of Greenwich, and at other times nearly stationary.

It has hitherto been supposed, that the variation traverses to a certain number of degrees to the east, and then it returns again to as many to the west. But I do not see why it should not be supposed to perform a continued circle round the poles of the earth: it is much more rational, than to suppose that it goes backward and forward: all those different stations, and appearances of the variation, would be equally made out, and appear on observation, to correspond with the present theory; and the azimuth compass could not detect any difference from the old supposition of its traversing forward and backward from east and from west.

When the variation is passing entirely round the poles, from east to west, or from west to east, then the difference of variation would be equally perceived, and present to the observer all the various appearances on the azimuth compass, be it either on the near side, or on the opposite side of the circle of the poles of the earth. And when the variation appears to be stationary, it is then in that part of the circle as to be fore-shortened to the view of the beholder; yet it is, nevertheless, in the act of proceeding, not standing still: after the manner of the planets, which traverse their course in perfect circles, and are never really stationary in themselves, yet to our view, by reason of our situation in relation to them, they appear sometimes stationary, at other times direct, and at other times retrogade. There are, of course, two points that present the lines of no variation stationary in appearance—one to the west, and another to the east; and when one of the lines of no variation passes to the off side of the geographic pole, the other one comes to the near side of it: we ignorantly take them by turns, in consequence of the line of no variation (to which the needle ever inclines) coming round to the place which has been left vacant by the departure of the other line of no variation, to the off side of the geographic pole.

As there are two lines of no variation equally distant from each other, there must, of course, be west variation on one side and east on the other of each of those two lines. But when you are situated directly on either of those two lines, there can no more be variation than you can be without it when placed in either of the other situations between these two lines. The needle, of course, turns towards the nearest of those two lines of variation.

When the needle points up these lines to the true magnetic poles of the earth, it is because the geographic pole stands directly behind the magnetic; then there can be no variation whatever perceived, although it is equally the same in itself, in relation of the distance of one pole from the other. Those lines of no variation are permanent in their existence, although they have a constant progression longitudinally.

The two lines of no variation were first acquired in nature as follows:—observe the process:—the earth being composed of particles that were thrown off from the satellite, (see plate 9, letter D,) and having descended in its course (as a comet,) in the line G, and again ascended back in the line E, these two original lines of motion constituted the two lines of no variation: the friction in these two motions, imprinted or gave the attractive virtue which ever remain permanent. The air, which fills the space between the earth and the satellite, has not power to disturb the two magnetic lines of no variation; for magnetism being so pure a principle, and so much finer than any one of the four elements, it retains its precedency. This first impression, which magnetism is so tenacious of keeping, is the common course in the order of nature; for things will not give up their first stamp: an apple-tree never changes to become a pear-tree: although a pear-shoot or sucker should be grafted on an apple-tree, still the pear-shoot or graft ever retains its first property; so it is with the first stamp of all things; it becomes the permanent subject. This order relates as well to motion, as to substance, forms, &c. So we conceive, that the first descending of the matter of the comet caused one line of attraction, called the line of no variation, and the ascending the other line of no variation. But now our earth is detained by the sun, to form a subject of his dominion; it can return neither up nor down those lines, more than twenty degrees each side the equator; that is, from Cancer to Capricorn, and from Capricorn to Cancer, thereby producing the equinoxes. But if the sun were to lose its balance of power over the earth, or over the magnetic power, (for there is a struggle between them,) and fail to detain it in the place where it is, the magnetic virtue in those lines (that draws up and suspends the earth) would draw the earth straight out of the solar system, and become as before, a comet, and lose the stratas of earth: nothing would remain save the nucleus, the velocity would be so great.

The magnetic influence over the magnetic poles, is much older than the diurnal motion, which diurnal motion constitutes the geographic poles; for the earth was at first a direct sphere and a comet. But when the sun, which is situated nearly in the centre of the solar system, had power to turn the earth

round, (having approached within its influence or vortex of air, that ever turns the contrary way to its own motion,) and gave it a diurnal motion, it has thereby found second poles, called the geographic poles, which is different to the magnetic oblique, from the direct magnetic poles, and still retains them to the present day.

The planet (see plate 9, letter D,) which traverses this distant circle, and holds up the upper end of the magnetic line, traverses his own circle round his own primary, (see plate 9, letter B,) horizontally to the aforesaid perpendicular magnetic line; and has also a zigzag motion, like that of the moon; so that while its circular motion (see plate 9) gives to our earth the variation, and also the variation of the variation, the zigzag motion produces the equinoxes. (See plate 9, letter N.)

The centre, or largest orbit, (see plate 9, letter B,) being an angle of the universe, holds up the sun, his satellite; but D governs our earth, as the earth does the moon. As for the rest of the orbits, of course, they are governed by corresponding causes and orbs, making up one great whole.

There is a variation at the surface of the earth, but none at the proper poles which are situated at the nucleus. At the nucleus, the variation is as though it were fixed in that respect; but the other end of the effluvia, or line of attraction, holds up the earth to a satellite of an angle of the universe, and traverses round this distant circle. These two points, the one fixed, and the other moveable, a line being fastened or attached to these two points, it is easy to conceive that its circular motion, being at one end, and not at the other, must, of course, form circles of variation from the fixed point all the way up this magnetic line; and one circle must eventually be at the surface of the earth, which constitutes the vulger but not the real magnetic poles, and also determines the circle of the variation. (See plate 9.)

Plate 9, letter K, is the magnetic line, which extends from the orb, situated at an angle of the universe to the body of the sun, and keeps it up in the air by virtue of this magnetic line to its present place.—Letter F exhibits the manner the north and south magnetic effluvia cross each other. This universal crossing forms one perpendicular line, between the two lines called the magnetic line of the plummet before spoken of: the plummet is the globe of the earth. Letter P shews, that while the satellite D revolves round itself in its diurnal motion, the air always flows the contrary way to matter in motion, as the darts at letter T represent.

Plate 8, letter M, shews the second circle in Deity.—Plate 9, letter M,

shews a comet thrown off from the satellite not yet taken into the system; letter P, the earth or the nucleus of the earth; V, the circle of the variation where it traverses round at the surface of the earth; fig. 6, the equator; and letter H, the magnetic equator.

Perhaps, a few remarks would not be foreign on the subject of comets, especially as the world has been so much agitated with the dread of a deluge, by reason of the near approach of a comet to our earth.

When we consider that the pressure (not the attraction) of the body of the moon, on the vortex of the air of our earth, has the power of raising the water over our shores at the conjunction and opposition of the sun, which produce the tides, there is some ground to fear that the pressure of a comet in the same way, by its so near approach to the earth, would have the same effect; and therefore, when the full time of the approach of the expected comet be complete, the combined force both of that and the moon together will prove fatal.

But we are to take into the account several things before we come to so hasty a conclusion. First: that a comet can have no vortex of air round itself; hence, it takes less room, and is easily stowed away, therefore the pressure would be much less on the water of the sea than might be expected. Secondly: a comet moves or travels in a full medium; consequently, the pressure it would cause on the water of the earth, is driven to the other place to prevent a vacuum, from whence he last moved; and thereby all things find their level again.

Thirdly: a comet may become (and it is very probable) stationary, and form an additional planet in the solar system, after the example of Georgium Sidus, Ceres, and Pallas, planets lately added unto the number of the solar system. Again: the orbs of the earth may as likely give way a little, to make room, as persons do in a crowd. And besides all this, there is still the same degree of room in space as ever. Nothing is added to matter; but the waste matter which is dissipated and thrown off by the planets by exhalation, &c. is brought into form and order again.

And above all, we have an infallible promise in the Holy Scriptures, that so long as mankind can look up to the heavens, and behold the rainbow, (a witness of the promise of safety,) they need not fear a second deluge.

SECTION VI.

Of local Attraction on board Ships.—Of the Mariner's Compass.—The Magnetic Poles of the Earth.

It is scarcely necessary for me to state, that the local attraction on board a vessel is of the greatest consequence to all navigators. Since its discovery, (which is but very recently,) it has been matter of considerable speculation, and various have been the experiments: first, to ascertain the truth of its existence; and, secondly, to find a means how to remedy its evils.

As to the real existence of the evil, it is now become an undoubted and an established fact; but, as to the variation itself, many years elapsed after the invention of the compass, before it was altogether ascertained that the needle did not exactly indicate the true poles of the world; and it was not until the middle of the sixteenth century, that the observations made in England and France clearly demonstrated this deviation.

But the reality of the variation, occasioned by local attraction, will be plainly seen in the following extract from Mr. R. Walker's "Treatise on Magnetism:"—

"The present Admiral Murray and Captain Penrose, (says Mr. Walker,) when cruising off the Neas of Norway, found that when the ship's head was in shore, it made a difference of nearly a point in the compass, from what it was when the ship's head was off shore; and as many navigators as have been accurate in their observations, have taken notice of the same phenomenon in different parts of the world. By this remark, it is not meant to insinuate, that such change in the direction of the needle was owing to any effect that the shore had upon it, but only, that by being in sight of the shore, an opportunity was had of ascertaining the fact. For, although all shores and head-lands may have a very great effect in deranging the universal current of the magnetic polarity, yet it is not to be supposed that the change of the position of a ship can change the polarity of any place, but only so much of it as comes within the sphere of action of the iron which may be on board of her."

As my humble opinion on this subject goes to disprove this supposition, and to shew that the local attraction is caused wholly by the error of having two compasses abreast of each other, or having two in the binacle at one time; I have, also, made an extract from " An Essay on the Variation of the Compass," by Mr. W. Bain, a master in the Royal Navy, which fully proves that it was not the iron on board that caused the following phenomenon.

Mr. B. observes, " In the river St. Lawrence, the change in the variation should be most particularly attended to, as it leads a ship, both in going up and coming down, on the coast most to be avoided.

" On coming down that grand and magnificent river, May, 1813, I found that it was necessary to steer a very different course from the opposite one made use of in going up, under very similar circumstances, a few days before. I noted the circumstance in my remark book, sent to the Lords of the Admiralty, on returning to England. And owing to that circumstance, and not having a copy, nor log-book to refer to, I cannot state, from memory, the courses steered, though I remember the difference to have exceeded one point; and that we had an eight and nine knot breeze, both in going up and coming down, with the weather uncommonly fine, and every circumstance extremely favourable for making such remarks.

" Subsequent to the above period, one of our ships of war, (the Zealous,) had a very narrow escape in going up that river. The compasses* in the binacle were so much affected by local attractions, that, had the fog not cleared away at the moment it did, the ship must have run on shore, not far from Cape Chat: she was in 19 fathoms.

" The gentleman from whom I had this information, could assign no other cause why the compasses were so influenced, except from the muskets placed round the mizen-mast; but, on inquiry, I found they had been there during the former part of the voyage, and, consequently, this could not have been the primary cause, as the deviation must have been sooner perceived. I am, therefore, inclined to attribute the near approximation of the land as being the primary, and the local attraction of the ship as the secondary cause†, acting on the magnetic needle with a compound force: all the compasses in the ship, when brought on deck, were alike affected. [Oh! how absurd a practice.

* Of course, the ship was steered by two compasses, and they attracted each other, and produced local attraction.

† This supposition must be unfounded; for the needle as often points off the land as towards it, according as the line of no variation is on or off shore.

This was a multiplication of the error: it is the proximity of the compasses alone which causes the local attraction.]

"I have great reason to believe, that the non-attendance to the changes of the variation of the St. Lawrence, and perhaps the vicinity, is one of the causes of the many losses that there happen."

This extract fully proves it was not the iron of the muskets wherein the cause of the deviation rested; yet, how difficult the task to instil into the minds of persons the proof of the contrary. So deep is the impression on men's minds, that they sincerely believe it is the proximity of iron near the compasses which causes the deviation; indeed, a person almost runs a risk to apply the cause to any other source. Unfortunately, the truth is, that a person, who in other respects deserves credit for his mathematical knowledge, first stumbled on this notion of iron being the cause of the deviation, and those who came after, fell upon the neck of his definition; and, consequently, the whole world became a heap of miscarriages.

Errors in science are nearly as dangerous as false notions of morality or divinity.

I cannot divest myself of the persuasion that the local attraction is wholly occasioned by steering by two compasses, or when two compasses are in the binacle; and it is, therefore, a duty incumbent upon me to use every effort to set the subject in as clear a point of view as possible. What is of more consequence than just notions in navigation? My presumption, then, will easily be pardoned for my bold attempt to lay bare the erroneous ideas of those who have met with patronage and success; but, in doing which, I must be allowed a little latitude, if it should be considered that I bear too hard on the darling hypothesis of another. But who can be offended that are simple searchers after truth? I offer my reasons, but force no one to believe.

Almost every person has given implicit credit to the belief, that it is the iron used in the construction of a vessel which causes the local attraction; and, probably, no one more so than the inventor of the correcting plate. The stated effect of this correcting plate does not appear to me in a very favourable point of view. I will offer a few remarks upon the subject:—if one of these plates, when applied to a single compass, is professed to be capable of correcting the deviation of that compass*, two plates ought surely to have the same effect on the two compasses in the binacle. I cannot, however, find in the whole work,

* See Barlow on "Magnetic Attractions," plate 2, figures 7 and 8.

concerning the experiments made by direction of the Lords of the Admiralty, that the plate was ever applied to the compasses in the binacle; but which I certainly should have expected would have been done in the very first instance. On the contrary, I find the plate was only applied to one separate compass; and this separate compass being an azimuth compass*, was stationed forward towards the bow of the ship, at a considerable distance, perhaps twenty feet from the binacle compasses, where, indeed, the compass in that situation of distance is perfect in itself, without any correcting plate; and I verily believe that the plate there applied stood in that angle so as to have no effect whatever. I readily admit, that Mr. Barlow's Essay possesses great merit in one particular, that of drawing, with a multitude of figures, sound conclusions from stated premises.

Many excellent and good navigators, under the same impression, suppose the iron of the vessel to be the cause of the deviation, in conjunction with the compasses being placed abaft of the centre of the ship; therefore, the iron has a greater proportion of influence in one way, towards the bow, than the other, to attract the needle. Mr. Barlow's plate was intended to equalize the difference of the proportion of the iron between that in the bow and that in the stern; but, (although I am almost single in my opinion,) I am confident that this will be found to be an error. I imagine that not even a whole cargo of iron on board a vessel could produce the phenomenon so frequentiy said to exist. Do not ships arrive safely to England every year loaded entirely with iron? Neither is it the iron employed in the construction of a ship, notwithstanding many have been so deeply impressed with this erroneous belief to that extent that they have alternately moved the compass to different parts of the ship, and they have there noticed the effect, and have, at last, found those compasses differ from the first observation in every part they have been placed. Unfortunately, they still remain in this error.

I will venture to affirm the principal cause is from having two compasses within spheres of attraction of each other; indeed, they are not quite free at four feet apart from each other. When, however, the distance is so great as not to have this effect, then the deviation arises from a faulty compass. When it is the latter, it acts in the following manner: viz. when the needle is brought steady in the binacle, with a good landmark, and also brought to a good bearing, then move it to the bow of the ship; there you may have from five to six degrees difference, perhaps to the west from what it was in the first station;

* See Barlow on "Magnetic Attractions," page 105, plate 2, fig. 7.

then remove it to the quarter-deck, and you may again observe as many degrees to the east. Here are three different appearances in one compass, according as it is shifted from place to place, and each arising, not from any iron in the ship, but altogether from a bad compass; and there has not as yet been given a criterion to judge of the goodness of the compass, as in other nautical instruments. This I hope speedily to remedy. One mark of a faulty compass is, when it will not come up a second time to a point made in the compass box for this purpose; say the lub-line for example. Let a faulty compass remain in its place, and turn the card on its centre, you will find it settle again several degrees to the right or to the left of the place where it first stood, and this it will do without moving the ship's head; then, for the sake of experiment, move the card again round its centre, and let it settle a second time: you will now, perhaps, find it stand as many degrees to the contrary way; but all is produced from a faulty compass, which will not come up, except by chance, a second time to the lub-line. What is fatal to the navigator, he never thinks of attributing the error to a bad compass, but always to the account of local attraction, or to the variation. As to the two compasses in the binacle, the compasses attract each other, and both become untrue, save when the ship's head stands either to the east or to the west; for then, in that situation, the two compasses stand abaft of each other, as it regards the poles: the north of one compass attracts the south of the other, and adds greatly to the strength and truth of both, being under the great magnetic meridional line. Here it may be objected, that the compasses in the binacle stand too wide apart to have this effect; but this I am bold, from experiment, to say is not the case; for the distance of four feet will not, at all times, remedy the evil. When the atmosphere is charged with electric matter from lightning, or a brisk wind is flowing through the rigging, which produces electricity, the compasses (if there should be two at that time in the binacle) will be troubled; and you will frequently see them hovering about in a very striking manner, as though some nail or iron had been by accident thrown into the binacle: as soon, however, as the electric fluid subside, the compasses become quiet again, and steady. All this deviation (notwithstanding the existence of thunder) would not be produced but for the presence of two compasses striving against each other for the mastery: they, in fact, wrestle with each other, and the weakest is ever subject to the strongest; indeed it is well known, that two compasses are rarely or never alike in strength. These, then, are the principal causes why navigators cannot depend upon the course they steer, nor ascertain the quantity of the

magnetic deviation from the true north and south, as well as to account for the ships in a fleet, which have been observed many times all steering different courses by the same point of the compasses. This effect of the electric fluid upon the compasses, published by me some years since, as a guide to mariners, is now more than ever abundantly confirmed by observations made by Captain Lyons, in his Journal in 1825, wherein is shewn the influence of the electric fluid, which came from the aurora borealis. I hope I shall not be thought tedious; but I consider it of very great consequence in order to give the fullest elucidation of this important subject, to make a short extract from Captain Lyons' Journal. Captain L. remarks, "At ten, P. M., I hove-to in consequence of the compasses* becoming greatly agitated. This had frequently been observed on other nights, between the hours of nine and eleven, which had always been the cause of great anxiety to me, while endeavouring to steer a course after dark.

"It is well worthy of consideration, whether this agitation of the compasses is at all to be attributed to the absence of the sun, or is in any way occasioned by the presence of the aurora, which phenomenon was rarely seen earlier than nine, P. M., and its greater brilliancy was generally at about ten, although the sun had then been set some hours.

"One one occasion, during the prevalence of one unusually brilliant aurora at ten, P. M., Mr. Kendal observed, that the larboard† binacle compass would not remain steady at any point, while the starboard one, by a bearing of the pole, had decreased in its accustomed error two points; but on the following morning, by a bearing of the sun, it was found to have resumed them. N. B. Up to this period, the error on this bearing had been eight points."

This subject has been considered of so much importance of late, as to engage a number of pens, and as many experiments, all of which have tended to little more than to involve the subject in greater difficulty. I have constructed a model for the purpose of explaining this existing phenomenon, and which it does to the entire satisfaction of every person who has seen it. This

* As the word compasses is expressed in the plural, I infer there were two compasses in the binacle, instead of one; and which, I presume was the whole cause of the local attraction here spoken of.

† Here again is mention made of two compasses, viz. the starboard and the larboard, in use at one time; and it is evident that they strove against each other for the mastery. Observe: the larboard compass was the weak one of the two, by its being so much more troubled.

model certainly shews the imperative necessity of steering by one compass, instead of having two abreast in the binacle.

My sliding binacle brings one compass from larboard to starboard, as the helmsman changes sides of the wheel when steering.

I shall subjoin, for confirmation of the great improvement of the Dipping Needle Compass over every other in use, a plate, and a short description of the properties of it; and also some satisfactory testimonials from actual experience of its performance in voyages to different parts of the globe, by gentlemen of the first ability, and sanctioned by His Majesty's Royal Navy, the Honourable East India Company, the Ship Owners' Society, and the Merchant Service. I will take the liberty to state, that the Russian, the Dutch, and the French Governments, by their official orders, have severally been supplied with my Dipping Needle Compasses.

POPE'S PATENT DIPPING NEEDLE MARINER'S COMPASS.

The advantages of this invention are,—First, this Compass increases its power of magnetic force where in others it diminishes, and that in every degree from the equator to the poles. Secondly, it retains its force even situated nearly over the polar point, where all others entirely lose it and become useless. Thirdly, it is more steady on its point; a circumstance of the first importance, when the agitation is increased by the motion of the vessel*.

A few remarks, by way of elucidation, will prove the above:—the first property it gains is from its peculiar construction, which regards placing the magnet or needle more in harmony, as relates to the dip of the needle, with nature; and, among many particulars, the principal point consists in the needle falling in a line with the attractive effluvia: this is effected by the discovery of uniting the

* I have, also, a Storm Card, to be used in rough weather. This Card has three magnetic bars, in lieu of one, which renders it weighty and steady; and, by its additional magnetic power, it is full as quick in motion as the light Card with one bar. From reports of actual experiments, it is found to be so essentially necessary, that it is recommended that no commander of a ship should go to sea without taking one of these Cards along with him.

nature of a Dipping Needle with that of an Horizontal Steering Card; by virtue of which, it has the power to alter its own elevation of dip to every degree of latitude it may be placed in, and, of course, stands nearly in the line of attraction: this it performs without taking the card out of the horizontal position. The second, it may be said to retain from the dip of the needle; for, at the poles, the Dipping Needle is found to increase its power, when that of the horizontal one is invariably lost. The third property it acquires by the manner of connecting the needle with the card; for, when the motion is increased, and the compass exceedingly disturbed, this needle quits the card, and attains a perpendicular motion, which serves most effectually to counteract that of the card; so that (between the motion of the card and the needle) the whole is brought to an equal poize; this, in connection with the card of the compass, being perforated, thereby admitting the air that is below the card to pass freely above, without taking the card with it, renders it much steadier; and, being placed deep in the box, is not liable to strike against the glass like the common card.

It scarcely need be remarked, that all compasses hitherto in use diminish their power every degree they are removed from the equinoctial line; which effect, the inventor of the present patent presumes, is occasioned solely by an erroneous system in the manufacture of the needle: viz. the mechanic, in this operation, is first careful to make it equally heavy at both ends, so as to swing parallel with the horizon on its point or centre; this done, the needle is further completed by touching it on the magnet, for the purpose of gaining the magnetic poles; when instantly it acquires a different position, falling from the horizontal to an oblique direction, to 71½ degrees, in 51 degrees of latitude. To prevent this, and to bring it parallel again to steer by, he is reduced to the alternative of loading the south end, either of the magnet or the card; which, indeed, effectually performs the intention of the mechanic, but not of nature; for, thus encumbered, the needle is eventually so impeded, that, when it is brought near the poles, its efforts are fruitless, the card falling all round the horizon without any direction, from the single circumstance of being lifted beyond its natural inclination; and the magnet, also, is hereby drawn by main force above the magnetic line, or magnetic meridian, and is obliged, in its own defence, to hang either on the left or the right of it, in order to form a greater angle; for it is the distance from the poles only that enables the horizontal needle to act at all: hence, the variation may, apparently, be much increased thereby.

The improvements in the New Compass are so evident, (as allowed by all

the scientific who have examined it,) not only for the high north and south latitudes, but for the East and West India services, as being less subject to be out of repair and lose the power of the attractive force, and is more proof against local attraction, &c. &c. This will appear more certain, when it is recollected that all metallic substances (considered by some to be partly the cause of the local variation) are contained nearer to the surface than the centre of the earth, they stand in the horizon; therefore, the common mariner's needle being poized horizontally, the metallic lodgements (in the horizon) have power to attract an horizontal needle, when this New Dipping Steering Needle points below that line, and forms nearly a true junction with the attractive influence, which influence points fifty degrees below the surface of the earth to the poles; hence this valuable instrument is not so subject to local attraction, &c. &c.

This variation of local attraction (supposing you steer by two compasses, but one alone of Pope's Compasses is recommended to obviate the local attraction) ever keeps the following rule, viz. when the ship's head stands to the N. W. and N. E. and S. W., this local attraction will ever exist by the common compass; and when the electric fluid in the air is increased, it excites the magnetic virtue, so as to occasion the local attraction on the above points to become one and even two points of the compass. It observes the following rule, that is to say,—when the ship's head stands to the N. E., then the navigator is to allow the variation to N. W., and if the vessel's head stand to the N. W., then you will find N. E. variation. Again: if the head stand S. E., then N. E. variation; but if her head stand S. W., then N. W. variation is to be allowed. The other points are less considerable: this invariably occurs by steering with the compasses in common use, nor does the use of the common azimuth rectify the evil; for the variation of the binacle compass greatly differs from the azimuth; whilst it is the variation of the compasses steered by that is desired, or no advantage is gained; for the azimuth only corrects the variation (occasioned by local attraction) on that point the ship's head is on at the time of observation, when previous to this she has steered on many points, all of which are brought into no account whatever.

EXTRACTS OF CORRESPONDENCE, CERTIFICATES, &c. REGARDING POPE'S PATENT DIPPING NEEDLE COMPASS.

Letter from SIMON COCK, *Esq. Secretary to the Ship Owners' Society, 33, New Broad Street, London, dated 19th June,* 1821, *to* WILLIAM POPE.

"Sir,—I have been instructed by the Committee to inform you, that

having examined your Patent Steering Mariner's Compass, they are of opinion that it possesses considerable advantages, and will accordingly recommend to owners of ships to give it a trial, &c. &c."

Extract of a Report made by Capt. W. MANNING, *of the Hon. Company's Ship Thomas Grenville, to* J. MORICE, *Esq. of the Shipping Office, in the East India House, dated 20th June,* 1822.

"Sir,—Pope's Compass has the advantage of being much more steady than the common steering compass. The card preserves its horizontal level in both hemispheres, which from the construction of common compasses they cannot do. I believe its power to be greater, and its indications more correct, than that of the common compasses."

Letter from Capt. J. BALANTINE, *of the Ship William, dated London, 20th November,* 1822, *to* WILLIAM POPE.

"Sir,—The compass I bought of you previous to my leaving London for Archangel, in August last, I find is not subject to so much variation from local attraction as the common compass. I strongly recommend it, therefore, to all ship-owners and masters, as possessing an advantage over the common steering compass, which only wants to be known to bring it into general use."

Letter from Capt. G. LIVING, *of the Ship Waterloo, dated 7th September,* 1823, *to* WILLIAM POPE.

"Sir,—I have much pleasure in acknowledging to you that the Patent Compasses, which I purchased of you for a trial in the Waterloo, under my command, performed very much to my satisfaction; and from their peculiar construction, I think they have great advantage over the common compasses. I kept them in use the whole of the voyage; and from all the observations I have made on them, I certainly think the local attraction of the ship has less effect on them than on any of the common compasses. With my sincere wishes for their being more generally used, believe me, &c. &c.

Letter from Capt. J. B. SOTHEBY, *in Hon. Company's Service, dated 4th February,* 1824, *to Capt.* BOULDERSON, *at the East India House.*

"Dear Sir,—Having had three of Mr. Pope's Compasses in the London, on her last voyage, I have no hesitation, but a great pleasure, in adding my testimony and opinion of the great superiority of his Compass to any other that I have met with, particularly from the dip of the needle being independent of the

balancing of the card, by which the Compass appears to act more freely, and yet with greater steadiness than any other I have seen."

Letter from Capt. P. CAMERON, *Commander of H. C. S. Balcarras, dated East India House, 4th February,* 1824, *to* WILLIAM POPE.

"Sir,—As you wish to know my opinion of the Compass that I bought of you last voyage, I have much pleasure in stating, that it answered my expectation in every respect."

Letter from Capt. P. HEYWOOD, *R. N., dated Highgate, 1st March,* 1824, *to* WILLIAM POPE.

"Sir,—I have just had the pleasure of receiving your letter, and am much pleased to find that you have received so many certificates in favour of your improved compasses, from Captains in the Hon. East India Service, who have had them on trial; I can only say, that as far as I can judge of the mode and principle of their construction, I have very little doubt but that time and experience will prove them to be very superior to any other. I sincerely wish you all the success you deserve in your endeavours to advance this branch of science, and remain, &c. &c.

Letter from Capt. THOMAS WILLIAMS, *dated London, 14th April,* 1824, *to* WILLIAM POPE.

"Sir,—I have much pleasure in informing you, that your Patent Compass I had on board the Hon. Company's ship Princess Amelia, last voyage to China, gave me more satisfaction than the common compasses usually sent on board; it being more steady, and much less liable to variation from the motion of the ship; and I have no hesitation in stating, that it was the Compass I mostly depended upon during the whole voyage, &c. &c."

Letter from Lieutenant W. P. F. HOOD, *R. N., dated London, 24th April,* 1824, *to* WILLIAM POPE.

"Sir,—Having attended with much pleasure to your explanation on the properties of your Improved Patent Mariner's Compass, it is with pleasure I can observe, that I am of opinion that it must have a decided preference over those in general use, from the circumstance of its combining the properties of a dipping to that of the horizontal instrument, without at all being found complex; and I have no doubt but its efficacy will be more obvious to those accustomed to high latitudes, where sluggishness of the common compass has been

found so great, that any improvement of this kind cannot but be felt with the greatest satisfaction."

Letter from GEORGE BIRKBECK, *F.R.S. &c. &c. &c., dated* 50, *Broad Street, London, 6th May,* 1824, *to* WILLIAM POPE.

"Sir,—I had the pleasure of exhibiting and describing your very ingenious Patent Steering Compass, in a Lecture on Terrestrial Magnetism, which I yesterday delivered in the theatre of the London Institution. Several gentlemen of considerable scientific eminence, who had not previously even heard of its existence, had thus an opportunity of becoming acquainted with its merits, and every one expressed a full conviction of its decided superiority. It is quite unnecessary to enlarge upon the advantages of your Compass, because simple inspection is sufficient to establish them; but I may observe, that the idea of suspending the needle, so as to admit of the dip, is original, and calculated in all latitudes, much lower or much higher than our own, to add greatly to the promptness and freedom of its motion; and that your method of directing the card, by a light and moveable connexion with the needle, is at once effectual and ingenious. With such opinions of the value of your invention, you cannot doubt that your complete success in this undertaking would highly gratify,

"Yours, &c. &c."

Letter from Capt. J. M. ARTHUR LAW, *R. N. dated London, 18th July,* 1824, *to* WILLIAM POPE.

"Sir,—The sluggishness or inefficacy of the ordinary Steering Compass, so dangerous and perplexing in high latitudes, must, in a great measure, proceed from the needle being attached to the card, and so balanced by artificial means, as to preserve the horizontal position, instead of being allowed to take that downward inclination of the North Pole, called the Dip, which every bar of iron or steel requires by the communication of magnetism. In the natural position of the magnetic needle, and in that alone, it may well be inferred, that the unknown cause of its polarity will act with the greatest power or produce an undisturbed effect. In your Patent Compass so much is done to combine the dipping of the needle with the horizontality of the card, that I am convinced your invention needs only to become generally known in order to be duly appreciated. The perforation of the card, by which the extent of its surface is greatly reduced, and consequently its power of agitating the air contained in the compass-box considerably diminished, with another cause of free and prompt motion, perceptible in the light and moveable connexion between the needle,

the card, and the cap, convey instantaneously to the mind, an idea of the advantages which an instrument of this construction must possess, in going far to obviate the effects of pitching and rolling motion at sea; and a very simple experiment on shore, may serve to shew how much the extent and number of vibrations produced thereby in compasses of the common sort, will be diminished in those made according to your improved novel and ingenious plan. Such being the peculiar advantages of your Patent Compass, evident upon mere inspection,—and the testimonials you have from men of skill and experience, who have given it a trial in both hemispheres, being so satisfactory, whilst the increase of cost is so very insignificant,—I have no hesitation in strongly recommending you to spare neither labour nor expense in giving publicity to your invention; believing that by such means you will serve the public, and meet with such reward as may encourage and better enable you to proceed with these useful inventions which you have now in progress, and to pursue a course of experiments which may lead to important discoveries in that branch of science to which your attention has been so far successfully directed.

"Yours, &c. &c.

"P. S. I observe now that something introductory to the subject of my letter may appear requisite. The fact is, that after the facilities you kindly afforded me of becoming perfectly acquainted with the nature of your important inventions, I felt it a duty to express my opinion of your Compass, that it might if you thought fit, be added to more valuable testimonials."

Letter from Capt. WILLIAM ADAMSON, *Commander of the H. C. S. Winchelsea, dated 25th August,* 1824, *to* WILLIAM POPE.

"Sir,—In the years 1822 and 1823, I had one of your Patent Compasses on board the H. C. ship Winchelsea, under my command; and have much satisfaction in informing you, that its card was much steadier than those of compasses in common use, which I attribute to its peculiar construction; consequently recommend it. "Yours, &c."

Letter from J. HERBERT, *Esq. of the Trinity House, London, to* WILLIAM POPE.

Trinity House, 26th April, 1824.

"Sir,—I am directed to request that you will attend the Committee, at this house, to-morrow, the 27th Instant, at two o'clock, on the subject of your plan for an improvement in the Mariner's Compass, and for the correction of the deviation thereof. "I am, Sir, your most humble servant,

"J. HERBERT, Secretary."

Note.—Agreeably to the above, W. P. attended the Committee, when they were pleased to order him to send, for their account, two of his Compasses to the Hudson's Bay House, with a view to their being sent out by some of their captains into the highest latitudes.

Letter from WILLIAM POPE *to the Honourable the Elder Brethren of the Trinity House.*

"Ball Alley, Lombard Street, 26th January, 1825.

Honourable Sirs,—In the month of April, last year, I had the honour to send to the Trinity House two of my Dipping Needle Compasses, by your kind orders, for the purpose, as I understood, of their being tried in the most northern latitudes; and as I find the Hudson's Bay ships are returned, may I beg permission respectfully to ask, whether your honourable board have received any report of the result of the observations made on them by the respective captains who took them out; being "Honourable Sirs, your very humble servant,

"WILLIAM POPE."

Letter from J. HERBERT *Esq. of the Trinity House, London, to* WILLIAM POPE.

"Trinity House, London, 4th February, 1825.

"Sir,—In reference to your letter of the 26th ultimo, relative to the observations that may have been made on two of your Patent Dipping-Needle Compasses, sent through the medium of this corporation, for trial in high northern latitudes,—I am directed to forward to you the enclosed copies of letters *(vide the two following)* thereon, which, subsequently to the receipt of your letter, have been communicated to this corporation by the Hudson's Bay Company. "I am, Sir, your obedient servant.

"Mr. WILLIAM POPE." "J. HERBERT."

Letter from Capt. J. DAVISON, *to the Governor and Committee of the Right Honourable Hudson's Bay Company.*

"Honourable Sirs,—I beg to lay before you the result of my experiment and observations on Pope's Patent Dipping Needle Compass, which your honours were pleased to send for a trial on board your ship 'The Prince of Wales,' under my command, on our voyage the last season.

"It affords me pleasure to state, that I found the Compass in question very superior to the common one, from its unusual steadiness in rough weather. It is hardly necessary for me to say, that with the motion of the vessel all compasses become more or less agitated, and a difficulty arises to the mariner to keep the course. Pope's Compass keeps its points with greater accuracy than

the common compass. More improvements are produced, in my opinion, from Pope's Needle being allowed to dip instead of being fixed horizontally; and, also, from the circumstance of his card being perforated to admit a free passage of air underneath.

"Another point of some importance I think it right to mention, which is, that the dip was increased in a higher latitude north.

"On the whole, I have no hesitation in saying, that his invention possesses considerable advantages, and will no doubt come to a general use. I would wish to add, that it would be desirable that two flies should be sent with every compass: a heavy one for stormy weather, and a light one for fine.

"I remain, your Honours' obedient servant,

"12*th January*, 1825." "JOHN DAVISON."

Letter from Capt. BENJAMIN BELL, *to the Governor and Committee of the Right Honourable Hudson's Bay Company.*

"Honourable Sirs,—Your having sent on board of your ship 'Camden,' under my command, one of Pope's Compasses for trial, on my voyage to Hudson's Bay,—I beg leave to observe, that I experienced the same remarks that Captain Davison has represented.

"I am, honourable Sirs, your obedient humble servant,

"BENJAMIN BELL."

Letter from GEORGE BIRKBECK, *F. R. S. &c. &c. &c. to* WILLIAM POPE.

"50, Broad Street, 17th March, 1825.

"Sir,—Having, as I formerly had the pleasure of stating to you, formed the most favourable opinion of the capabilities of your Patent Steering Compass, I have been much gratified by obtaining an account of its full confirmation, through the letters which you have sent for my perusal. Such testimonials, furnished by practical men, respecting the superior working of your Compass, leave no room for any question respecting its merits; and I trust the day is not very distant, when no vessel will leave our shores without possessing an instrument so conducive to the successful performance of a voyage. At the same time, I must remind you, that the introduction of the most valuable improvements, has generally been, for a certain period, somewhat slow; and that some ignorance and much prejudice, must be removed before you will be able to derive the benefit, which your merit in improving an instrument of the greatest importance to mankind, in my opinion, entitles you to expect; and, ultimately,

I am persuaded, must enable you to obtain. With the best wishes for your entire success. "I remain, very faithfully yours,

"GEORGE BIRKBECK."

Certificate from OLINTHUS GREGORY, L.L.D., *Professor of Mathematics, Royal Military Academy, Woolwich.*

"I hereby certify, that I have seen and examined Mr. Pope's Patent Steering Compass; and that I regard its construction as truly ingenious, and calculated to be very useful. Its manner of suspension, so as to admit of the dip, is, to the best of my belief, original, and calculated to give both promptness and freedom to the motions of the needle and the indications of the compass; especially in latitudes considerably different to our own, where compasses of the common construction are sluggish in their action, and often in consequence erroneous."

"*June* 21, 1825."

Letter from JOHN BLACKETT, *Esq. of Mill-Wall Dock, Poplar, to* WILLIAM POPE, *dated* 12*th September*, 1825.

"Sir,—On my first seeing your Patent Dipping Needle Compass, I had a high opinion of it, and sent two of them in my ships to India and New South Wales; and from the report I have had from time to time from the captains, I am convinced they have a decided preference to any other compass, particularly in high latitudes. "I am, Sir, your obedient Servant,

"JOHN BLACKETT."

Two Letters from CAPTAIN CLARK, *of the Indian Trader Transport, of* Mr. POPE's *Patent Dipping Needle Compass, and also of his improved Storm Card for Rough Weather.*

"Cove of Cork, 10th October, 1826.

"Sir,—Since my letter to you of the 20th of February last, I have had several opportunities of proving your Compass along great part of the coast of England, and part of the coast of Ireland, this last summer, during which time I have always used it for steering by, and taking angular bearings; the result has been always satisfactory, as I shall attempt to explain:—it is well known the common compass is much affected by the local attraction of the vessel; I have repeatedly taken three, four, and five cross bearings of the land by your Compass, with the ship on different tacks, and always found the bearings taken directly before and directly after the ship went about, gave the same

point on the chart, and always coincided with an exact latitude by observation, when that has been obtained. This is a degree of accuracy which the common compass is not equal to; and which I ascribe to your Compass being more free from local attraction on account of the needle being placed more in the true line of magnetic attraction than the common compass. This practical experiment will, perhaps, say quite enough in its favour, without making any further remarks, the superiority must be obvious to all; in short, my late trial of the Needle, combined with the observations made in my former letter, have given me such proofs of its accuracy, as well as its steadiness in a heavy seaway, that I feel great pleasure in giving you this further account of my observations on your valuable invention.

"I remain, Sir, your obedient servant,

"Indian Trader Transport.—To Mr. POPE." "JAMES CLARK."

ACCOUNT OF THE STORM CARD, OF THREE BARS, IN LIEU OF ONE.

"Portsmouth, 28th February, 1827.

"Sir,—I wrote to you on the 10th October last, giving you my further opinion of your Dipping Needle Compass; since which I have been on a voyage to the West Indies, and wishing to give a fair experimental trial, whether it was better without the additional magnets, or with them, I used it on the passage out, according to your advice, without the additional bars, and the result of my observation was, that in bad weather, with a high sea, it is much steadier for steering by than any of the common compasses. On the passage home, I used it with the additional bars, and I was astonished and pleased at its superior steadiness; for, in a heavy sea, and the darkest night, as well as in fine weather, it always vibrated as quick as the ship's head; and if the helmsman steered well, it appeared nailed to its point. After this experiment, I am decidedly in favour of the improvement, and I would recommend you to send always with your Compasses a Storm Card, fitted in this manner, and you will find it give great satisfaction to every one who uses it. The theory is obvious; for the magnetic power being in proportion with the surface, it is here nearly tripled. I desired my chief mate to make his careful observation of the Storm Card, and I annex his opinion of the practical trial. "And remain, your obliged servant,

"JAMES CLARK."

Extract of a Report made by Mr. ANDREW PEARSON, *Chief Mate of the Indian Trader Transport.—Experimental Trial of the Storm Card.*

"I hereby certify, that the Dipping Needle Compass was decidedly steadier in a rough sea, and quicker in its motions in fine weather, after the additional bars were put on, than it was with the single bar alone; and I consider it a great improvement on the invention for a storm card."

Extract of a Letter from Mr. WILLIAM LAWTON, *Master of the Britannia South-Seaman, to his Owner,* THOMAS STURGE, Esq. *Dated off Valparaiso, May* 9, 1825.

"Sir,—I feel much obliged to you for Pope's Dipping Needle Compass; it has helped our passage very much, and is superior to any compass I ever saw before. I am of opinion that it possesses a decided advantage in relation to the local attraction: in bad weather it does not vibrate like the common compass, and in light weather it traverses quickly. I have made it my business to take particular notice of this most valuable (or rather invaluable) article. Much encouragement should be given to the inventor of such an instrument.

POPE'S PATENT BINACLE, WITH A SLIDE FOR THE COMPASS.

This invention effectually prevents all local attraction occasioned by two compasses in the binacle: it also brings the compass straight before the person when steering, and diminishes the heat in the binacle, which heat so exceedingly impairs the magnetic needle in strength. It might here be remarked, that some commanders, being convinced that it is the effect the two compasses have on each other that cause so much local attraction, have wisely determined to steer by one, keeping all others below deck; and then, of course, they place the binacle in the centre of the wheel, or in midships; this, indeed, remedies the first evil, viz. the influence of the two compasses on each other; but, at the same time, it creates another evil, viz. the obliquity of the helmsman to the lub line, as it ever must be the case when the compass is in that situation,—the helmsman, of course, being either to the larboard or to the starboard of the wheel.

Thus, between the card of the compass being too small for the box, (as frequently is the case,) and the compass itself not being placed straight before the man at the helm, he does not see the compass with the head of the ship as it

really is. A third impediment in the old binacle is the confined heat of the lamp, which tends greatly to the diminution of the strength of the magnetic virtue in the needle of the compass; for a cold atmosphere contributes to the power of the magnetic needle; and it may be fairly inferred, that the heat in the binacle has caused very fatal effects.

But this newly-invented Sliding Binnacle is, it is presumed, complete in all those respects; and when the subject of local attraction is considered, will be found worthy of patronage, and stand foremost in the article of binacles. To prevent heat, the inventor has been careful to give ventilation to the binacle; and the invention is so constructed, that the compass (although there be but one in the binacle) slides so as to be always immediately before the helmsman, as standing on either side of the wheel. The local attraction occasioned by the two compasses, is thus entirely prevented.

W. Pope begs most respectfully to state, that he has, for the purpose of setting this subject of local attraction, as above, and placing it in a clear point of view, invented a simple model, which, at one operation, fully proves that it is not the iron of the vessel, nor even a whole cargo, (for frequently vessels are laden with iron without inconvenience,) but the attraction of the two compasses on each other, which is particularly obvious when the atmosphere is charged with electric fluid; and this, the inventor is bold to maintain, is the chief cause of local attraction on board, which was first discovered and set forth by himself, being also the Inventor of the Patent Dipping Needle Compass, &c. &c.

W. Pope has fitted up a Sliding Binnacle as a specimen, and will feel honoured by gentlemen calling to view the same.

Having given a short account of the Dipping Needle Compass, with a few reports of its merits, let us return to the subject of local attraction. As seldom any person is credited for bare assertions, I refer the reader to the following cases, as a convincing proof of the evil of steering by two compasses in the binacle:—1. Of the muskets, detailed as above.—2. As to commanders who have experienced a great deviation by local attraction. It is a question whether they were not at that time of finding local attraction, steering by two compasses, or what has the same effect, having two on deck instead of one.—3. As to the compasses being raised several feet above the deck. This circumstance of raising the compasses always produces a good effect, free from local attraction:

this is parallel with steering by one compass. As a proof of this last case, permit me here to insert the copy of a letter addressed to Mr. John Bywater, Mathematical Instrument Maker, Liverpool, &c. from Captain John Williams:—

"Ship Albion, April 4, 1820, Liverpool.

"Sir,—I adopted your plan of the correcting compass on my last voyage to New York and back to this port, and found, by placing it about nine feet abaft the binacle, and seven feet above the deck, that it was uninfluenced by the iron knees, &c. on board. Sometimes, according to the course steered, it differed from the binacle full one point, while at other times they agreed: and I run by it for the Saltees this time in thick weather, without having made land, and made them very exact, though it differed from the binacle full three-quarters of a point: and I am happy that it has been of great service to me, as I could never depend on my compasses before.

"I remain, Sir, your obedient servant,

"JOHN WILLIAMS."

Can any example be more plain? I will now insert a few observations from Mr. Bywater's Treatise:—"Captain Mounsey, of the ship Perseverance, to whom I shewed the model in the spring of 1820, has paid considerable attention to this part of the subject in his late voyage to India, and his report is important; for the experiments and observations he made during the voyage clearly shew that he had no deviation in his steering compass,* though he had a considerable number of iron knees on board his vessel. This case of Captain Mounsey is not an isolated one, for several other masters of large merchant vessels having iron knees, &c. on board, have, at my request, paid attention to this point, and their report completely corroborates what Captain Mounsey has stated."

* In this reference, it is worthy of remark, that the word compass is used in the singular number; thereby we learn, that Captain Mounsey steered by one compass instead of by two compasses; and the good effect of which appeared, and accorded entirely with my system. I wish to notice here, that I cannot be biassed by interest in this opinion; for, as a compass-maker, I may look forward to the sale of the many, and not to the few. But, should not a man, in a degree, lose sight of his own interest, when the maritime proportion of the great family of mankind is so much concerned, and therein the whole world? I confess, that I should feel happy for every commander to adopt the plan of using only one compass; and also, if they would render their vessel sea-worthy by taking no other compass on board but Pope's Dipping Needle Compass. Perhaps you will smile at this.

My model shews more in five minutes than could be expressed in a volume: it has been exhibited before most of the public maritime bodies in London with entire conviction.

I will now return to the subject of the origin of magnetic attraction. I have taken some pains in the formation of a plate, or drawing, in which is represented the orb of the earth, as it was perfected from the chaotic state and matter of the creation; (see plate 6;) in which is also shewn the sphere of the earth with the stratas, (see letter L,) and the great nucleus therein; (letter R;) which nucleus is the spherical magnet in the earth with its poles, (R R,) and also an horizontal mariner's needle, situated on the surface of the earth, (letter P,) which points into open space instead of unto the magnet poles, which is by reason of being poised or loaded at the south end of it, which is the constant practice in its manufacture.

The principle point here, is to prove, first, that there is such a thing as a nucleus in the earth; and, secondly, that it is of this exact size or dimensions; thirdly, the cause of the sluggishness of the mariners' needles in high latitudes; and, fourthly, the form or direction of the stratas of the earth as they are at present found in the globe of the earth.

Let me now explain, that the poles of the magnetic virtue, called the north and south poles, are 40 degrees from the centre of the earth, and 50 from the surface, and not on the surface of the earth, as is generally supposed.

When the discovery of any property in nature is given to mankind, it is not uncommon for it to be treated at first as hypothetical, and only gains confidence by time and experience: and lest this should be the case with the subject under discussion, I shall endeavour to make all as plain as possible: for it seems to be abundantly capable, as much as the subject is novel.

It is a matter of fact, that to whatever place the magnetic dipping needle points, at that place must be the point of attraction, and that place of attraction is the magnetic poles. Now, suppose a line were let fall from the place of variation (say 20 degrees to the west) through the centre of the earth to the opposite side, this line would become an axis, and form the two magnetic poles; the magnetic would dip 71½ degrees in its own circle, in 51½ that of London; (supposing a circle drawn round it;) this line of dip must, of necessity, cut the perpendicular line at 50 degrees downwards from the surface of the earth. If you take your stand as many degrees to the east of the point of variation, then the dipping needle still points, although it be backward, to the same 50 degrees of this perpendicular line; and if you take your stand on the point itself of the line

of no variation, still you will find that your dipping needle points perpendicularly direct to the same 50 degrees. It follows then, that at this 50 degrees perpendicularly down from the surface, there must be situated the magnetic poles of the earth; and the dipping needle also points out by the dip the diameter of this wonderful nucleus in the heart of the earth. For what degrees remain on the perpendicular line of the 90 degrees to the centre, is the 40 degrees for half the diameter of the nucleus of the earth; the other half put together from the centre, extends the nucleus to 80 degrees diameter.

The place of the points of the poles are rendered equally certain, by the representation of the three magnetic boats: (see plate 6:) the three boats are supposed to be anchored by a line of attraction; and what person that knows how by two lines given to find a third, would not concur with me, that the obliquity of the dip from an horizontal line, whether more or less, must point out the place of the magnetic anchor on the described line.

I particularly wish my readers to follow me close, and take the following directions, and they will find the same result for themselves. First draw a circle, as seen in plate 6, letter W, then divide its four quarters into 90 degrees, then describe a perpendicular through the centre to the point of the variation that is about 20 degrees to the west. Suppose you have already drawn a line for the geographic poles, then draw a small circle at the end of this perpendicular magnetic polar line round the needle, and divide it also as the first great circle in the same order, to ascertain the certain degrees of the dip of the needle; then draw a line for the dip from the centre of this small circle through the division of 70½ degree of the same, and you will find the line of dip point out and cut the 40 degrees up from the circle on the line B, which you see is placed or drawn from the point of the present reputed 20 degrees to the westward variation to the centre of the great circle. It is not difficult to conclude at what degree the magnetic point stands on the magnetic perpendicular; yet, nevertheless, whatever the scruple may be, if any, it is most certain that the needle cannot point to any place beyond the perpendicular line of variation; for when the needle passes the point of variation, it then turns about and points backwards to the same place. Then I conclude, that as those three lines (more might be made to the same effect) cross each other at 40 degrees from the centre upwards, (as shewn in the plate,) the poles cannot possibly be either above or below the 50 degrees downwards on the magnetic perpendicular line.

It is certain that there is always a straight line between two points, so there is seldom a straight line between three; but when this happens to be

the case, it points out some sound relation between them. Now, for example: if you should fancy to take the circle for the size of the nucleus, wherein are the points for the poles, either above or below 40 degrees from the centre of the earth, they would not coincide with the lines, or be cut by the three lines of position. (Represented by the magnetic boats, see plate 6.) But as those lines all meet at 50 degrees downwards, then 40 degrees up on the same line must be the place of the polar point in both hemispheres. This being the case, it necessarily follows that there is a substance at that place as well as a mathematical point; and on the consideration that all natural things form themselves (if left at liberty so to do) into globes, this substance of the nucleus, at which the polar points are situated, must also be of a spherical form; then it is not improper (for every thing has a name) to call this substance, which is 80 degrees diameter, the nucleus of the earth, which is a spherical magnet. (See plate 6, letter R.)

Having proved this point, the next thing of consequence to navigation is the sluggishness of the mariner's needle in high latitudes. If you turn to plate 6, letter P, the cause will appear most plain. If the needle which here stands horizontal was not prevented, it would fall into the direction of the line D; but if the needle be loaded at the south end, as it always is done to make it horizontal, it is not difficult to conceive, that the needle being placed in the situation of letter P, with its south end loaded, by that means it turns its back (as I may say) on the magnetic pole, and of course, points straight clear off or from the earth, pole and all, into open space. And it is but right to think, that if any one thing be expected to attract another, that it ought to be at liberty to turn towards it; but all mariners' needles being loaded at one end to make them horizontal, takes them from their natural dip; hence, the sluggishness of the common horizontal mariner's needle, when taken into high latitudes. This very great evil will be completely obviated, if you steer by my newly-invented Patent Dipping Needle Compass.

SECTION VII.

On Geology.—The several native Salts are the Limbs or Skeleton of Things.—On Marine Substances.—The Influence of the Heavenly Bodies over the Sublunary World.—The Change of the Variation of the Magnetic Poles is the Cause of Inundations.—The proper Time to accomplish the North-west Passage to the Pole.—The Water of the Seas is nothing more than a Mineral liquefied marine Salt.

In the preceding part of this work, I have treated of creation in general; I will now offer a few remarks on the subject of Geology. I have introduced the matter of all things, whose substance is contained in the chaotic matter: it would be but right for me to shew how the operation was performed, to bring out of the formless mass the beautiful order and exquisite form of things seen in creation. To speak in brief: generation is produced by a heavenly influence, (I do not mean the heaven of heavens, for this is altogether moral,) a starry form, and an earthly substance. The influence of the stars are not so remote that they cannot affect the earth, as some people suppose; for all things are (so to speak) both near and far,—they are contiguous to each other, because all space is full. The distance of the stars do not prevent their operation on the sublunary world; although the parts of creation do not touch every single individual, yet they do in effect of their influence. Now, in the example of a strained chain, if a person draw the first link, every link is equally drawn and equally quick, if at ever so great a distance, without lapse of time; therefore, to say, which is commonly urged, that because the moon and planets are so far distant, they cannot affect either mankind or this earth, this erroneous assertion must go for nothing. How fully are the effects of the stars demonstrated by the various passions which follow the weak lunatic at the times of the full and conjunction of the moon with the sun.

I. The reason of this influence is, that the moon so sympathizes with man, that when she is afflicted by the evil aspect of another planet, so also are those persons to whom that influence then in action particularly relates, accordingly affected, in a surprising manner, as to sickness, health, &c.

II. The various passions of men are in part governed by their several complexional habits of body; for every man is, by nature,—according to the four elements,—an airy man, a fiery man, an earthy man, or a watery man, according as his radical nativity was at his conception. These influences of the heavenly bodies shew themselves, in some degree, after the following examples: the airy man has too much of the manner of the monkey; the earthy man is melancholy, and possesses too much of the bear; the fiery man is passionate and fierce; and the watery man is so changeable, that you will not find him twice in the same mind: if, however, there be a proper mixture in any person of sanguine and melancholy, such person is capable of forming a sound judgment on most subjects.—As for the geologists of the present day, they seem to be all pulling at the wrong end: they have placed the valley on the hill, the sea on the mountains, and parcels of the orbit of the moon they represent as having fallen on the earth in piles of stone, because quantities frequently fall out of the air. When they happen to espy mermaids basking on the rocks and in the sea, they lie in ambush, in order to catch and bring them home for their children to play with. But, suffer me to state what is nearer the fact:—prolific nature being a great economist, makes the most of every thing, and gathers up all the fragments; and what she cannot make to become tangible, at times, she will, at least, make visible; this is that which is called supernatural. All the endless variety in nature is wrought and composed by an heavenly influence, a starry form, and an earthy substance. Now, this being the case, when there are storms at sea, which greatly endanger men's lives, and their hearts quake within them, and hope as it were upwards, just on the dissolution of the visible form, then the heavenly influence, ever looking down, meets the corporeal substance in its expected change, then is the thing visible to the human eye. It is by such means an appearance is produced between the two salts which are present and co-operate; (viz. the animal salt and the marine salt;) so that there is really seen, occasionally, that which cannot ever be felt. The imagination which is produced from the influence of the stars at times, form these sights, and sometimes succeed in producing actual living animals. One of this description was lately exhibited in London, as being a real mermaid; but my notion of this creature is, that it was not a natural but a monstrous birth; and therefore, to make an end of it, (as is usual in births of this kind,) it was thrown into the water, not supposing it would be picked up and brought to England, and exhibited as a real mermaid. Mermaids may be seen, but never felt.

One who has a good taste for the study of geology, perhaps finds, in his

research, a bed of shell-fish on a mountain; a second stumbles on interspersions in stone quarries. In the roads between Bath and Bristol, I have many times seen in the snake-stone, the perfect form of a snake very neatly curled up in the stones which were thrown up to mend the roads; but I never saw one of those snakes with a head: the naturalist, however, would ascribe this appearance to petrifaction; but, if this were a petrifaction, the head would certainly as soon petrify as any other part of the body. A third person meets with the bones of a mammoth, and being of the naturalist's opinion, supposes them to be petrified. A fourth person picks up a stone which fell from the top of a tower, and in consequence of its great fall it was broken asunder, and from out of which came a monstrous large living toad. A fifth person opens a long shut-up tomb, and to his surprise, out flies a large bat: now the tomb being closely jointed, nothing could possibly get in from the time it was built. A sixth person brings home a mistleto, gathered from an apple-tree. On the shores of Cumberland, a seventh person (perhaps a fisherman) picks from some old oak timber that lies in the water, a little shell-fish, (not unlike the muscle,) not yet come to its maturity, that hangs by a lace of sea-weed. "Here it will be necessary to observe," says Garrard in his 'Herbal,' "it is well known to the natives of Cumberland, that some of the same species, when full-grown, disengage themselves from the sea-weed, and become living birds, and are commonly sold in the markets under the name of 'Winanats.'" It would be tedious to proceed any further with this subject.

The great chaotic formless mass of earth, contains the whole variety of natural salts, which salts alone are the cause of the forms of every thing when they are quickened by heat, &c. All productions are in themselves natural, and wait only for their latent salt to be excited in them, and they then spontaneously shoot forth and shew the forms of their respective genus; and the respective salt has power to transmute the watery parts when drawn up into the salt to clothe, as with its fit substance, the skeleton; and the form, is in the end perfected by the aid of transmutation of the water into its respective substance. Fermentation is the first cause of dissolution; petrifaction follows; a new form succeeds, which is the production of these two, and this new form is governed by the original composition. It is said in Job, "Canst thou bind the sweet influence," &c. Job, chap. xxxviii. verse 31. The various respective salts are in close relation to the star which excites to life the salt of the individual, and therefore these salts take a starry form according to the heavenly influence and the earthy substance. After this manner, the great eternal Moral

Cause chose to work in physical matter: all things come from Him and again revolve into Him.

So much are the present school out in their notions of the nature of things, that you will frequently hear it said, "The hen laid an egg, and a chicken was hatched therefrom;" and if you attempt to put them to rights, they take fire, and although thrown, they will wrestle still; but the truth is, the egg was before both the hen and the chicken. That this is the course of nature, may be demonstrated by many examples. Basil Valentine says, "The country wife knows it well, that you cannot produce a hen for your use, but by the putrefaction of an egg, viz. by the heat of the hen's body. If bread fall into honey, ants are bred there, which also is a singular mystery in nature above others. The countryman also understands that worms proceed out of putrid flesh of men and beasts; as also of spiders, worms, &c. in nuts, apples, pears, &c. None are able to enumerate the various kinds and species of worms which proceed from putrefaction: the same is also observed in vegetables, &c." "You ought to know (continues Basil Valentine) if any thing proceed by putrefaction, it must of necessity be after this manner. The earth, by its secret and hidden moisture, is reduced to corruption, or a certain destruction, which is the beginning of putrefaction. Without moisture there can be no true putrefaction; and if any generation proceed from putrefaction, it must needs be kindled and produced by the property of heat, or the element of fire; for without natural heat no production can be made. If that production assume a living breath and motion, that cannot be without air; for if the air did not co-operate therewith and lend its aid, then the first composition and substance from whence the generation proceeded, would of itself be suffocated, and die for want of air; wherefore, it is clearly seen, and fundamentally demonstrated, that no perfect creature can be generated without the ministration of the four elements; and that always one element shadoweth its operation and life in another."

If this notion of fermentation and putrefaction were kept in view, and acted upon by ship-builders, and all other persons interested in the timber-trade, it would prevent the many fatal consequences which arise from the wet and dry rot, as well as from the engendering of insects. An attention to this subject would soon develop its advantages.

It is necessary to premise, that there are three points to be noticed: first, the time of the year; second, the age of the moon,—both of which ought to be observed previously to the felling of timber; and thirdly, drawing the native

sap from the timber when cut down, before the sap has power to enter into a state of fermentation.

This drawing the sap is a large field for experiment: one way is by boiling the timber in water; by which means, when the wood becomes dry, the sap will either be boiled out, or completely hardened in the wood. Boiling in oil has been found to succeed in many instances; and I presume, that if the wood were boiled in copperas, it might have the desired effect, as being of the nature of the copper, which is found to be proof against the engendering of insects.

It is with rotting of timber, and breeding of insects therein, as it is with infection: the infection first unites itself with the watery parts; hence the sap of the timber first imbibes the infection in the same way as the saliva of the human mouth. (I here beg to warn all persons who visit infectious apartments, against swallowing their spittle; by emitting the saliva, serious maladies may mostly be guarded against.)

At the time of the increase of the moon, it is admitted that the sap of all vegetation ascends; but in the decrease of the moon, the sap does not return; it is then converted, by transmutation, into the plant; and by this transmutation, it becomes congealed, and in consequence, the plant is augmented,—usually termed "growing."

It is said, if you cut two sticks from the same tree, and if one be cut at the increase, and the other at the decrease, of the moon, the one that was cut at the decrease will not decay so soon as the one that was cut at the increase. The reason of this is obvious:—the sap in the one is in a watery state; but the sap in the other is congealed, and thereby becomes fixed and further removed from fermentation, and consequently less subject either to decay or to engender insects.

The time of the year the timber is felled is of great consequence; for in the winter the sap ceases to ascend, and then there is no excitement to fermentation and putrefaction. Unfortunately, for the sake of the bark, which removes more freely when the sap is up, the oak is always hewn down in the summer, the very worst period for the purpose: this circumstance alone is sufficient to cause the rot in the timber, as well as to excite its proneness to breed insects. As for foreign timber that is frequently employed in stately buildings, but which, oftentimes, decays before even the building is finished, all the evils resulting therefrom arise precisely from the same source as that which causes the rot in the oak timber. From this it is reasonable to suppose that the

foreign timber is usually cut in the summer; but, what is of still more importance, the greater quantity is not generally cut down at all. In many countries, the trees very frequently are laid prostrate by the wind; and it is, therefore, impossible to say what length of time they were lying before they were cut into boards for exportation. In order to set this subject in a clear point of view, I will give a passage from "Drake's Voyages," page 554; wherein it is stated, that "In the woods of Lapland, there are almost as many trees fallen as standing; for the soil, after it has reared them to a certain height, can no longer furnish the proper nourishment, nor is it deep enough to allow them to take firm root, whence the least blast of wind oversets them. In all these woods, nothing is to be seen but firs and birches blown down." From this statement it may be inferred, that much of the timber imported is infected with the dry rot; but its condition is lost sight of when sawn into planks.

I should think it remiss to pass over in silence the following paragraph taken from the "Morning Herald," of January 20, 1829, which was extracted from the "Sheffield Mercury."—It is clear, the insects it treats of could not have penetrated into so hard a substance, therefore they could not have been petrifactions. But it is very possible there is a degree of animal salt and iron ore (such as is found to exist in animal blood) which resides in mahogany; and this is more probable from the colour of that wood: iron gives the colour of red, and iron is supposed to be the property of the salt, which gives that colour to blood in general. I would describe the process after this example: first, suppose the tree, in the time of its youth, had an animal salt from nature, (as nature supplies a salt for every species,) and having, at the same time, an excess of vegetable salt over the animal, this excess of the vegetable over the animal caused, those salts to assume the form of a tree; but the tree afterwards receiving a wound which mortified, (apparent on its rottenness,) the bruised part fermented; after that, putrefaction took place: then, (as is always the case after putrefaction,) there succeeded a change of mode of life; in this case it proved to be from the vegetable to the animal, and the issue was a fine black beetle. All this is produced from fermentation and putrefaction, as is the case with the production of mites in cheese. The following is the paragraph just alluded to:—"On Wednesday last, a fine log of Honduras mahogany was opened, belonging to Messrs. Shepherd and Son, timber merchants of this town, measuring seventeen feet long by nearly two feet square. When the sawyers had got about four feet from the end, they came in contact with a pithy substance, which they were at a loss to account for; and, upon further examination, it

appeared to be a large damaged place, between two and three feet long, and fourteen or fifteen inches wide, full of beetle nests and excrement; and so offensive was the smell which issued from it, that it was scarcely sufferable by any who approached near it. Owing to the men, at the beginning, not perceiving any thing different in the rottenness of the wood, except the smell, but what they might have met with on opening any other log, only two of these shells or nests have been preserved entire, although the place was full of them and dead beetles. The circumference of the largest is six inches, and has four small holes in it; three at each corner, measuring, the largest of them, a quarter of an inch, and the others not quite so large, and the remaining one still smaller, which was in a distinct part of the shell. The shell seems to be composed of a dark brown bark, and is nearly the thickness of a halfpenny, and the shape of each is of a triangular form. A fine black beetle, upwards of an inch in length, and perfect in every part, except the legs, has been preserved. What is most extraordinary, the log on each side, for about four inches, is as beautiful and perfect as any other part of it, and not a place any where either could or can be perceived where these destructive insects have made an entrance."

But to return to the production of natural things: if fossil substances could only come into inland and mountainous places, (from the circumstances of the sea, at a former period, flowing over the places where they are found,) I would demand, how came those substances in the sea itself, but from the respective salts which govern each genus? and even how came the water of the sea, which is nothing but a mineral marine salt that liquates by the air, which otherwise would be as solid and firm as the mineral salt after evaporation? It is well known, that salt of tartar liquates by being left open to the air.

The terrene substances, even the rocks themselves, would share the same fate of turning to water again, (as originally they were,) but for the excess of astringency of the terrene salt which resides native in them more than in the marine salt. Here follows another example of one thing coming out of another: the waters above the firmament came out of the waters below the firmament; for when there was heat, (which was constituted by friction of the air against the adamantine body of the sun,) such heat drew moisture, and attracted the fresh water from the salt; the fresh being lighter than the salt water is more easily attracted. All water would be salt but for the circumstance of the distillation of the fresh from the salt by the heat of the sun: hence came the water above the firmament from the waters below, which, by evaporation, fre-

quently is returned again into dry substantial salt by heat and by evaporation. I may here insert a brief account of floods, &c. as they are so nearly connected with the present subject. As for inundations, it is well known the sea is constantly changing its bounds, encroaching on the land on one side, and receding from the shores on the opposite side of the globe. We need not go far for proofs of these distressing effects: it will appear, that the cause of this phenomenon is produced and governed by the variation of the magnetic poles to the poles of the earth; for, whichever side of the globe the variation is found to be, the water is driven back therefrom, being pressed down by the magnetic pressure, after the example of the dimple in the cup of mercury, described in page 3. But when the variation returns, the water leaves that coast, and prevails on the opposite side of the magnetic poles. From this view of the subject, we may safely prognosticate, that the Goodwin family, whose estate is at this time lost to them by the encroachment of the sea, (now called the Goodwin Sands,) will be restored to them at some future time.

If it be a fact concerning the encroachment of the sea over the land, at different times, and at different places, and as often receding and leaving it dry, (it being occasioned by the variation of the magnetic virtue,) then it exactly applies to the navigation of the north-west passage, which, at this time, has been found so difficult to navigate. If the waters were much higher in those parts or channels, then the water in them would be deeper in those straits, &c. which are attempted to be passed into the polar basin; and if more deep they would not be frozen up to the same degree as they now are. The water is shallowed by the pressure of the magnetic virtue directly under the magnetic pole, after the example shewn in the experiment of the cup of mercury. This example of the pressure on the mercury, I think, is of great weight in the argument. According to the best of my recollection, I have read in some journal, that, in many places in the Polar seas, there appear the remains of the washings of the seas, which certainly indicate the water to have been on the cliffs, at some former time, to a great height, and that, too, far in shore, where the sea never comes at this time. This is fully accounted for on the supposition that the magnetic virtue of the magnetic poles has power to press down the water on the same side of the geographic pole, on which side at any time it is found to be.

Here let me take the liberty of recommending to our brave countrymen to defer attempting the north-west passage while the variation is to the west, as they will experience great difficulties; but I think if any commander succeed

at this time, it is that judicious commander, Captain Ross. A proper calculation, drawn from actual observation of the past variation, will sufficiently shew in what year this enterprise may be undertaken with success and honour; which, if the Lords of the Admiralty should view in the same point of light, there is no doubt but they will improve every probable idea which may be presented on an obscure subject of such national importance, the nature of which precludes the usual blaze of light to shine on; and, therefore, in its absence, such a glimmering taper as this may be acceptable.

As for magnetic tides, besides the memorable deluge of Noah, Ogyges, and Deucalion, there are many other accounts of the waters of the ocean making remarkable encroachments on the land, and returning to their former bounds again.

"After consulting a multitude of accounts, (says Mr. Churchman,) these magnetic tides seem to take place according to the revolutions of the two magnetic points; for while the magnetic points approach the meridian of any place, the sea seems to gain [Mr. C. should have said *the sea seems to lose*] upon the land, and the contrary when the magnetic points recede from that place."

Many of the moderns believe, that the accounts of the great island of Atalantis (mentioned in the Timæus of Plato, from the obscure tradition of the Egyptian priests) is not altogether fabulous, and that America agrees with the ancient description thereof. "At that time, (the account says,) the Atlantic Sea was navigable, and had an island before the pillars of Hercules; that this island was greater than both Lybia and all Asia together, and afforded an easy passage to other neighbouring islands." In process of time, it is said, this great island of Atalantis, being absorbed in the sea, entirely disappeared; and I suppose this circumstance drew the shallow waters from the land of the new world, America, to fill up the void left by the removal of the island.

The Indians, on the Malabar coast, tell us that the Moldavia Islands were formerly joined to India; but now they are said to be divided into eleven thousand islands: the sea encroaching has covered the low grounds, and turned the high grounds into islands. Strange stories have been told of the Moldavia nut growing at the bottom of the sea. Garcias thought the trees that bore these nuts were of old time, and that the land on which they grew was overwhelmed by an inundation, and afterwards cast up by the working of the waves.

Varionus is of opinion, that all the Oriental Islands, between Asia and the Straits of Magellan, have been occasioned by the seas breaking in

violently on the land, and thereby separated one part from another. "Language (says Dr. Johnson) is the pedigree of nations: all the inhabitants of the islands scattered over the great Pacific Ocean, speaking a dialect of the ancient Malay language, proves that the people are of the same nation. As they know so little of each other, and are so unacquainted with navigation, it seems unlikely they should be scattered so many thousand miles asunder, if those islands had not been part of the same continent. May they not be the scattered remains of one great country; and might not the sea, by its encroachments, have covered the low grounds, and turned the tops of mountains into islands."

I presume this supposition fully accounts for the inhabitants found in every newly-discovered country, without having recourse to the notion, that there were more Adams created than one, or that matter is eternal; and, what is of more consequence, it fully confirms the Mosaic account. What Ovid says on the subject of change is well known:

> "I've seen the solid earth transform'd to sea,
> And water also turn'd to solid land;
> While fishes' shells far from the ocean lie,
> And rusty anchors on the mountains' top!"

All these circumstances demonstrate, that the limits of the ocean have never been insurmountable; and that, by continually changing the face of the globe, it has taken away the land, and restored it again to its inhabitants alternately.

I shall mention only one or two instances more on this head: in a survey of Cornwall, Carew affirms, that the sea has swallowed up the whole county of Lioness; and that there was such a county he sufficiently proves by many cogent reasons. Camden, out of Giraldas, reports, that, anciently, a great part of Pembrokeshire ran out in the form of a promontory towards Ireland, as appears by the speech of King William Rufus, who said, that he could easily, with his ships, make a bridge over the water, (now called Saint George's Channel,) so that he might pass on foot from thence to Ireland.

Before the subject of inundation and tides is passed by, it would not be improper to remark, that the deluge or flood of Noah is not intended to come under the class of inundations, as occasioned by the change of the magnetic poles, or the variation thereof from one side of the globe to the other. The cause of this deluge was very different and particular, as follows:—a common

inundation is occasioned by the pressure of the magnetic stream on the water of the sphere of the globe, on the opposition side where the variation is as above; but the water of Noah's flood was occasioned by immense torrents of rain, the waters of which had been previously drawn up in the way of evaporation or exhalation. It is very remarkable, that, until the time of the deluge, it had never rained on the earth; for, although the heat of the sun had drawn moisture from below, and thereby caused a watery mist to go up, and water the land, (described in Genesis, chapter ii. verse 5,) yet it had never lifted (by the exhalations the water of the terraqueous globe) it high enough above the earth to constitute water for showers of rain; when, however the attraction of the heat of the sun had obtained, for the first time, power to raise the water to a considerable height, the water-spouts did then break through their bounds, to which the water was confined in the atmosphere. The exhalations of water, and all the water of the seas, were now broken up, (called the fountains of the great deep,) and water followed water, until all the water of the terraqueous globe was drawn up into the atmosphere: and as the water before that time stood on the opposite of the land of America, (called the New World, and it being then under water,) made an even balance, the centre of gravity being nearly equally distant between the water and the land; but when the body of the water was removed, the other crouched under the old place of the water, and the centre of gravity was no longer between the land and the water, but in the centre of the remaining earth; which circumstance gave the water the advantage when it returned from the skies to cover the whole globe. By this circumstance, there was enough water to cover all the land; and in addition to this, the water had no down-hill into the place of the sea to run into, as that place was raised by the change of the centre of gravity. The water of the sea being drawn up by the heat of the sun, the water, in that situation, took place of the air: air being the cause of friction on the sun's adamantine body, it produced the heat of the sun, and the water coming in by being drawn up, it cooled the excessive heat of the sun; and by driving a vast portion of air from the body of the sun, of course, the cause of the exhalation being removed, and for the want of the sun's heat, the waters returned to their wonted places, from the atmosphere again to the face of the earth. When the earth, with the waters thereof, came round in her annual revolution to the equinoxes, she met with a strong wind, (fully declared in Genesis, chapter viii. verse 1,) now called the equinoctial gales, and that wind drove the waters back again from the land, and restored the old centre of gravity to the terraqueous globe. All this, in a sense, was

natural: but the Almighty's warning to the antediluvian world, by the preaching of Noah (for it is said, that he was a preacher of righteousness) was supernatural.

GENERATION OF STONES IN THE AIR.

The unaccountable heaps of stones, which have at different times fallen from the air, has been matter of surprise to many. I may say, the naturalists of the present day need not go so far as to the orbit of the moon to fetch their origin, when we recollect that the whole earth itself, with all its most solid parts, was, in the first stage of creation, nothing but water, brought together by the power of astringency. It is easy to conceive, that the watery exhalations (drawn up from a terraqueous substance by attraction of the heat of the sun) in the air, are, at times, astringed in the same way as is already pointed out, and produce in the air, from water, those quantities of stones alluded to, and from whence they are forced to the ground by the pressure of the air. This elucidation of the subject will, no doubt, excite the astonishment of all those naturalists who conceive that these heaps of stone came from the orbit of the moon.

SECTION VIII.

Further Description of the Nucleus.—The Earth was a Comet, before the Creation of Mankind.—The Longevity of the Ancients accounted for.

The nucleus of the earth, having existed as a comet prior to its being taken into the solar system, may appear, at first view, to be incredible. Indeed, I have been asked, why I should suppose the earth, or the nucleus of the earth, to have been first a comet? My answer was grounded on the necessity of the thing. It could not otherwise have been; for it is evident, that matter was first generally diffused, and then it moved; and, from a general diffused fluid, it became under the denomination of particular atoms: after which, some of these atoms (being of the nature of iron) became magnetic, and by the act of friction, the atoms became attractive; then by attraction they drew together, and, by this effort, formed a mass, which before had no particular form. This mass, small as it was at the first stage, was the first part or foundation of the earth, properly called the nucleus. It is reasonable to suppose, that the nucleus became luminous by the friction of the air, like unto the appearance of a comet; and it would have remained so, as the body of the sun does at present, but for the gross stratas of earth of 50 degrees thick which surround the nucleus, and thereby hide its light from our sight, and also from shining in the air. Those stratas lessen the friction of the air; and of course, as the light is covered up by the stratas, it cannot be so great. Although the nucleus is without light, for the above reason, it is possessed of a mineral heat: this mineral heat may be termed the nether fire, which acts on the earth in concert with the upper heat of the sun, to animate the vegetable and other parts of the world.

This notion of the earth being first a comet, is neither against reason nor Revelation. I suppose the earth, at that stage of creation, had nearly a straight line motion, and no diurnal motion, and would, to a distant beholder, have had a similar appearance to a comet.

LONGEVITY OF THE ANCIENTS.

The longevity of the ancients is a matter of much surprise; but, I presume, it will be fully accounted for by the simple consideration of the earth's revolving, at that infancy of time, in a smaller circle round the sun than at some time after, or at the present time. We consider, that because it is one annual revolution which constitutes the year; so the circle of revolution being extended, made the time proportionably long or short, as the circle was large or small, without adding to the number of years, or days in each year. From correct accounts, it appears, that the earth is never stationary in its distance from the sun, but is in the act of approaching nearer, or receding further from, the sun by inconceivably small degrees. This subject may be said to be of very great importance to philosophers and divines: it has exercised the minds of the wisest and most learned of men: and besides this, it has unfortunately given great opportunity to the enemies of truth, to cavil about the account contained in the Holy Scriptures, viz. that of men's living to the great age of 600 and more years in the early stage of the world.

In the construction of what constitutes time, mankind may nominally live either 60 or 600 years; yet the real length of time would be the same. The following remarks, I think, will make the subject quite clear:—

If you admit the theory of chaos, that of confused atoms, and that those atoms were afterwards collected to form the body of the sun, the moon, and the stars, to make up the appearance and production of the present order of creation,—and also that the earth was taken into our solar system at some period, (say the time of creation sooner or later, it does not matter,)—it will not then be difficult to bring the mind to believe, that at that time of the creation of man, the earth might have been situated either a little nearer or further from the body of the sun than it is at the present time. The reader will now please to refer to plate 11.—If we place the situation of the earth, at the time it was first caught, into the influence of the sun's vortex at letter D, the circular or diurnal motion which it then acquired, threw it off by slow degrees; for all bodies in motion press towards or incline to straight lines: this, with the joint repulsion of the body of the sun being greater, from the circumstance of its nearness at that time to the earth, the earth could not but be forced off from the centre by small degrees, in each revolution, into wider space. Every revolution the earth made round the sun, of course, it would perform its career in a larger circle; its annual revolutions enlarging its path or circle from D to A instead

of from D to D; which A is supposed to be the earth's greatest distance from the sun. Until the earth arrived to letter A, it continually pressed itself into wider space; but, at the time it had arrived to letter A, it acquired by its bulk and velocity so heavy a vortex of air as to prevent its proceeding further from the sun. When it is considered that it is the revolution of the earth round the sun, which produces our solar years of time, a body in motion (situated at D) would travel, and come round, to the same point D again, being a smaller circle, twice in the same time, as in a circle twice as large as from B round to B. But still it could be accounted but one revolution; and, therefore, it would be but one year, in either case. Although it were twice the real time, or ten times more, yet no instrument, it may here be noticed, constructed for keeping of time, could ever detect the difference, though ever so great; because art depends upon nature. According to this, it was easy for the ancients, when the earth revolved in a small circle, to live as many more nominal years, as the earth's returns to the same point in the heavens were quicker. Perhaps, the earth is, at this time, situate at B in the return from A. This is probable; as the recent observations of Furguson clearly demonstrates, that the moon is now nearer to the body of the earth, than it formerly was. This statement of Furguson's makes all perfectly clear: as the moon is nearer the earth than it formerly was, and as the moon is a part of the earth, of course, the earth must be nearer the sun than it formerly was; but at some length of time, by small degrees, it may return to the place or circle it first revolved in: when this shall be the case, mankind, individually, will again live as many years as they did formerly.

It is a very probable supposition, if the sun from some cause should revolve, at some future period, less quickly than it formerly did, there must, in that case, be less repulsion to drive the earth to so great a distance from it: if the sun possess less power of repulsion, then a smaller circle must be described by the body of the earth, and of course, the real time of the year will be considerably lessened. In case, however, we should repass this bound, then the great Creator only knows how much nearer we shall be arrived to the day, for which all other days were made.

SECTION IX.

The Theory of the Tides, as being influenced by the Attraction of the Body of the Moon, a manifest Mistake.—Churning the Universe.

Why should the world any longer be shackled by high-sounding titles? Reason is far above all names. I could not pass over, without a few remarks, the absurd notion, that the tides are produced by the attraction of the moon; but, in doing which, I hope I shall not be considered intrusive. My ideas may be serviceable to some, and cannot possibly be offensive to any.

I shall be enabled to confound the doctrine of the tides, as refers to the system of the attraction of the moon over the element of water, the surface of which exceeds in quantity that of the land of the globe; and although I have given so much power to attraction, yet I can admit of none in the case of the tides. My readers will most likely think that the individual who dares to oppose so great an authority as Sir Isaac Newton, must possess confidence indeed. I know that truth is mighty, and will in the end prevail; I shall, therefore, with all due respect, attempt, for the public good, to throw down a column of the fabric of the present system, (which is but a shadow,) viz. of the present doctrine of the tides; indeed, I believe the whole building (save that part which is pirated from exalted Pythagoras) will be in danger.

By way of elucidation, it is a well known fact, that when the moon is situated at the conjunction of the sun, and also at the opposition thereof, the tides are high; and they become neap tides when the moon is situated between those two points. This effect is said to be produced by the power of attraction of the moon on the water of the globe. I ask, why, then, if the waters of the ocean be drawn up by attraction at these times, would there not be, at these times, high tides in the ocean? If this be admitted, the waters would recede from the shores, and leave them bare. Now, the contrary is the fact; for the water is forced over the land by pressure, in the same proportion as it is pressed down in the ocean. It is perfectly understood that nothing which is material can be in two places at one and the same time: then it follows, that when the water is over the shores it must of necessity be down in the ocean; therefore, when it is reported to be high tide, or that the water is drawn up by the at-

traction of the moon, it is, indeed, *vice versa:* it is, then, in fact, low tide in the ocean, as regards the attraction of the moon; and where, according to Sir Isaac's system, it should be most high, and shew itself most visible by being drawn from the shore. This explanation evidently points out the error of the tides being influenced by the attraction of the moon. The real cause of the tides will appear, when it is considered that all space is full by the four elements; and the air is as strong a body, in this relation, as any one of the other elements. The vortex of air, belonging to each sphere, presses upon each other; so that when the body of the moon comes into conjunction with the earth and the sun, it cannot so easily pass the strait between the earth and the sun, without pressing the vortex of the air of the earth; which pressure, in the ocean, forces the water over the shores. If you press your hand in a basin of water, the water will flow over the sides: so it is with the water of the ocean, as relates to the tides. The pressure is so very great on the water at the conjunction and opposition of the moon, that it even forces the body of the moon out of its proper path, which is the cause of that striking zigzag motion of the moon in her tract round the earth, as you see described in astronomical books: to speak vulgarly, she is compelled, in this predicament, to run the gauntlet as well as she can. The water, with every other thing on the surface of the earth, is kept on the earth by the pressure of the air only, and not by the attraction of gravitation.

From the above reflections, it appears plain, that the tides are occasioned by pressure, and proves that there are tides in the ocean as well as on shore; and, of course, the waters thereof in the ocean rise and fall to a very great height, according to the proportion of waters which are driven over the land. Here I would suggest a question to those readers who are expert at navigation:—as the height of the side of a vessel is taken into account in an observation at sea, (query,) do the tides in the ocean at all interfere with the account in an observation in navigation? It may be supposed the surface under the ship is elevated and depressed alternately, by the pressure of the body of the moon on the vortex of the air of the earth; but when the moon has passed through the strait, between the body of the sun and the earth, the waters return to their usual height.—But, for the circumstance of the moon coming round the earth in each lunation, the tides would certainly cease; as an illustration of this, if a stone be thrown into a pond of water, you would see formed, on the surface, circle after circle; and if a second stone should not be thrown into the pond, the surface of the water would become quite placid: so also is the case with the rising and falling of the tides.

CHURNING THE UNIVERSE.*

I am now led to the subject of churning the universe. I am fully persuaded that such a transaction took place; and although I do not intend to enter minutely into the subject, yet I imagine that my few remarks will be worthy of perusal.

It is stated in the book of Genesis, (chap. i. verse 2,) "that darkness was on the face of the deep, and the earth without (particular) form, and void" of the shape of any thing which can be conceived. This churning the universe will be accounted an odd expression; but give me permission to state, that I know what I say. I must, however, make a little reserve, lest a physical work should appear to be entirely metaphysical, as the churning here spoken of took place when all was moral, directly antecedent to the existence of corporeality; but that I may not come entirely short of my proposition, I must at least say a little. I have to premise, that a great part of the universe was actually churned in order to bring it to a physical mode and order of existence. In this action, the moral was eventually changed into the physical,† in its first stage, as a fluid; and this was performed by the admixture of two opposites, which two are now, in the physical world, enshrined in each other; that is to say, in the natural or physical world, they are hidden together, and cannot be seen separate: after the example of mik and runnet, of which cheese is composed; but neither the runnet or the milk of which the cheese is so composed, is in the least apparent, although both are present in the composition. It is said in the Holy Scriptures, that there is a veil over all things.

The admixture of any two opposites into one composition, a third (separate and distinct from both) must ever be the consequence. In order to make this subject more intelligible, I will give an example of the mixture for the production of colours. Put the colour of blue with that of yellow, and if these two colours be well mixed together, you will soon lose sight of both, yet the colour of green will be produced: so it was when two morals were impregnated, the natural world was the child begotten. Such is the constitution of the physical world. I must beg you to admit, that the universe was churned: the earth was the curd, and the other elements (particularly the water) formed the whey.

* This subject more properly belongs to an intended work "On the Moral World;" which work, if time and health permit, will shortly be submitted to the Public.

† This was effected by the admixture of two morals, the one was captivated and brought down into the lower parts of the earth. This is admitted in Ephesians, chap. iv. verse 9.

SECTION X.

The emphatic Letters of J,E,H,O,V,A,H.—Their Forms include every possible Shape of Line in Creation.

As every thing must assume a form, the form of lines which the chaotic matter took, was the form of the letters of the sacred name of JEHOVAH, the great Creator. It is remarkable, that the forms of the emphatic letters of the name of the Creator are included in every line which nature is capable of, or that man can possible make, describe, or pourtray; viz. the form of the J, the O, and the A. (See plate 3.) To clear this point, I maintain that the very form and sound of these letters are natural and not arbitrary; and that the forms were at first given, (in the true construction of hieroglyphics,) because no other characters could be substituted, with the same propriety, for these three letters. The place which has been assigned to each of these characters, in the order of the Greek alphabet, has its basis on science:—for instance, the A is placed first in the alphabet, in preference to any other letter, because this letter will, in its powers of proper sounds, make out more expression in its combinations with other letters than any other: it was, therefore, justly placed first in order in the alphabet. From this, you are to understand, that the sound, the form, and also the place they occupy, have a deep and a hidden ground in the nature of things.

The great Creator, whose name is pourtrayed or written in all the forms which nature is capable of, has a very different mode of existence to those in himself beyond creation, for there the mode of existence is all moral; but, in nature and creation, it comes into manifestation in the before mentioned forms, numbers, and sounds. It is said, that the wise ancient philosophers knew the Creator by the things which were seen; or, to be explicit, they knew the spiritual by the natural.

The forms are natural, and not arbitrary; so are the sounds of words, for they have their sense only according to the bearing they make on the heart when expressed, and the modulation of the word in its formation in the mouth. This is a large field which I have entered; but I must only take my readers to the gate for the present, they may at pleasure enter therein by themselves, and make a variety of observations, and form examples of their own. The forms of creation are in the forms of the name as above. All natural things

as they stand connected, tend, in their forms, to a circle, which is the O, and so of the rest of the three letters, whose forms are comprised in every possible form which can be made on the inner parts of the circle of the O, and they form, if properly placed, a significant character. (See plate 3.)

The mystery of expression is found to exist entirely in the vowels; for you must observe, it was only the vowels which were in use (without the consonants) at the time before the confusion of tongues, when only one language was over the whole earth, viz. the language of nature. This being the case, man could easily understand and converse with animals, as we are instructed respecting the serpent and Eve's conversation with him. But this mode of speech is imperceptibly lost to mankind; for the emphatic with men is now changed and substituted for the accentuated, whereby the language of nature is lost to us. The form of the letter A is the internal form of nature, that is to say, the letter A is the second form, and is a half of the square contained in the circle of the letter O. The letter O is the first form as pourtrays on the external of extended creation; and the J is the third form. Now, in these three forms are included all the possible forms in every natural thing; (see plate 3;) the straight line is comprised in the A, which A forms the square; the zigzag is formed in the J, and the circle in the O.

In the act of proceeding from a moral to a physical world, the natural forms and sounds, just alluded to, are the best means to express any particular moral.

The physical world came or proceeded from the moral world; the former, (that is the moral,) therefore, must have first made its appearance in the most indistinct manner, scarcely to be understood by beings whose mode of existence is only in one of the two modes, and not in both. At length, those unintelligible sounds and characters are become imperceptibly familiar to human understanding, so that scarcely any one who knows the right from the left, or who have learned to put the alphabet together, but can at length join in the sense of what is intended to be conveyed to the mind by those forms and sounds, although they may not, after all, be able to define, or even to apprehend, the difference there is between the sound and form being arbitrary from its being natural: this works a great difference to the case in hand; for if the sound of words of speech were arbitrary, then they would relate to nothing antecedent; but as they are natural, then they convey to our minds the conviction that they have a deep ground in truth, and shadow forth that from which they proceeded, and

on which they depend in the moral world. If you apply these considerations, you will easily apprehend that sound of words, as well as of forms of letters, have a very deep relation to that from which they proceeded, and from out of which they came. By pursuing the subject after this manner, it becomes easy to conceive why God wrote his name in the emphatic letters belonging to His name JEHOVAH, as well as in all nature; it was, that mankind might not, after their great removal from His immediate presence (in whose presence they formerly were when in the same moral mode of existence as the Creator himself) to a physical or a natural mode, entirely forget their origin; but to enable them to read and apprehend Him in all visible things.

I need not say much to explain the difference there is between accent and emphasis, being a subject so well known; but I think it may not be improper, before we pass on, to give an example. By emphasis is meant the stress or force of voice which is laid on some syllable, particular word or words in a sentence, whereby the meaning and the beauty of the whole may best appear. What I wish to convey is something more than what is inculcated in the above, where the consonants are made use of in common with the vowels; but I mean, by emphasis, such a sound as you may imagine would be produced by the vowels without the use of the consonants, which is more in harmony with the original language of nature.

On the authority of Sheridan, I will now state, for example, a single sentence, to shew that the original emphatic manner of speech was more comprehensive: viz. "Are you going to town to day?" which sentence, if used according to the accentuated mode, would produce a single meaning; but if you make use of the emphasis, this sentence has five significations. If you place the emphasis on the word "are," then it would suppose the question to be,—are or are you not going to town? If you place the emphasis on the word "you," then it would query whether you or some one else were going to town to-day. If you place it on the word "going," then it would mean going, or else remaining at home. And, lastly, if you place the emphasis on the word "day," then it would mean to-day or some other day.

I think I have made this sufficiently plain to my readers, therefore, shall conclude by observing, that no one can dispute the powers of the emphatic over the accentuated. Let them only revert to the force in music, which is nothing but emphatic tones of sound in a sufficient variety of expressions to fill up all the relations between the two extremes of harmony and discord.

SECTION XI.

Of the Imperative Circle filled with Squares; so called because there is an arbitrary Number of Circles belonging to the internal Part of a first Circle, be that Circle either large or small.

To square the circle and to cube the sphere have been an insurmountable difficulty from time immemorable, or, at least, since the time of Archimedes. In attempting to come near the performance of squaring the circle, I pursued the following plan: true it is, that the knowledge of one thing leads to another; and sometimes very great things are brought out of little beginnings. This happened with me in squaring the circle; for, in attempting to fill the circle with squares, which was by filling my first circle, and turning their angles outwards, unavoidably, I found, when the circle was completed, that I had pourtrayed on my paper the exact number of fourteen circles, without attempting to make either, save the first which I started with. This I thought exceedingly strange; and I could not, for a long while, be fully satisfied that such a conclusion could be right; consequently, I supposed that if a circle of nine inches diameter were made and would contain fourteen circles, that another of eighteen inches would certainly contain twice the number. Here, however, I found myself in error; for the latter circle contained no more in number than the former. Even after this, I had my doubts upon the subject, although I had tried the dimensions of both circles with great exactness. With the increased expectation of gaining a multitude of circles, I accordingly struck as large a circle as possible on a dining table, and still pursued the same manner of filling it with squares; but here again I was disappointed, for I found that my circle contained no more than fourteen circles. This excited more interest than ever. I then consulted some of my scientific friends on the subject, to find a reason for it; and they gave it as their opinion, that as I had already tried so many

different dimensions of circles, which always came to the same conclusions, they thought it must be founded in natural proportions of the circle to the square. Being still dissatisfied, I thought I would put the thing to a final test: for this purpose, I struck a circle on the floor of a large room, the diameter of which was seven feet nine inches. With so large a circle of seven feet nine inches, I assured myself that I should find, in the result, considerably more circles in number than in the circle of only nine inches; and, "to make assurance doubly sure," I made every circle with the greatest precision. My efforts, however, proved abortive,—my fond hopes were frustrated,—for, alas! my extended circle contained no more than fourteen circles, which number of circles I found comprised in my diminutive circle of only nine inches! Of course, I then became satisfied; though, I must confess, under very great surprise and admiration.

Having thus far advanced, in order to turn this discovery to some good account, I have constructed the plate, No. 8, of one circle, into which circle I was compelled, as before, to find fourteen circles, the unavoidable result. These circles represent and serve to explain, in a natural manner, the seven attributes of Deity; and it harmonizes with my pre-conceived notions of the moral world. (See plate 8.)

We find, in the Revelation of St. John, that mention is made of the seven spirits of GOD; which number, of course, must relate to the attributes of God; and in many other places in the sacred volume, like mention is made of the number of seven. I will, therefore, with the utmost deference, attempt to explain the seven attributes, and their opposites, by the fourteen circles; for the number of circles contained in the circle is imperative as relates to its number, and the seven opposite principles in the moral world are as equally imperative. Upon consideration, it will appear that every thing in the moral as well as the physical world has its opposite. By way of comparison, I have given one circle to each attribute, as it is in relation to its opposite principle. For instance, can right exist without left? Can up exist without down? Can black exist without white? And can TRUTH exist without falsehood? &c. &c. The seven proportions which are pourtrayed in the centre seven circles of the dark shade from letter B inwards, are to shew, in plate 8, that they are contained in the gall of the moral world; for there is a gall in the moral as well as the physical world. (See Acts, chap. viii. verse 23.) In this plate, you see pourtrayed a figure in the centre intended to represent the Leviathan

of Job, which I consider (under the name of Lucifer) to have been the first moving cause of chaos, which Lucifer turned part of the moral world, as far as the third circle in Deity, into physical matter.

In order that my readers may try the experiment, and come to the same conclusion as myself, I will describe the manner in which I went about to fill my circle with squares. I have to remark, that if the space should sometimes either be a little too small or too large in the centre, that this difference may arise in consequence of a want of care in drawing from the centre of the lines: as every thing is inclined to press from circles to straight lines, you will, perhaps, take on the outside rather than the inside, and so have a spare space in the centre. The manner to fill the circle with squares, (so as to have no blank places round the exterior circle,) is so to contrive to turn all the squares with their four angles outward, towards the circles, and put enough of these squares to fill all the ground of the outer circle. The four points of the first square will fill four parts, or points as a beginning of the circle; still pursue the same process of squares until you have covered all the paper, and you will then find that those straight lines of the squares will constitute a second circle within the first circle. Proceed in the same manner with the second and third circles, and so on to the end, and you will find fourteen circles, neither more nor less, whether your first circle be seven or seventy inches. The only imperfection of the complete performance of filling the circle with squares in this example is, that the lines of the squares cross each other; but the circle is perfect at the exterior, where the points of the squares touch the circle. The part of the lines crossing each other, are left to be further perfected by those that follow after me; so I will conclude, by wishing the favoured individual every success in the exercise of his pursuit.

I wish to remark here, lest I should be mistaken by my readers, that I do not think a small circle, or that any small thing is capable of as many divisions as a large one. But still it is a very striking fact, that you cannot get into a circle, according to the system here set forth, more than fourteen of those circles produced by squares.

I know nothing which resembles this circle filled with squares, so much as examples in the rule of perspective. From the base line of perspective, to the point of sight, you may introduce fourteen millions of objects equally, and after all, none of them will rise above the point of sight, and yet they are all equally seen to the eye.

I shall make a few remarks on the point of sight and the horizontal line in drawing, which will be useful to draftsmen and young painters, both in designing and making collections of engravings: for, when you have considered, and been convinced of the propriety of the following rule, you will find that very few specimens are to be found which will bear the title of good perspective. My rule of judgment is short; it is this:—in a correct painting or drawing, (as regards perspective,) the point of sight ought always to be placed on the horizontal line, and the horizontal line should never be above the height of the eye of a standing figure which is found in that painting or drawing.

DESCRIPTION OF THE PLATES.

PLATE 1.—Profile of the Author.

N.B. I found it necessary to cancel Plate 2, as its contents were embraced in the other plates.

PLATE 3.—Page 19.

The Three Emphatic Letters, J, O, A, Characterized.—For the literal description of these emphatic letters, see page 98.

PLATE 4.—Page 22.

An Elaboratory of a Chymist.—This Plate represents a Chymist in the act of revivifying plants from their native salts.

PLATE 5.—Page 18.

Formation of the Nucleus of the Earth.—The forms and motion of the action of the ferruginous atoms belonging to the nucleus, when in the act of collecting matter to form the foundation for the sphere of the great mass of our earth.

PLATE 6.—Page 32.

The Sphere and the Situation of the Nucleus of the Earth in it.—This Plate represents the earth as when completed and fit for the habitation of mankind.

PLATE 7.—Page 38.

The Amantha.—The representation in this Plate I have called the Amantha, because it is so much in resemblance to the form of the human body. This Plate relates to all nature, and is intended to include not only the solar system and starry heavens which surround us, but all creation, which creation extends as far as the outer verge of the second circle in deity and no further. See plate 8.

Letter L shews where the head begins; the feet are properly placed on the crown of the head, according as they are in nature. If you look round the Plate, you may trace all the relative parts of the human body, and also the twelve signs of the zodiac pourtrayed on their proper members, which members correspond to their respective signs. The internals of the human frame contained in the cavity of the stomach, &c. represent not the signs of the zodiac as the limbs do, but the planetary system. The human body is an epitome of the starry heavens, and called the microcosm. All other things in nature represent only one part of the body: this relation between the members and the parts of the heavens is very perceptible in its application in the way of medicine; for instance, one medicine being under the dominion of the sun, is termed a solar plant,—mineral or metal, as it may be; hence it is serviceable to cure the disease to which the heart is subject, for the heart is also governed by the sun, and represents in the human body the sun in the solar system.

The ancient physicians successfully cured one member by another. If the heart of a man were diseased, the physician considered that the natural strength which remained in the heart made a good effort to drive out the complaint; the wise doctor, therefore, helped this internal heart with the corresponding external heart, viz. by a solar medicine. So, by the virtue of the effort of both together, the disease of the heart was removed. I have found this to be true from experience.

PLATE 8.—Pages 7 and 102.

The Extent of Space and the Leviathan of Job.—The dark circles (from B inwards) are intended to represent the gall of deity; (Acts, chap. viii. verse 23;) which circles contain, in due proportion, the same number of squares and circles as are comprised in the light circles from B to G. The seven dark circles are governed by seven opposite principles to those which govern the light circles. [It was my intention to have explained the subjects of this Plate by references on the Plate; but they were so numerous, and the spaces so limited, that I abandoned the idea, and have consequently here given the best definition that I possibly could.]

No. 1.—The First Heaven; the principle of which is the ground of all things. Truth environs the gall; and the opposite of Truth is falsehood, which is pourtrayed in one of the dark circles.

No. 2.—Love (of Truth) . . . . . the opposite of which is hatred to Truth.

No. 3.—Justice (as it exists in Truth) . . . . the opposite of which is Injustice.

No. 4.—Mercy . . . . . the opposite of this is Cruelty.

No. 5. } Present, and Omnipresent, (in Truth) { the attributes of the devil are, or his influence is, ever absent in Truth.
No. 6. }

No. 7.—Omniscient . . . . . the opposite to which is Ignorance.

The figure in the centre is intended to pourtray the Leviathan of Job, represented to be drawn out with a hook. This idea is correct, seeing that, in the moral world, he is situated in the gall, as a sort of principle, which principle is called Lucifer: he is, in the natural world, in the nucleus as a substance: the principle and the substance form a pair. I have given to him the figure of the animal which his moral principle best resembles: he is said to be drawn out with a hook; this drawing out is verified by the nucleus being drawn annually up from one constellation to the other, called the equinox.

PLATE 9.—Page 9.

An Angle of the Universe connected with the Solar System.

PLATE 10.—Page 63.

Pope's Patent Dipping Needle Mariner's Compass Card, before placed in the compass box.

> The watchful ruler of the helm no more,
> With fix'd attention, eyes the adjacent shore;
> But by the oracle of Truth below,
> The wond'rous Magnet guides the wayward prow. Falconer.

PLATE 11.—Page 93.

Longevity of the Ancients.—The time of the ancients explained, which time corresponds with the age of the moderns.

PLATE 12.—Page 101.

The Imperative Circle filled with Squares.

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PLATE III.

The three Emphatic Letters, J. A. O.

PLATE IV.

The Laboratory of a Chymist.

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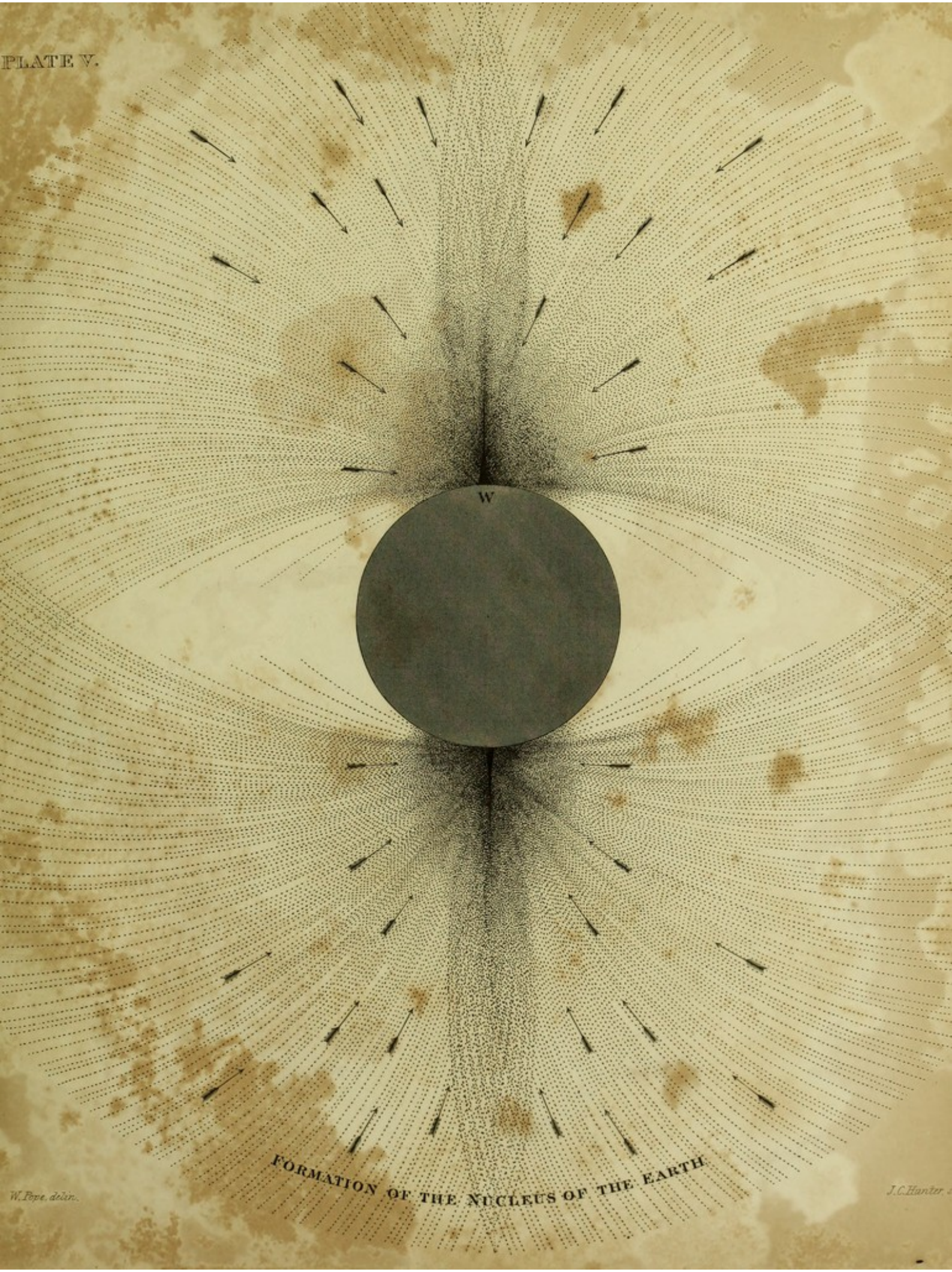
J.C.Hunter sc.

PLATE V.

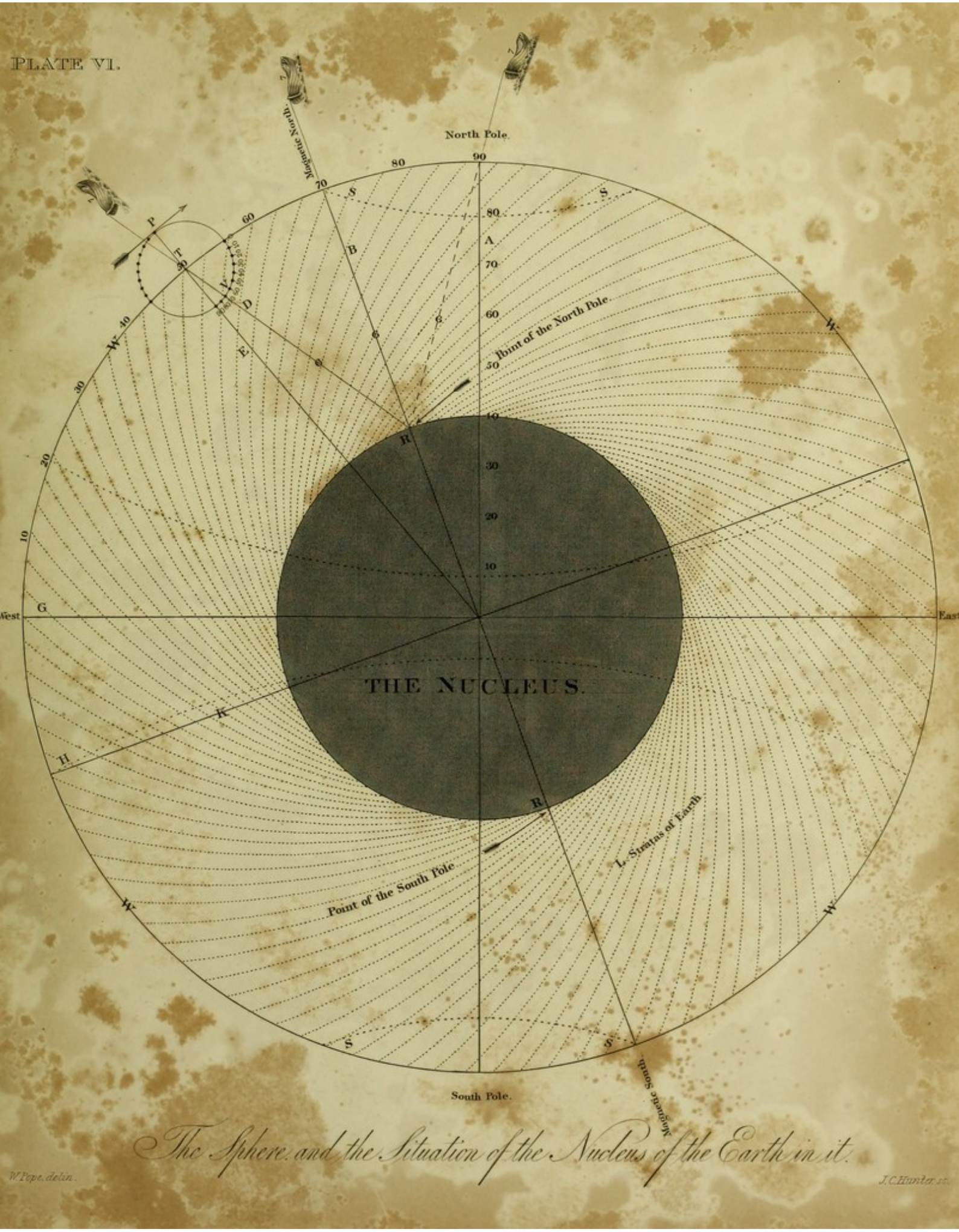


FORMATION OF THE NUCLEUS OF THE EARTH

W. Pope. delin.

J.C. Hunter

PLATE VI.



The Sphere and the Situation of the Nucleus of the Earth in it.

W. Pope. delin.

J. C. Hunter. sc.

PLATE VII.

The Amantha.

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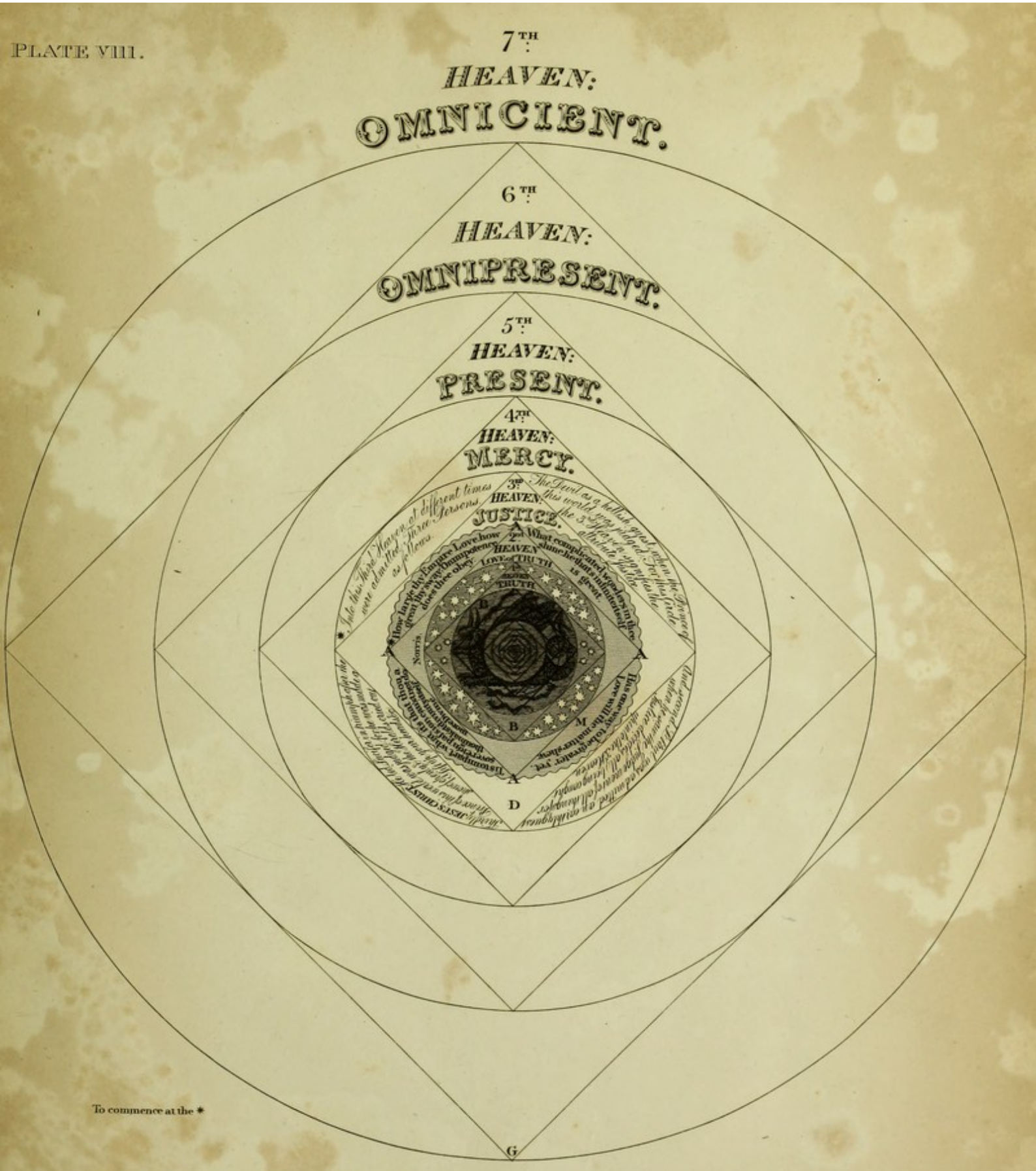
PLATE VIII.



The extent of Space, & the Leviathan of Job.

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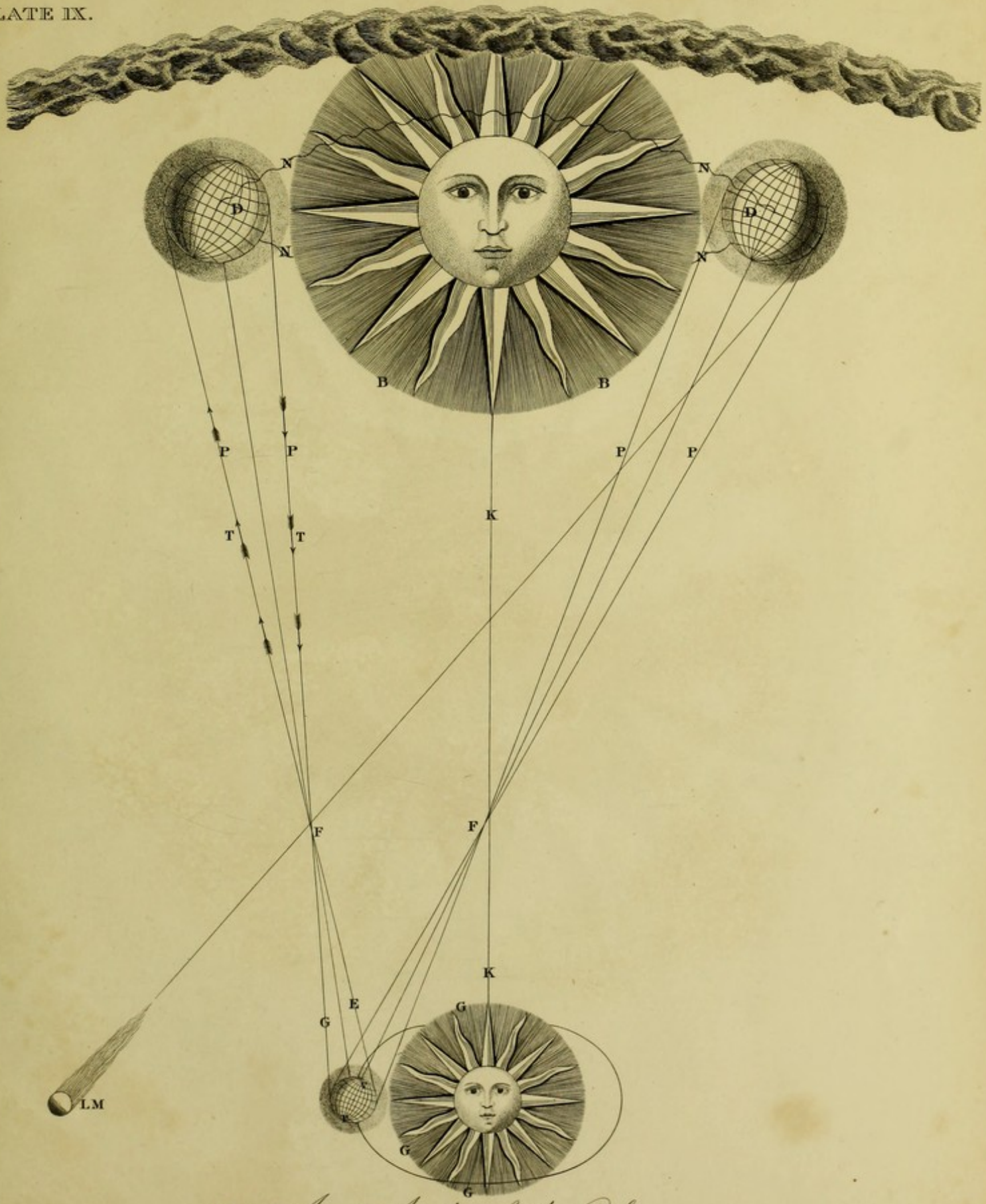
PLATE IX.

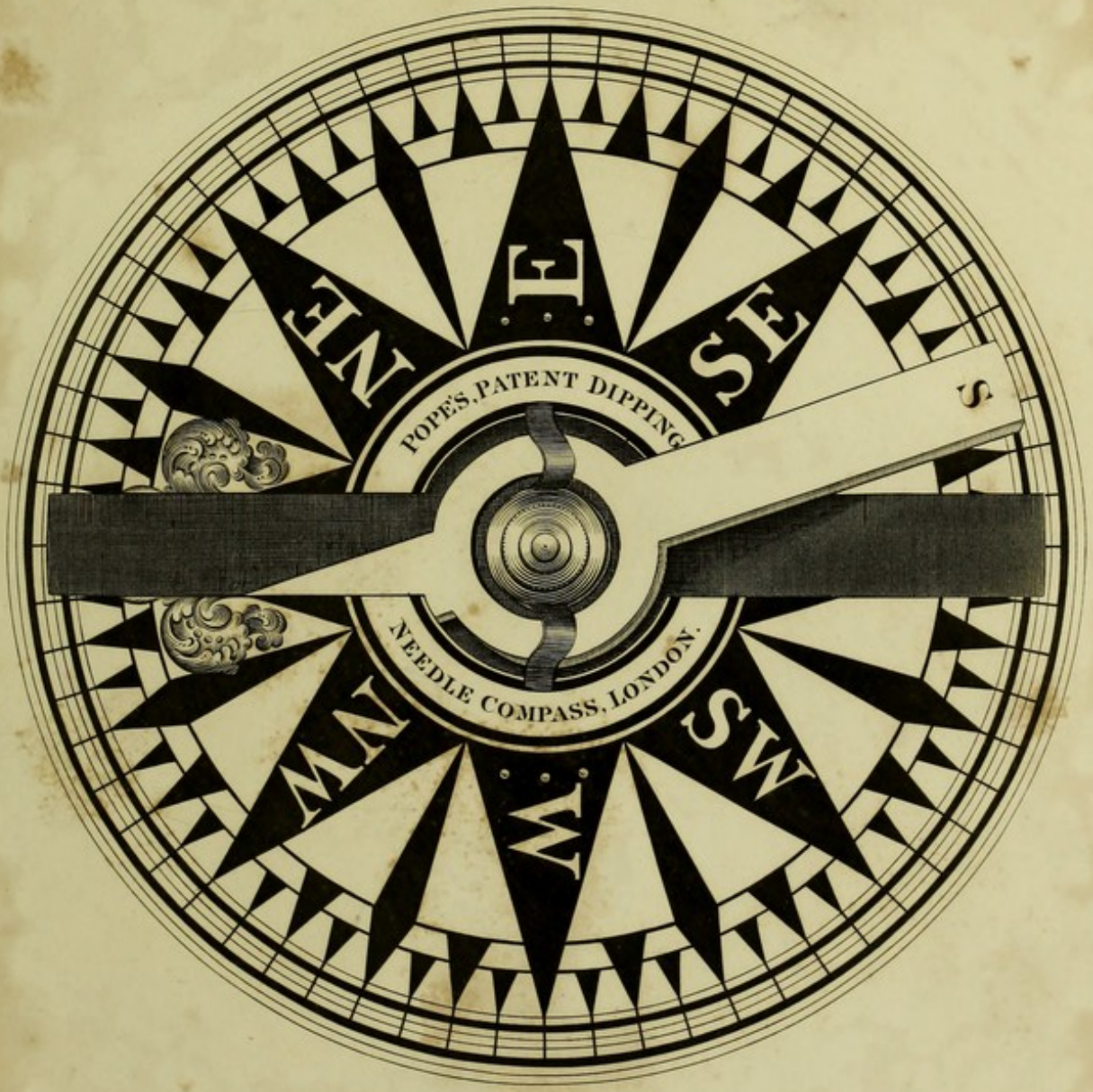


An Angle of the Universe.

W. Pope. delin.

J.C. Hunter sc.

PLATE X.



Popes Patent Dipping Needle Mariners Compass Card.

Dpt. delin. *J. C. Hunter sc.*

PLATE XII.

The Imperative Circle filled with Squares.

J. C. Hunter sc.