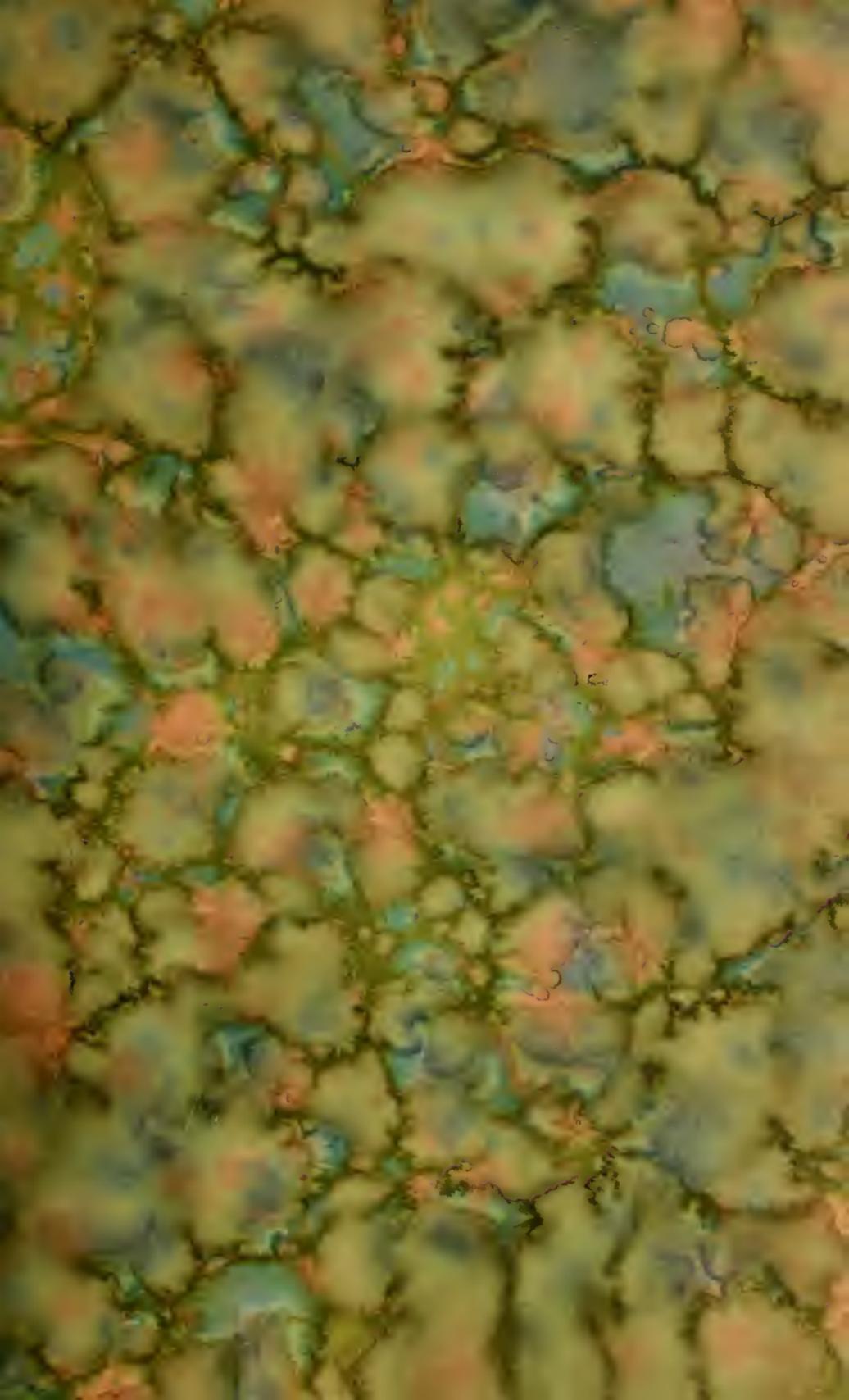




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# LECTURES

ON THE

*POLITE ARTS.*

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THE SECOND SERIES.

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Delightful task ! to rear the tender thought,—  
To teach the young idea how to shoot ;  
To pour the enlivening spirit, and to plant  
The generous purpose in the glowing breast.

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OF THE

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## LECTURE I.

## ON PERSPECTIVE.

.....

LADIES AND GENTLEMEN;

I HAVE now the honour to open a second series of Discourses on the Principles of the ARTS of DESIGN: In this Lecture I propose more immediately to elucidate the nature, and the general properties, of PERSPECTIVE. The recollection of the candour I have experienced on former occasions, flatters me with the hope of your equally cheerful attention to the subjects of our present Series; and I willingly persuade myself, that our late recess has rather enlivened, than enervated, your desire for a further acquaintance with these highly pleasing Studies; and that, as their principles become more familiar, they will likewise prove more agreeable, and more satisfactory.

We have heretofore had occasion to admire that wonderful contrivance (the EYE), by which we not only inspect objects around us, but also survey those remote from us; to admire—that astonishing apparatus which communicates to the mind those infinitely various ideas received by the sense of sight; a further examination of this organ, will with pro-

priety form an early subject in this discourse. Give me leave, therefore, to request your attention, while I endeavour to explain some of the principles by which this admirable faculty is regulated.

I am not offering remarks as an Anatomist, or, as an Optician; leaving therefore observations which, to be properly understood, might require much previous knowledge, I shall consider the Eye as composed of (1) the CORNEA, or external part, which by its projection from the ball of the Eye, enables the pupil to enjoy a much greater quantity of vision than it could receive if the cornea were level with the surrounding surface of the ball. (2) The PUPIL; this you know, LADIES and GENTLEMEN, is an orifice in the center of the iris, through which the rays of light pass, into a very clear and transparent medium, called the CHRYSTALDINE HUMOR; whereby they are converged towards a focus; and are again transmitted to the VITREOUS HUMOR, through which they pass, and by which they are nicely adjusted to their true focus on the retina. (3) The RETINA is a very elaborate collection of (apparent) net-work; being an expansion of the optic nerve; by whose motions, the brain, or seat of sensation, receives information of all that the Eye beholds. Objects are pourtrayed on the retina in their proper colors, and forms, and with their just degrees of force; so that it becomes an accurate, and vivid; picture, of whatever is transmitted by the rays passing through the pupil. Vivid you may suppose it to be, but perhaps its accuracy may seem somewhat doubtful, when I proceed to say, that every  
every

every object delineated on it appears *inverse*; what is really above, seems below; what is really to the right hand, seems to be to the left.

This inversion of objects is very distinctly seen in the dissected eye of a large quadruped, an ox, or a horse; and very beautiful, indeed, it is to behold: but perhaps the same effect is more familiar to my auditors, from occasional observations they must have made, on the transmission of luminous rays through a small hole, or crevice, into a dark chamber. In this case, external objects, or the effects of external objects, become depicted on the opposite wall of the chamber, *inversely* with respect to the actual situation of such objects; thus, if the perforation be next a street, the approach of passengers is, as it were, announced, by a ray which strikes the part *opposite* to that whereon they are situated: for the supposed crevice being far too small to afford passage for the rays emitted from every part of an object, becomes a centre to those rays whose different directions permit them to converge. Therefore, the ray from above, continuing its natural course in a straight line, necessarily strikes, in the chamber, somewhere below; as the ray from below necessarily strikes somewhere above: its direction not being altered by its passing through the orifice; though its quantity may be diminished.

How then do we acquire the faculty of distinguishing the actual situations of objects? By habit; by the exercise of another sense (I mean Touching), as another medium of obtaining certainty. This habit commences much too early in life for us to notice

its progress in ourselves ; therefore, to detect it, we must endeavour to trace it in those not yet accustomed to the enjoyment of their faculties. New-born infants make little use of their organs of sight, as the parts which compose those organs do not possess consistence sufficient to conduct the rays of light with certainty. By degrees, this confusion ceases, the humors become clear, and the retina receives the rays in their due force and order : at this period, infants may be observed to look, and stare, and exert their attention, but, in vain, till, after innumerable efforts, they discover the just situations of bodies,—first of luminous bodies, whose rays issue in a compact order, and are most impressive on the Eye ;—afterwards of objects in general.

As infants cannot relate the progress of their acquisitions, we are obliged to infer that progress ; we therefore seek information on this subject, from those, who at years of maturity have received the invaluable faculty of seeing. With what sensations must the minds of such persons be overwhelmed ! sensations of unutterable delight ! especially, if the transition from darkness to light, were momentary, and miraculous. In general, however, the Eye is unable to bear a transition so sudden ; but requires time, wherein to be strengthened by use. Here indulge the remark, how happily the Evangelist LUKE expresses at once the liberality of our Lord's manner of giving, and the importance of his gift ; “ to those who were blind—he *presented* sight,” a present worthy of, and alone in the power of, him,  
whose

whose creative omnipotence originally formed and planted the organs of vision !

I beg leave here to offer an instance of the reception of sight, in which its progress is very distinctly related. It is the case of a young man, born blind, and couched at fourteen years of age, by Mr. CHESSELDEN (*Philosophical Transactions*, No. 402) : It is related of him, that,

“ When he first saw, he was so far from making any judgement about distances, that he thought all objects whatever touched his eyes (as he expressed it) in like manner, as what he felt touched his skin ; and he thought no objects so agreeable as those which were smooth, and regular, though he could form no judgment of their shape, or guess what it was in any object that was pleasing to him. He knew not the shape of any thing, nor any one thing from another, however different in shape, or in magnitude ; but, upon being told what those things were whose forms he knew before from feeling, he would carefully observe, that he might know them again ; but having too many objects to learn at once, he forgot many of them ; and, as he said, at first he learned to know, and again forgot, a thousand things in a day. One particular only, though it may appear trifling, I will relate. Having often forgot which was the cat and which the dog, he was ashamed to ask ; but catching the cat, which he knew by feeling, he was observed to look at her steadfastly, and then setting her down, said, ‘ *So, Puss, I shall know you another time.*’—We thought he soon knew what pictures represented which were shewed him,

him, but we found afterwards we were mistaken; for about two months after he was couched, he discovered at once they represented solid bodies, when to that time he considered them only as party-colored planes, or surfaces diversified with variety of paint; but even then he was no less surprised, expecting the pictures would feel like the things they represented; and was amazed when he found those parts, which by their light and shadow appeared now round and uneven, felt only flat, like the rest; and he asked which was the *lying* sense, feeling or seeing?—Being shewn his father's picture in a locket at his mother's watch, and told what it was, he acknowledged a likeness; but was vastly surprised, asking how it could be that a large face should be expressed in so little room? saying, it should have seemed as impossible to him as to put a bushel of any thing into a pint."

At first he could bear but a very small portion of light, and every object appeared to him very large (like him who saw men walking, as large as trees); but by degrees he acquired juster perceptions. Imagine then, what must have been his sensations when taken to Epsom he surveyed the distant prospect!

Mr. CHESSELDEN relates other instances of a similar nature; and he observes of all, that they were mightily perplexed how to move their eyes after the operation (not having had occasion to move them during their blindness); and that it was by little and little, by degrees, and after a time, they were able to direct their eyes to any object they wished to inspect.

Such

Such is the progress of Sight; and similar is the progress of the Art of Seeing: for there is actually no little art in seeing, and in understanding the principles, the powers, and the connexions, of sight. How the sense is performed we have already noticed; to explain its principles, is the object of our present attention; and when we have attained to just ideas of these, we shall be, I hope, enabled so to imitate them, that we may deceive the very organ itself from whence they originate: which, in my apprehension, is the business and the perfection of Perspective.

The sentiment just expressed, implies that how valuable soever is the sense of sight, like all our senses, it is subject to be deceived by proper objects, or combinations of objects: thus, what is flat, shall appear round, and be estimated to the sight as round; what is near, shall seem remote; or, what is distant, shall be regarded as close to us. For example, were we not thoroughly certified by other means, a fly passing rapidly at a few inches before our eyes, might seem to be an eagle aloft, or an eagle aloft might seem to be a fly near at hand; and, in the obscurity of night, how often have we actually mistaken a bush that was nigh, for a spreading tree at a distance; or, a spreading tree at a distance, for a bush just before us.

In advancing from the Obelisk in St. George's Fields, toward Black-Fryars Bridge (other similar situations have the same effect), at a proper distance, by night, the eye is very easily deceived with respect to the true stations of the lamps elevated on the bridge; not infrequently changing their declination  
from

from right to left, or from left to right: the cause of this is obvious; for, a spectator having no other rule whereby to judge than the brilliancy of the lamps, if a lamp at the further end happens to appear *brightest*, it immediately persuades the eye that it is *nearest*; or, if they appear equally luminous, the eye is biassed to suppose them equally distant; and thus, if the imagination assume such, or such a direction, or *bearing*, of the lamps, to be the true one, the Eye coincides with that assumption, and reports accordingly.

Neither is it by night only that the eye is liable to such deception, though night is certainly favorable to this effect; for, that by proper objects the eye may easily be deceived, in the day-time, appears from a customary question put to strangers on their entrance into the church of St. Peter, at Rome. Having advanced a few paces, the visitor is asked, of what size he supposes the angels to be who attend the great altar? as they appear to be human figures; “the size of life, or perhaps a little larger,” is the usual reply; whereas, they are, in reality, much more than double that size.

I remember having observed, in passing a long street, where the tops of the houses were nearly uniform, a ladder set by some workmen in a position exactly corresponding to the apparent gradation of the parapets; whereby it very much confused, if it did not destroy, the *perspectivity*, and distance, of that side of the street.

BARON DE TOTT has given us some remarks on visiting the Pyramids of Egypt; which, as the sub-  
ject

ject is curious, and allied to this discourse, I shall be permitted to introduce.

“ I cannot take leave of these Monuments,” says he, “ without mentioning a strange deception in their appearance at different distances; it may serve to give some idea of the height of these masses, which is not to be conveyed by any comparison.

“ I have already said, that I set out, at midnight, from Gisé, with the Arabs, who were to conduct me to the Pyramids. We directed our route by keeping these prodigious edifices, which seemed like so many mountains, continually in view. Being arrived at a village, which had hid them a moment from our sight, they re-appeared, on leaving it, so large and so near, that I thought I could touch them. I was even desirous to alight, but the guides assured me they were still a full league off. In fact, we continued to ride on, near three quarters of an hour, at the end of which the (great) Pyramid seemed so much lessened, that I alighted from my horse, a hundred paces from it, as much surprised to find it no bigger, as I had been before at its enormous size. But I presently found it magnified again on my nearer approach; and these contrarieties in its appearance, made me curious to discover their cause. For this purpose, I removed to the distance of six hundred paces from the Pyramid, along the plain horizontal to its base; I then turned about, and this point of view giving me its greatest apparent size, I remarked, that at this distance, its perpendicular height filled the angle of the visual rays in such a manner, that, on a nearer approach, this same

angle, which I shall compare to the two legs of a compass, could only embrace a part of the object, and that at the distance of a hundred paces, I could only discover a third; to which the sensation I experienced must be attributed.

“It follows, from this observation, that every object which exceeds the chord of the two visual rays, appears greater, and that which does not fill them, appears less, than it really is. This principle might be usefully applied to public buildings, if the best point of sight were to regulate their proportions.”

Let no sailor laugh at the ignorant land-man, who does not perceive a ship's real course; for the eye judges of objects by comparison, and calculates, as it were, the size and nature of those afar off, by those around it. Thus, houses, trees, &c. near us, furnish means of determining with respect to others of a similar kind at a distance, and we judge of them accordingly: but, in the course of a vessel at sea, having no adjacent objects by which to calculate, the unaccustomed eye is embarrassed and deceived: I remember to have paid great attention in this instance to no purpose. As it is on sea, I presume it may be on land; if in the sandy deserts of Arabia there be any spaces without others around them in contrary, or at least in different, directions, I very much doubt if the eye, not habituated to such perceptions, can distinguish a slope, whether rising or descending, from level ground.

That the eye may be deceived into an opinion contradictory to the demonstration of the other senses,

seems

seems, when first mentioned, highly improbable; yet so I have known it. In mechanical instruments this is frequent; but other instances offer: in a ship a little way out at sea, whoever looks back will see the land diminish, and recede from him; it will appear to him (especially if the gale be steady, and the sea be smooth) as if he absolutely retained his situation, while the gentle breezes wafted the shore out of his sight: but that the fact is really otherwise needs no proof: the fallacy originates with the beholder himself.

In travelling the roads of England, at every mile, or half mile, either a change of direction in the road, a variety of prospect, or some other novelty, occurs, which diverts the *tædium* of the journey. On the Continent many of the highways are perfectly straight, and level, for six, eight, or more, miles together; they are planted with trees in great uniformity on each side, and, by order, the carriages travel on the *pavé*, which is in the middle; thus, to the traveller, cooped up in a chaise, they permit no prospect but directly along them. If we imagine ourselves just setting forward at one end of such a road, our first observations may probably commend it as a most noble vista! its regularity almost surprizing, and the sight of the cross at the further end, pleasing enough. We move on for half an hour, perhaps, tolerably contented, but on examination, the future distance seems as long as ever; the same vista, the same regularity, and the same cross at the further end, are exactly as discernable as at first; surprized by the appearance, we almost  
c 2 believe

believe we have stood still. Notwithstanding the *allons*, of the postillion ; the *crick crack* of his knotted whip ; the jerks of his massive jack-boots, and the rumble of the wheels on the *pavé*, at the end of a second half hour (I speak not of English travelling) we again examine, and again we seem to have advanced—nothing ; for still the trees are uniform, as before, still the vista is perfect, still the regularity is the same, and still the cross at the further end is exactly as discernible as ever. If, when we have accomplished this patience-improving labour, fickle fortune should turn us into such another, good heavens ! a quarter of a mile in it, will either bring on sleep, or convince us, in spite of conviction, that we have made no progress from our very commencement.

And pray what are the causes of these deceptive appearances, Mr. LECTURER ? Those, LADIES and GENTLEMEN, I proceed to consider.

Whether animals have equal vanity and pride to man, in supposing themselves examples of perfection, I know not ; but, I confess, it sometimes startles me to see some of our species very little acquainted with their own natural and personal imperfections ; rather, while we freely acknowledge that our sense of sight is indeed noble and invaluable, let us remember that it is limited and imperfect ; though our visual powers surpass “ the mole’s dim curtain,” they equal not “ the lynx’s beam.”

Beside the fatigue which naturally arises from perpetual contemplation of unvaried uniformity (which it will be granted, is very considerable) and  
which

which acts as one cause of visual deception, there is likewise a distance at which the powers of the human eye fail with respect to every object, so far at least that it ceases to afford pleasure to the inspector; and this distance is regulated by a ratio, correspondent to the magnitude of the object inspected. If angelic powers may scrutinize through various systems; those of man are confined by his nature, and by his situation, to a small horizon; if he ascend the highest mountain, if he emulate the wing of the eagle, yet his survey bears a diminutive proportion to the "ken of angels:" but if he stand on level ground, and use no artifice, narrow limits bound his view. This is not all; we have before explained the natural principles by which sight is performed; we now further remark, that objects, according to their magnitudes, occupy proportionate quantities of the rays admitted by the pupil, and of course proportionate spaces on the picture impressed on the retina. In other words, according to the angle under which they are seen, they impart ideas of their dimensions.

I need not *prove*, that every object apparently lessens as it recedes; that as it diminishes, we survey it with less pleasure; that we the less distinguish it, and particularize it from among others; that it therefore costs more pains to examine; that if it be composed of parts not very large, this examination is an anxious labour; now, if it lessen perpetually as it recedes, it is certain that at some determinate distance it will cease to be visible. It may be worth while, to enquire at what distance this takes place.

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The smallest angle under which, in general, we may view an object, is one minute; this angle gives for the greatest distance at which a strong eye may discern that object, about 3450 times its diameter: for instance, an object one foot in dimensions, becomes invisible at 3450 feet distance; and a man five feet in height, is precluded from our view at five times that number of feet, that is to say, at 5730 yards, or about three miles: This calculation is for common day light. Now, if we would take our visual powers at the utmost, we must select an opportunity when they are surrounded by obscurity, and the object inspected is surrounded by light, or is itself luminous; for instance, a light of one inch diameter is discernible by night at above ten times the distance, at which by day we could discern a foot diameter, consequently, vastly beyond its daylight vanishing station, which is little more than four hundred yards.

These principles elucidate the first part of the science of Perspective; which accounts for the diminution of objects: The cause of this, we have observed, is, the perpetual decrease of the angle under which they are seen, correspondent to the increase of their distance; the reason of this decrease, we have remarked, arises from the structure of the eye; and thus we have liberated the science from much of that universality with which some have incumbered it; by proving, that the primary principles and powers from which it originates, and by which it is directed (*i. e.* those of sight) are by no means to be considered as unlimited, or universal.

This

This will be further apparent, if we reflect, that we are much more sensible of the variations which take place in an object at a small distance from us, than of those which may happen in one considerably removed: thus in the *first* hundred yards of distance of an object of one foot in dimensions, we distinctly perceive its diminution; but, if it was advanced from its vanishing station toward us, *two* hundred yards, or even much more, we should not trouble the eye to inspect it. I infer, from this remark, that to apply the rules of Perspective to remote subjects is nugatory, even on theoretic principles, as already stated; and if we proceed to consider the actual space of vision admitted by the pupil into the eye, we shall greatly confirm this remark. It is true, *omniscient* Providence has contrived that a certain sensation of vision should be felt by us, even from objects whose lateral situations are almost parallel to the eye; but, this is uncertain, confused, and indistinct: it serves indeed to direct us, to warn us of danger, and for many other important purposes; but it is too vague, and embarrassed, to afford just ground for principles, much less for application of principles to practice.

I apprehend, that, in direct vision, when we attentively inspect what is before us, we cannot be said to see on many degrees *sideways* from the horizontal, or strait, line, immediately issuing from, or passing up to, the center of the pupil. I deny not that we may discern, but I think that discernment is imperfect; consequently, that the very object which centrically opposes our sight, is most distinctly

distinctly seen by us ; those on each side of it, are somewhat less seen (though perhaps to calculate the difference might be difficult): those on each side of them, still less ; and so on, lessening in accuracy as the distance increases, till those remote from the center are disordered, and indeterminate.

If this be fact, of what use are perspective representations which extend to many degrees on each side of the center ? is it not rather embarrassing the spectator to offer such ? especially, when we well know, that by choosing a proper distance, we reduce the whole to comprehensibility. Who that designed to view St. Paul's Church, for instance, or any similar object of great magnitude, would advance close up to the pillars of the frontispiece ? on the contrary, he would walk from the object, I say, from the church, till he had acquired a station properly distant from whence the eye might include the whole ; within a few degrees of its central line of vision.

Thus, then, we have confined the truth of vision (consequently the truth and the art of Perspective) first of all, to the centre, and to a certain extent around it ; secondly, to that distance from the spectator (looking forwards), at which it is worth while to apply the rules of vision : *i. e.* to the space more immediately adjacent to him, and to a small field of view, which he more accurately inspects. The rules of vision are useless, applied by compasses to distant mountains, to the parts of buildings very far off, or where no objects offer a gradation : A plain sky, a plain sea, are no subjects for Perspective : but, where the eye can most closely inspect,

in forms to which it is most accustomed, under circumstances to which it is most familiar, and with which it is best acquainted, there it is most easily deceived, and most effectually delighted by the deception.

It appears desirable, that the effect we wish to produce, should be well understood by us before we proceed to the means of producing it; and since in other respects Nature is the original, the model, the guide of Art, I see no reason why, on the subject of Perspective, Geometry should be permitted precedence; since her efforts ought to be directed, not to the surpassing, but to the imitation of the universal mistress, and regulatrix.

We now therefore, recall our consideration to the source of Perspective appearances,—the construction and natural powers of the human eye. We have already proved (I hope distinctly and clearly) that the diminution of objects is caused by the smallness of the angle under which they are seen, and this is one reason why distance renders them invisible to us. Another cause equally powerful, though of a different nature, is, the various quality, and force, of the rays of light emitted by, or reflected from, objects in various situations, and at different distances.

It is evident, that an object near the eye, which, consequently, occupies a great proportion of the rays received by the pupil, will possess a large space on the retina; and the rays of light reflected from it (*short* as it were) having passed through a less distance from the object to the eye, they will enter the eye in full force and vigour; whereas by the removal of this object to a station further off, not only the quan-

tity of its rays is diminished, but also their lustre and vivacity; they become feeble, and dim. This is natural to its distant situation, considered simply in itself, and if we advert to the superior advantages possessed by other objects remaining near the eye, we find, not only that they occupy on the retina much of the space heretofore occupied by the former, but also, by the vivacity and strength of the images they raise, they *outshine*, so to term it, their distant friend; unless, indeed, as in the obscurity of night, the nearer objects are dark, while the remote are strongly enlightened.

I proceed now from natural causes, to those which are adventitious; the principal of these is, the rarity, or the density, of that medium through which objects are seen. To prove these effects demonstrably, I have only to request your recollection, that in the late foggy weather you could see, scarcely further than you could feel; or, if the eye had strength enough to discern objects immediately around it, those at a little distance, were involved in uncertainty. The objects were in their places; in full proportion; and your visual powers in vigour; but the gross medium prevented their usual perception. This is an extreme instance of what is perpetually occurring around us, in a lower degree.

The air is a very subtle and transparent fluid, and in a small space, or distance, has no perceivable effect in discolouring objects; but in objects very remote, we discover its power. A mountain at hand, is green; or brown, the same mountain seen from afar, is blue; from hill to hill may be clear, while the lower grounds (as affording most vapour) are confused; the upper

part of the steeple of a great church, may be distinct, while the body of the same church, is scarcely visible. This one great cause, branches out into numberless variations, producing effects corresponding to the seasons, and the weather; to climates, and to regions. A certain English traveller in Spain tells us, (and the case is the same in other warm countries, in very clear weather) that the outlines of distant hills, trees, &c. are defined with surprizing accuracy, and sharpness: elsewhere, this effect is reversed, and the outlines of distant objects are mellowed, softened, and rendered indeterminate.

Such are the natural principles of Perspective, the diminution of objects, and the weakening of their power on the eye, by distance: these are so obvious as to be undeniable, yet are they so powerful as to controul the whole of Perspective: if beside this the obliquity, declination, or bearing of objects, their contours, and their forms be understood, the science should appear to be complete. This latter article will speedily engage our attention, for having thus, briefly, noticed the leading principles of natural Perspective, I proceed to offer a few hints in explanation of that foundation on which we mean to erect the ART OF PERSPECTIVE: we have already disclaimed the universality of the powers, or of the application of this Art: I hope, therefore, that by taking up our ideas with modesty, and moderation, we shall attain greater accuracy, and certitude, in what we attempt.

The seat of Perspective is the Eye; one eye if you please; for it is undeniable, that by opening, or shutting, either eye, the position, and general appearance of an

object is changed: therefore, we regard only one eye in this business, and that eye we consider as a point. A word more on this subject:—At a certain distance, the rays from each eye coincide, and unite, so as to answer the purpose of one eye, by transmitting to the mind one image only of the object inspected; this remark will hereafter appear of importance; since, whoever places himself to view a picture nearer than this distance, contravenes the design of the Artist, whose calculation is intimately connected with this circumstance.

As it would be perplexing to treat on points, or small objects, when extensive, and larger objects, are more distinct, I submit the following principles to consideration.

A plane is a surface; a mere ideal extended superficies, having no thickness: this sheet of card paper, is therefore almost a plane, but not quite; as having some substance. This drawing-board is almost a plane, but, for the same reason not altogether; however, it may serve to elucidate the nature of planes; excepting, that as planes are mere geometrical ideas, they may be supposed in any direction whatever; or any number of them may cross each other at all points with facility; a facility to which mahogany has no pretensions. Permit me however to call it a plane. Now for its application:

The direct central beam of the eye, whether we consider it as a ray of light, issuing from the eye, or entering into the eye, is, in either case, (naturally) diametrically opposed to the horizon; in other words, the horizon is the height of the eye; I speak of a  
fair

fair equable horizon. The course of rays shot from the eye, to the various parts of this horizon, is a level, a plane of rays. A fan spread open may illustrate this idea; the handle may denote the eye of a spectator; the circumference of the edge of the mount may represent the horizon, and the sticks are a level or plane of rays issuing from the eye to the circumference: or they may be regarded as rays issuing from the horizon, and terminating in the pin or pivot, the center of the handle: this statement is perhaps most conformable to Nature; but for purposes of Art, either supposition may be adopted by way of explanation.

As I wish to render this part of our subject clear and familiar, I shall remind you of what we all have observed, occasionally, I might say constantly. In entering a house, at the level of the street, we suppose right before us is a flight of stairs: observe these stairs; of some, *i. e.* of the lower ones, we see the whole tread of the stair; of others, higher up in the flight, we see little or nothing of the tread; of others, higher still, we see no part of the tread; but, if the front of the stair was away, we should see *under* the tread of the stair. Now each of these stairs may be taken to represent a plane; but it is evident, that only one of them can be the true horizontal plane. If we proceed up this stair-case, we observe other planes presenting themselves to our view, and each of them in our progress, answering to the horizontal plane: our eye has traced this—up the stairs—to the floor of the landing place—to other stairs, still higher—and so on. In this manner would the horizontal line correspond to the height of our eye, were we to ascend to the very top  
of

of St. Paul's Church ; where, by means of this correspondence, we should enjoy a more extensive prospect. The same effect, *inverted*, would follow our descent : we should first lose sight of what was lately our horizontal plane, and all things lying on it, would disappear ; the same effect would attend that which in succession became our horizontal plane, till we came to the level of the ground itself ; and the ground itself would also yield to this principle, if we had occasion to descend still lower, as into a kitchen, into a well, into a deep pit, or into a coal mine.

Again, the ground whereon a spectator stands, is a natural plane : now if we suppose a spectator to remain fixed, while all the space from before him to the horizon, is gently raised up vertically, when it has risen to the level of his eye, he will not be able any longer to discover objects situated upon it ; they are precluded from his sight, and, together with the ground plane itself, they form a mere line ; or they vanish : it follows, that the line formed by the horizon, is the vanishing line to the ground plane. Or, change the supposition, and imagine the ground to maintain its stability, while a spectator descends ; as he goes lower, and lower, the distance between the horizon and the ground diminishes, till at length these two planes appear to him to unite. But there is no need for imagining such high ascents, or such deep descents ; an instance at hand may assist in demonstrating this principle.

On this drawing board, we see *now* from end to end ; but as I elevate it (yet keeping it horizontal), when it is equal in height to the eye, we discern not  
any

any part of it, but its edge. Now, observe, that if the ground plane, were it produced, would vanish into the horizontal line, all lesser planes lying, being, and situate, (as the lawyers say) on this ground plane, or rather forming parts of this ground plane, would vanish into the same line. But, although not thus produced, yet the ground plane (and consequently all planes upon it) have a perpetual tendency, and inclination, toward the said horizontal line, till at length they unite with it, and in appearance become a part of it.

If a plane lying on the ground follow the direction of that ground, *i. e.* if it lie straight before the spectator, the point to which the sides of a portion of it cut *direct* will tend, is, that which is struck by the center beam, or ray, of the spectator's eye; it is; I say, the center of the horizontal line. But if this portion of a plane lying on the ground, be situate in an oblique direction with respect to the spectator, then that point on the horizontal line to which it apparently tends (*i. e.* its vanishing point) will be removed on that line, from the center, to one side of it, according to its obliquity. *e. gr.* If it is ten degrees oblique from the eye, its point of tendency will be ten degrees distant from the center, and so on.

As an example, I have, you see, laid this portion of a plane of card paper, obliquely on this plane of mahogany, (which represents the ground plane immediately before the spectator) but as the directions of the sides of these two portions or planes do not agree, it is certain the lines they form, if prolonged, would never arrive at the same point in the horizon; but, according to the variation of the card paper, from the  
true

true point of the drawing-board, so will its vanishing point be removed on the horizontal line. But, please to observe, that while it remains on the drawing-board, it may wish in vain for any other line on which to vanish; the original plane has the absolute power of directing it in this respect.

Thus, have we illustrated the nature of planes, of the horizontal line, and of its center, of the ground plane, and of vanishing lines and points. What has been said, has related only to planes, in a horizontal position,—What must we do with vertical planes? The same principles answer this question. Instead of supposing that, from the center beam, or ray, of a spectator's eye, a line is extended laterally, which, in consequence, forms the horizon; we must suppose a line to be extended *perpendicularly*, above, and below, the center; then is its office with respect to vertical planes, the same as that of the horizontal line with respect to horizontal planes. I move this drawing-board (holding it vertically) along the edge of the table; when it arrives at the direct beam of the eye, it becomes in unity with the said central vertical line; consequently it appears a mere plane, or, it vanishes. And this portion of a card-paper plane, is, you see, directed by that to which it is affixed, so that although it will not vanish in the same point as the drawing-board (which now represents a portion of a vertical plane at the same elevation as the spectator's eye), yet it will vanish on the same line, in a point correspondent to its obliquity in respect to its original plane.

As to vertical planes parallel to the spectator, I scarcely think them objects of explanation, after what  
has

has been said; the only perspective of which they are capable, being a diminution as they recede from the spectator: but if we suppose any objects portrayed upon them, these will preserve their regular stations; not only the perpendicular lines continue perpendicular, but the horizontal lines continue horizontal; and thus, a square, which in either of the planes we have treated of would become oblong, (I mean shorter on two sides than on the other two); or a circle, which would become elliptical, in a parallel vertical plane retain their forms;—a square though diminished continues to be a square, and a circle continues to be a circle.

Neither shall we at present, regard planes oblique to the horizontal, or to the vertical line, since such are also of a construction similar to those already described; and since in our future progress they may be attended to with advantage. Enough has been said for the present;—I am not addressing an auditory in academical trencher-caps, bonnets, and bands, but (a considerable part of it at least) in gauze caps, bonnets, and ribbons; who, I conceive, engage in these studies not intensely, though heartily; not as the business of life, but as a most agreeable relaxation, uniting pleasure with improvement; and, therefore, refer the subjects already treated to candid consideration. For similar reasons I have avoided all mathematical terms and expressions, that I possibly could, and have endeavoured to familiarize the whole: if I have succeeded according to my desire, we have suffered little loss in the absence of abstruse terms, and hard names; and have had little reason to regret the pompous into-

nations of AXIOM, THEOREM, COROLLARY, or, Q. E. D.

In looking down the regular and strait streets as we pass along this great city, we may observe, and appropriate to what has been our subject, the planes around us: the pavement is undeniably the ground plane; in that part of another street which crosses the end of the street down which we look, is the center of the horizontal line: the fronts of the houses on each side of the street, form vertical planes; and as the ground plane, by its continual apparent rising, seems to seek a union with the horizontal line, so these vertical planes, by appearing to approach closer and closer, as their distance from the eye increases, appear perpetually to seek a union with the vertical line, and especially with the center, or direct beam of vision which regulates the whole.

I conceive the whole science, and secret, of Perspective is now opened; whatever variations may happen, or indeed can be contrived, may be reduced ultimately to these principles: I shall therefore detain you but little longer, on this part of the subject, while I notice what, perhaps, may to some person or other, and at some time or other, prove of service, if not of importance.

From the nature of the visual rays, I infer, that the misfortune of a cast in the eye, arises from the obliquity, and declination, of the center beam of one eye caused by the unequal strength of the eyes, whereby one shoots, as it were, its beams well, the other with infirmity; now as this is regulated very much by the

situation of the nose, a gradual addition of some thin substance to that side of the nose next to the affected eye, would, I am persuaded, in time, direct the center beam of that eye, from its false, to its true, direction.

To support what has been said on the nature of the angle under which objects are viewed, I appeal to all magnifying glasses, which act by extending the angle, and which may be considered as an eye in advance; and as counteracting that diminution of objects which is the basis of perspective.

I shall remark further, that if the bodily powers of man in some instances are exceeded by those of creatures of inferior rank in the creation, yet his mental abilities make him ample amends: of this, the subject of sight is a direct proof: since, however confined by nature, art has extended its powers immensely "beyond this visible diurnal sphere." Not only are the splendid luminaries from whence we derive light and heat, inspected by us, but other systems are explored, and other suns examined. Perspective has its uses too in the business, such at least was the opinion of that great philosopher HUYGENS, who, wishing to calculate the dimensions of a remote star, could only attain his object by *reversing* his telescope, and thereby reducing the sun to similar dimensions, as if placed at a similar distance: very justly, therefore may it be said, that this science is not confined to this terrestrial ball; its principles extend into ether itself, and its laws regulate the splendors of the celestial luminaries.

But with regard to ourselves, LADIES and GENTLEMEN, we are attending to perspective as to the prin-

ciples of one of our faculties; and indeed, it seems to me so intimately connected with our natural faculties, and capacities, (those highly proper objects of our study) that I am sorry, when I meet with any person, who, though possessing the gift of sight, is ignorant of the principles of a science so very important, and invaluable.

OBSERVATIONS.

## OBSERVATIONS,

*Relating to the Examples given in the Plates, and which belong to the foregoing Discourse.*

**A**LTHOUGH geometry must not be permitted precedence of some of the general principles of perspective, yet is an acquaintance with certain of its problems very useful to the student; principally for the following reasons (1) because, being formed by the compasses and ruler, they are mathematically exact; and therefore (2) They discover at a glance the difference between the same figure in geometrical proportion, and when seen in perspective: as for instance, a square, or a circle, is determinately different in its form and appearance. We shall therefore attend somewhat to the simple elementary figures of this science, and to the readiest methods of forming them, previous to rendering them in perspective.

These examples are also of use in reference to the study of architecture; since the forms of the parts of buildings, and their ornaments, are composed of figures, which the principles of geometry treat with the greatest readiness and correctness. In fact, neither architecture, nor sculpture, can exist unaided by geometry; and all imitations of those arts, by painting, &c. must be regulated by the same principles.

## P L A T E I.

No. I. Two lines not parallel, produced till they meet, will form an *angle*: thus A and B are united at C, and form the angle ACB. N. B. An angle being generally denoted by three letters, the middle one should always represent the angular point.

An angle is divided by setting one foot of the compasses on the angular point C, and striking the arch DE: then from D and E, sweeping EF, and DF; whose intersection divides the original angle, by a line drawn to C.

No. II. When a line stands erect on another line, it forms a *right angle*, as BAD: when it exceeds a right angle it becomes *obtuse*, as BAC: when less than a right angle, it is termed *acute*, as BAE.

No. III. To divide a right line into two equal parts; set one foot of the compasses on the point A, and sweep an arch above and below the line; then sweep a similar arch from the point B: their intersections united by a line, will mark the exact division, as C.

No. IV. To raise a perpendicular from a given line: from any point as a center, as C, mark two equal distances A and B: from thence sweep the arches AD, BD, a line uniting their intersection D with the original point C, will be the perpendicular required.

No. V. To let fall a perpendicular from A to a line beneath it: set one foot of the compasses in A, and strike BC: bisect B and C by the sweep BD, CD, (as before in No. I.), the intersection will be perpendicular to A.

No. VI. To raise a perpendicular at the end of a line as A. B: set one foot of the compasses in B, place the other foot any where towards C, then from C as a center, sweep ABD: through A and C, draw a line till it intersects the circle at D, which will be perpendicular to B.

## P L A T E II.

No. I. Between two points, as A and B, to find two other points situated directly between them, so that a line may be drawn from A to B with a short ruler. From the points A and B, make the interfections C and D, then from the points C and D, make the interfections G and H, these two points G and H will be in the continued line A B.

No. II. To draw a right line which shall touch a circle at a given point. Let A, B, C, be the circle in whose circumference the given point is A; from the center D, rule through the point A; a line of sufficient length, as E, to which at A, erect a perpendicular as FG, which prolonged through A to G, is the line required.

No. III. From a given point to draw a right line, which shall just touch a given circle. Let A be the point given, from which a tangent (just-touching line) is to be drawn to the circle DEF: from the center G, draw GA, divide this line into two equal parts at H; from H as a center, describe the semicircle GDA; then a line drawn from A through D, will be the tangent required.

No. IV. To divide a line into any number of equal parts. From one end as A, draw at pleasure AD: from the other end B, draw a line parallel to AD, as BC; from A towards D, and from B towards C, set off a number of spaces, one less than the number desired: then unite the first in AD, with the last in BC, and so on in progression: their interfections with the original line will divide it into the number of parts required.

P L A T E

## P L A T E III.

No. I. A plane surface, terminated by three right lines, is a *triangle*: if the three sides are equal, it is an *equilateral triangle*. To form this figure, from A strike A C, the length of A B; from B, strike B C the same length: their intersection gives the third point C.

No. II. A plane terminated by four equal sides, at equal angles, is a *square*. To form a square: erect A C, which terminate at the same length as A B; rule C D parallel to A B: and B D, parallel to A C.

No. III. To construct a pentagon, first describe the circle A B C, which bisect, by ruling the diameter A C; on the center D erect the perpendicular D B; divide the semidiameter D C in E, which rule to B, and carry the interval E B to F: the distance B F, is one fifth part of the circle A B C. Any side of this pentagon bisected, gives the proportion for a decagon, as *a*.

No. IV. To construct a hexagon, or figure of six sides: first describe the circle A B E D C F, which bisect by ruling the diameter F E: from the points F and E, with the same opening of the compasses as was used in striking the circle, strike the intervals A C and B D, which will give the points for constructing the figure. Any side of a hexagon bisected, gives the proportions of a dodecagon, as *a*.

No. V. To construct a heptagon, or figure of seven sides: first describe the circle A B, which bisect in its diameter, as A B: with the interval of its diameter form the equilateral triangle A B C; then from one of its angles as B, rule the right line B 7 of sufficient length; upon which set off the number of sides (as 7) of which the figure desired is to consist: rule 7 A, then take two of these parts, as 7 5, and from the point 5 carry 5 D parallel to 7 A, striking the diameter of the circle in C D; then from C, the higher angle of the triangle A B C, rule C D, which striking the circle in E, will give A E for one seventh part of its circumference: carry this interval round the circle to complete the figure.

N. B. This method is general, for a polygon of any number of sides: but, it is to be observed, that many polygons, which are near enough for practice, will not stand the test of mathematical exactness.

## P L A T E IV.

No. I. To describe a circle within a triangle: Bisection the angle  $BAC$  and  $CAB$ , by the method shewn in Plate I. No. I. The intersection of these lines in the middle of the triangle, gives the center, as  $D$ ; from which a circle may be drawn, touching the triangle on its internal sides. By opening the compasses from  $D$  to  $A, B$ , or  $C$ , we may inscribe a circle around the triangle, touching its extreme angles,  $ABC$ .

No. II. To describe a square within a square. Of the square  $A, B, C, D$ , unite the opposite angles,  $AC$  and  $BD$ ; bisection these, as  $AD$  in  $E$ ; draw  $EF$  and  $HG$  parallel to  $AC$ :  $EH$ , and  $FG$  parallel to  $BD$ , to complete the figure.

It is evident, that to inscribe a circle within the square  $ABCD$ , the opening of the compasses from the central intersection  $O$  to  $E$ , gives the diameter; as the opening from  $O$  to  $A$ , to  $B, C$ , or  $D$ , gives the diameter of a circle around the original square.

No. III. To inscribe a circle through any three given points, as  $ABC$ : unite them by lines drawn to each, bisection the lines thus drawn, by perpendiculars, whose intersection denotes the center  $D$ , from which a circle may be drawn through  $ABC$ .

No. IV. To find the center of a circle: rule at pleasure a line touching at each end the circumference, as  $AB$ ; on  $AB$  erect a perpendicular as  $C$ , then bisection so much of  $C$  as is contained in the circle, which will give the center  $D$ .

No. V. The readiest way to form an oval, is by striking two small circles, (one at each end of a right line, as  $ab$ ,) their intersections denote the centers from whence to strike the opposite sides to complete the figure: thus, from  $c$ , with the interval  $cA$ , strike  $AB$ , and from  $d$  strike  $DC$ .

## P L A T E V.

No. I. Another method of forming a heptagon, or figure of seven sides. Having described the circle  $ABC$ ; with the interval  $EB$ , the semidiameter of the circle, strike a semicircle, as from  $A$  to  $C$ , unite  $E$  and  $B$ , which bisection the line  $AC$  at  $D$ , the interval  $AD$  or  $DC$ , will be nearly one seventh part of the circumference: near enough for practice.

No. II. To describe an enneagon, or figure of nine sides. Beside the general method which serves for polygons of any number of sides already given, we shall add another way of forming a nine-sided figure. First describe the circle  $ABC$ , then with the same opening of the compasses, describe the arc  $AC$  as from  $B$ , unite  $A$  and  $C$ , also  $BD$ ; from  $C$  describe an arc, as  $EF$ , and from  $E$ , describe an arc to cut it at  $F$ ; rule  $DF$  to this intersection, cutting the circle in  $a$ : the interval  $aC$ , carried round the circle, completes the figure.

No. III. To describe an endecagon, or figure of eleven sides. Having struck the circle, draw the semidiameter as  $AB$ , which bisection at  $C$ ; from  $B$ , with the interval  $BC$ , describe the arc  $BD$ ; and from  $C$ , describe  $CD$ , striking the circle in  $E$ ; from  $E$ , with the interval  $ED$ , draw the small semicircle  $a$ ; unite  $C$  and  $a$ , which carry round the circle.

No. IV. To describe a spiral line. There are many kinds of spirals; some of which are of very complex operation; but this kind of spiral is formed by ruling a line across the intended centers, as  $Aa$ : from  $a$  strike the upper semicircle, as  $Ab$ ; then remove the compasses to  $A$ , and strike the lower semicircle, as  $bd$ ; return now the compasses to  $a$ , and strike the upper semicircle  $d$  to  $e$ : continue this process as often as is requisite. If a certain number of lines be required in a given space, mark their divisions on the cross line  $dbc$ .

A scale for lengthening and shortening lines. Supposing the plane superficies  $ABFE$ , had a number of lines inscribed upon it, it is evident, that on the space from  $A$  to  $B$ , the intervals 1, 2, 3, 4, 5, 6, are the shortest which can possibly be formed, &c. By ruling the angular line  $BC$ , these same intervals are lengthened on the line  $BC$ , in proportion to the angle adopted. In ruling  $BD$ , they are still more enlarged; and in ruling  $BE$ , they are most of all enlarged; so that, the interval  $E1$ , is far longer than  $A1$ , and might be transferred to another scale, or to a subject for practice, as wanted. By the same manner *inversely*, if  $BE$  was the length of the original line, a line set at the angle  $EBA$ , would receive the intervals; and would shorten them proportionately.

## P L A T E VI.

To draw a line or lines, to a point given, which point is situated beyond the limits of the paper.

As it sometimes happens, that a point to which it is required to draw lines, may be at some considerable distance from the subject with which those lines are connected, a ready way to draw lines to such a distant point is very useful.

No. I. Let AB and CD, be lines already drawn to P, which is a fixed point, it is required to draw from E, which lies between A and C, a line which also shall tend to P. Draw AC, at pleasure, through the point E, then at some distance, draw BD, parallel to AC: rule the diagonal AD; draw EE, parallel to CD, and FG parallel to AB; unite E and G by a line, which if continued, would strike the point P.

If the point from which it is required to draw the line, does not lie *between* two lines, but *beyond* them, as *a*, rule *aA*, and at a proper distance, rule *bB*; draw the diagonal *ADd*, then rule *ad*, parallel to CD, till it strike the diagonal in *d*; from *d* rule backwards *db*, parallel to AB; then will *b* be a point, through which a line drawn from *a*, will tend to P.

By turning the paper, this point *a*, instead of being *above* the lines CD, &c. becomes *below* them: the process is the same.

No. II. Another method of producing the same effect. Let AB, and CD, be lines given, tending to P. It is required to draw through the point E, situated between those lines, a line which also shall tend to P: rule at pleasure, two lines through E, as AG and FC: from A, rule through C, a line sufficiently long; and from F, through G, rule another line, meeting the former in *a*; from *a*, draw *aH*, and *aB*, at pleasure; draw the diagonals HD and BI, whose intersection gives K, for a point through which a line drawn from E will tend to P.

No. III. When the point, as *e*, is beyond the lines given. Draw *ea*, and *ef*, at pleasure, cutting the original lines in *c*, *a*, *f* and *g*; draw the diagonals intersecting at *o*; draw also at pleasure *bk*, sufficiently long; at *d* where it cuts *ci*, rule *dh* through *o*; also rule *bi*, through *o*; from *h* draw through *i*, a line sufficiently long; and from *b* through *d*, another line to intersect it; this intersection gives *k*, for a point, through which a line drawn from *e*, will, if continued, pass on to P.—This figure also may be reversed, by turning the paper; but the principles are the same.

## P L A T E VII.

*To measure the Distance of* INACCESSIBLE PLACES.

As occasionally either curiosity or utility excites in us a wish to know the distances of places, when we cannot measure directly to them—besides the amusement which results from this, as a piece of geometry, we present in this plate two subjects for the purpose of ascertaining the distance of a place which is inaccessible.

Fig. 1. Suppose the spectator stationed at A, wished to know the distance of the object B. At some little distance on one side A, as C, erect a small stick; this being secured, retreat to D, observing that C covers the object B, whereby it appears that both are in one right line; here also erect another stick, then on the other side of A, at the same distance from A, as D is, and A also covering D, erect another stick E; then advancing to F, at the same distance from A as C is, place another stick, and continue advancing to such a point (G,) that from thence A appears to cover B, and F appears to cover E: this point, G, is the same distance from A, as A is from B.

Fig. 2. But if it should happen that this process requires more room than can conveniently be engaged, this figure shews the mode of ascertaining the distance in a place of smaller dimensions.

The spectator being stationed at  $a$ , desires to know his distance from  $b$ . On one side of  $a$ , as  $c$ , fix a stick; then advancing beyond  $a$ , toward  $d$ , fix on a spot which is some convenient number of times the length of  $ac$  (as three times) where also erect a stick: then fix on some convenient part of the line between  $db$ , as  $e$ , and divide its distance from  $a$  into three parts (or so many as the line  $ad$  is divided into.) Set off one of these parts at  $f$ , taking care that  $a$  covers  $c$ ; and advancing along the line  $cf$ , toward  $g$ , fix on that point from whence  $a$  covers  $b$ , and  $f$  covers  $e$ , (as  $g$ ;) then measuring from  $g$  to  $a$ , it will be found one-third part of the distance from  $a$  to  $b$ : so that if from  $g$  to  $a$  be 100 yards, from  $a$  to  $b$  is 300 yards.

N. B. If the line  $ad$  was divided into four, or five parts, &c. then the line  $ag$  would be one fourth, or fifth, &c. of the distance  $ab$ .

## P L A T E VIII.

TO ENLARGE, OR TO DIMINISH, AN OBJECT,

*By Means of Squares.*

Divide the outer frame of the original, by any number of squares, at pleasure; always taking care that they be exact: then, into precisely the same number of squares, divide the space allotted to the copy; the interfections of the lines will give so many points of certainty, that the forms of the objects represented may be procured with great correctness.

N. B. For greater accuracy it is best to number, and mark, the squares, that one may not be mistaken for another. By this mode, a large picture may be reduced to the size of a drawing: or a drawing may be transferred to a picture of any size whatever.

## P L A T E IX.

The structure of the eye, is in fact, the source and origin of Perspective, and all appearances of objects are regulated by it, and are conformed to its principles. We have therefore thought it adviseable to explain in some degree, the nature and construction of the human eye.

No. I. This figure represents the eye as a globe inclosed in its membranes, but having an aperture through which the rays of light pass into it: the chief body of this globe is filled with a kind of gelid humour, whose convergent powers are not very strong: but nearer to the orifice whereat the light enters, is a kind of lens, whose convergent powers are considerable, and this is of principal use in producing correct vision.

This figure is meant to shew that the rays of light, which by passing through these humours, produce vision, are directed to opposite parts of the eye from those at which they enter, so that *A* above is depicted on the *retina* (which lines the inner cavity of the eye, and is the immediate seat of vision) in *a* below; *B* at *b*, *C* at *c*; *D* at *d*, and *E* below, at *e* above; only the center *C* retaining its original direction: it follows, that objects are depicted on the *retina* inversely.

No. II. This figure shews also that objects are depicted inversely; at the same time it hints at the nature of that converging power which the humours of the eye possess, whereby the rays of light are directed precisely to reach the *retina*, and neither to exceed the distance of that membrane, nor to fall short of it. The proportion of these powers we shall see in another plate.

No. III. Shews the nature, and causes, of the apparent diminution of objects. We observe, that *AA* occupies on the circle of the retina, a much greater portion (as *aa* on the line *aa*) than *BB* does, which only occupies the space *bb*, cutting off a space on the smaller line *aa*, proportionate to so much of the line *AA*, as is cut off by the line *BB*. On the same principle *CC* is narrower (as *cc*,) than *BB*; and as *CC* occupies but a small portion of the line *AA*, so it occupies but a small portion of the circle of the eye, or of the line *aa*. This is one reason why distant objects appear fainter than those which are at hand: but other reasons are given in the lecture.

No. IV. Is an instance of ocular deception; but in some respects rather artificial, than natural; it represents a vessel containing a piece of money, so placed at the bottom of it, that the eye cannot perceive it, because its beams shoot over it: to render it visible to the eye preserving its station, the vessel is filled with water, the refraction of the rays in the water enables the eye to discover it. Many deceptions of the eye are practised by glasses, &c. in optics; but they do not properly belong to the nature of perspective, though they flow from similar principles.

## P L A T E X.

This example exhibits the nature of a cone of rays, as issuing from an object to the eye of a spectator: if a transparent medium or glass were supposed to be situated between his eye and the object; it is evident that the point where any ray intersected that medium or glass, would represent to the eye a correspondent point of the original object: and if the whole number of rays were thus described on the glass, they would form a picture of the object; corresponding exactly to its dimensions, and figure, and having the same effect to the view of the spectator.

Now this is the very essence of PERSPECTIVE; to compose a picture, drawing, or representation, which, though delineated on canvass, paper, or wood, &c. yet, should convey to the beholder, as clear, accurate, and correct, ideas of the subjects designed, as if they were seen through a glass, or other transparent medium. To accomplish this, we must not trust to the accuracy of the eye, its recollections of the nature of lines, and forms, and their correspondencies to each other, but must by strict analysis, examine the truth of their appearances, and understand the causes, the effects, and the applications of their principles:

## P L A T E XI.

No. I. Is explanatory of the several refractions of the rays of light, in order to their acquiring a true and exact focus.

The outer coat of the eye is termed the *sclerotica*; adjoining is the *choroides*, which is lined by the *retina*.  $Bcd$   $B$ , is the transparent part of the sclerotica, called the *cornea*; between which and  $CC$  (the *crystalline humor*) is placed the *aqueous humor*.  $DD$  the *vitreous humor*, occupying the remaining internal space of the eye.  $N$  the *optic nerve*, inserted laterally, leading to the brain.  $oo$  the pupil.

$A$  is a ray which, striking the eye precisely centrally, needs no refraction in its passage to the bottom of the eye.

$b$ , is a ray, striking the eye in  $d$  (the cornea), whose refractive powers would divert it from the direct course, to a focus beyond the extent of the eye (as  $F1$ ), were no other medium interposed: but, in passing to  $F1$ , it impinges on ( $CC$ ) the crystalline humor; and by this is again converged to a nearer focus ( $F2$ ): but as this is also beyond the limits of the organ, it is, in passing out of  $CC$  into the vitreous humor, again converged, and falls exactly on the nervous expansion of the retina; at a third focus ( $F3$ ); there producing perfect vision.

No. II. It is necessary to premise, that in explaining the following examples, the terms *perpendicular* and *horizontal* have no relation to the natural horizon, but relate solely to the position of lines with respect to each other: thus the line  $IC$  is perpendicular (i. e. at right angles) to the line  $Cb$ . These figures likewise explain many of the terms adopted in treating on perspective.

In this example, the upright plane is supposed transparent, and the eye to be situated at  $I$ ; a line drawn direct from  $I$ , to the plane (or picture) strikes it in  $C$ ; which is therefore the Center. From  $I$  to  $C$  is termed the *distance* of the picture: and is the just distance at which a spectator should survey the picture. The question is, in what part of the picture the eye ( $I$ ) will perceive the point  $A$ ? To determine this, the point  $A$  is united to the bottom (or ground line) of the picture, by a line parallel to  $IC$ ; where it intersects the picture, at the ground line, is termed its *seat* on the picture; the seat on the picture being united by a line to the center  $C$  (i. e. its vanishing point,) it follows, that in some part of this line will be the representation of  $A$ : the exact place is found, by uniting  $I$  and  $A$ , which give the intersection  $a$  for the true situation of  $A$  on the picture to the eye placed at  $I$ .

No. III. Is exactly the same example diversified by a point on each side  $A$ , which worked by the former process, gives for  $1A2$ , the representation  $1a2$ .

## P L A T E XII.

No. I. Instead of the points being placed on each side to form a line, in this example, the line is formed *forward*. The representation is equally found by obtaining its seat on the picture, and uniting it to its vanishing point; then drawing AI, BI, to determine its perspective length, as *ab*.

No. II. Is a curious problem, shewing the imperfection of the art of perspective, geometrically considered. Every thing standing as in No. I. it appears by this figure, that the representation *ab* (of AB) may likewise be the representation of any line in any direction, whose extremes will give the points *ab*. Thus A 1. A 2. or A 3. may equally appear to I, to be AB. This being evident, it may be asked, how then do we determine with respect to the real forms of objects? The reason is partly because by perpetual use the mind acquires the habit of judging, and comparing objects with each other; and partly because the effect of light and shadow decides the matter. This figure may illustrate the supposition of undistinguished slopes in the Desert of Arabia, and seems to confirm the idea.

No. III. Is intended to shew, that when the plane wherein any object is situated is parallel to the picture, the representation of the object will be parallel to the original, and will exactly follow it: as appears by *abcd*, which when beheld by J, corresponds to ABCD.

## P L A T E XIII.

Is a section explanatory of the principles reasoned on in the Lecture. It represents the eye of a spectator at three differently elevated situations, I 1. I 2. I 3. The lines drawn from the various points of the objects to the eye, (I) shew, by the spaces they occupy on the upright line A O, immediately before the eye, in what proportion the eye discerns the parts of such objects.

To I 1, the slope A B appears not much larger than the small space B C : C D is totally unseen by it ; as is great part of D E ; E, F, and G, H, it sees distinctly ; but H K is a mere line, and therefore its extent is not perceivable.

To I 2 many of the parts hardly discernable by I 1, are very distinct ; and it has a view of H K ; but does not see the top of the house, except as a line.

I 3 has yet greater advantages, which appear on inspection.

This example shews what is *possible* in perspective ; not only horizontal, or vertical planes, may be delineated ; but slopes both upward and downward, when surrounded by objects whose directions are different ; and which therefore afford a contrast.

If at any time the student doubts whether a certain part of his design may be seen from the station he has chosen for the eye ; a similar section will decide the case.

## P L A T E    X I V .

After the former example, which has shewn the nature of the horizontal plane, and the variations which occur by reason of different levels of the eye, this example, which proposes to explain the effects arising from different levels of the eye, in reference to vertical planes, will meet with little difficulty in being understood. We have here also supposed three different stations, at which the eye is placed: I 1. I 2. I 3.

I 1 sees the edge of the house A, as a mere line only; but beside having a clear inspection of the interval B D, he sees the side of the church also, as appears by the line C; this he sees in perspective, as appears by the interval C D. D E, he also sees, but not E F.

I 2 beside the view he has of A B, sees also the side of the house (B,) but then he does not see the interval C D, otherwise than as a line; neither does he see the interval E F.

I 3 has a considerable view of the side of the house B, though he cannot see C D; he also sees the side of the church E F, but has not so complete a view of F G, as I 2 has, or, especially as I 1 has.

These examples demonstrate the propriety of paying great attention to the choice of situation, from which objects are beheld: at the same time, they illustrate the nature, the power, and the application of planes.

## LECTURE II.

LADIES AND GENTLEMEN,

NATURE is ever various in her operations and effects; but, that variety, however diffuse, or extended, is, nevertheless, the result of certain general and permanent principles, whose simplicity is accommodated to occasions as they rise, and whose application is always directed by utility, and by convenience.

Art is the imitator of nature, and is never so truly valuable and excellent, as when, like nature, its principles are few, simple, and facile; and their application general, certain, and evident. It will therefore be my endeavour at this opportunity, to introduce to your acquaintance, some of those elements of the PRACTICE OF PERSPECTIVE, whose utility is most extensive. Let us never forget, that our business in treating the natural appearances of objects, is not to surpass, or to vary, but to imitate, them; and those are the most useful methods which to the readiest expedition, unite the happiest certainty.

I wish to suggest, preparatory to our proceeding to practice, that perhaps perspective may be further illustrated, if we consider it under two ideas, first, as DIRECT; secondly, as REFLECTIVE. To explain myself, I beg you to consider, that, when you survey objects,  
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of what nature soever (whether a simple lawn, or an extensive champain) they appear *before* you, if seen by you through a transparent medium, as a glass window; but, if you see them in a mirror, although their general effect is the same as before, and their verifimilitude almost as decisive, yet in some respects they differ. Before, they might be said to be depicted on the window *through* which you saw them; now, they may be said to be depicted on the mirror *in* which you see them: yet as a picture, they have the same forms, the same effects, the same proportions, and the same relations to each other. The slab which is under that looking-glass, demonstrates this matter: in looking at the slab itself (which we term an original object) we observe, that, its front is, and appears to be, nearest to us; whereas, in the glass, it appears farthest off. This lady's fan, which I lay open on the slab, appears in the original subject, to be situated, with the circular edge of the mount furthest from us, and the handle nearest to us; but, in the glass, the mount seems to approach, and the handle to recede; correspondent to this effect, you see the ornamental figures on the mount are inverted. This reflective quality, enables the mirror to exhibit a most perfect picture of surrounding objects; and, when objects thus exhibited are correspondently similar, the eye is hardly induced to acknowledge the deception. This square tea caddy, whose four sides are perfectly uniform, appears almost as tangible in the glass as on the slab; this round ball, is as evidently a round ball

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in the glass, as in my hand; nor would you (were the effect of the light and shade suspended) be sensible of any difference. Since then this reflective perspective (shall I so call it?) is no less exact and determinate than the direct perspective, and since it is abundantly more convenient in practice, for some kinds of subjects, it will hereafter become a principal object of our attention.

To render reflective perspective equally exact as the direct, is no very difficult matter, so far as to answer our purpose: it depends on the introduction, the selection, and the situation of an object; for instance, if we wished the glass to become a representation, or picture, of the fan with the handle furthest from us and the circular mount nearest to us, it is but reversing its original situation, and we obtain our desire: nevertheless, the figures on the mount are not brought into their just situation, but although relieved from their topsy-turvy state, yet continue reversed as to right and left; as also the letters or whatever writing is on the fan.

But our attention is now directed to the necessary preparatives for the practice of perspective: among the first, and most important, is CONSIDERATION, and this is to be applied to several articles. If, as we have already stated, the natural horizon be the height of the eye, it needs little proof that the situation to be adopted for this principal line, is a subject of consideration; this appears yet more strongly, when we reflect, that, if the eye be placed too high, it raises the

the horizontal line proportionately above the just elevation at which we are accustomed to survey objects, and at which others are supposed to view them; it treats us as if we were giants, or were exalted on stilts; and if we lower the horizon, none but dwarfs will thank us. In fact, as nature has proportioned us to the world about us, our best way is to consult that moderation which is most general, and most convenient. Security is in the medium; avoiding extremes.

Moreover, as a piece of perspective is a representation of certain objects from a given station, to which it is most intimately adapted, we should (if it may be done) endeavour to accommodate the principles of a subject to the situation from whence it is most likely to be inspected; since the nearer that situation may be brought to correspond to the original station, the nearer will the effect of the composition approach to verisimilitude: this, therefore, is also to be considered. And, if in a picture intended for a certain place, in any apartment, an artist should omit to observe on which side the light entered, and should, therefore, cast his shadows *toward* the window, and his lights *from* it, I should think he stood in great need of the article to which we are attending, and that, to say no worse, he was a very inconsiderate practitioner.

The infinite variety of cases connected with these remarks, preclude the possibility of rules which may be generally adapted to them: but, on the last article of consideration, which at this time I shall submit to

your

your candour, the Distance for which a picture is constructed, and from which it should be viewed,—some-what like rules, or an advance towards them, may be attained: it is, I say, possible to suggest regulations for the DISTANCE of the picture.

Perspective supposes, that, objects may be situated so close to a spectator, that he cannot see them; and, in fact, our daily practice toward objects of any considerable magnitude, justifies this supposition; since we constantly recede from such objects, to a proper distance at which to view them, as observed on a former occasion. An additional remark may confirm this idea.

I conceive it needs little proof, that the boundary of the space of vision, or of the rays received by the eye, is a circle; for since the orifice of the pupil is circular, it cannot well be otherwise. Now as the two outlines, or boundaries, of the visual rays from the two eyes, at a little distance from the person, have precisely the effect of one only; it appears clearly, that nature never intended any object, whose diameter is too large to be comprised within the space of that circle, should be surveyed closer than that station, which produces the effect of compounding these circles. In fact, the internal humors of the eye are obliged to assume a form different from their usual one, when they wish to accommodate themselves to the inspection of objects introduced within this distance; which, perhaps after all, are usually seen with one eye (the other becoming quiescent), or are at least, best seen with one eye only.

A similar mode of reasoning greatly enforces the importance of this article in relation to subjects not so closely approximated, but of larger dimensions, seen *directly forward*; and, if we advert to subjects seen *laterally*, we shall find, that by a bad distance, the confusion of rays admitted sideways into the eye is very much increased, and what "being remote from the center, is naturally disordered and indeterminate," now becomes insufferable.

Permit me by a familiar example to illustrate this matter. When two persons stand conversing close together, they naturally look at each other about the height of the eye, and, consequently, see very little more of each other than the face; as is evident, from the necessity, if their conversation should happen to have any reference to the foot, for a motion of the head to inspect it: which motion of the head be it remembered, deranges totally the former system of perspective, as it changes entirely the field of view. But, if a person wished to survey another from head to foot, it would require a space between them of at least double the height of the beholder. And the same is true of latitude, as of altitude. It is certain, that if a very precise inspection of every part was desired, this distance is not calculated for that purpose, but, for a general, complete, view of a person's whole figure, this is the least distance at which the angle of vision could receive, and contain, such an object.

To the choice of a judicious distance, which is a principal care of intelligent artists, the following hints may contribute.

If the center of the perspective system adopted in a composition be about the middle of a picture, the distance may be shorter than if it were at either side of the piece; since before objects become sufficiently remote from the center to appear distorted, the picture ends: on the contrary, when the center is near one side of a picture, a longer distance will be most advantageous to objects situated further from it.

I do not see much difficulty in determining, geometrically, the distance requisite, if what I lately offered be just; for, if to survey a person five feet in height twice five feet is a necessary interval, to double the height of the eye in treating smaller subjects, or, by increasing the distance, to suit the apparent dimensions of principal objects in larger pieces, is no great trouble. But; unfortunately, geometry is an unaccommodating kind of science, and very adhesive to principles it has once assumed; therefore I wish to leave the matter rather to judgment, than to geometry.

The general nature of a subject, the particular natures of objects introduced, the situation for which the performance is adapted, the source of its light, and the principal effect of its composition, are all so many varieties, against which there is no providing by rule: a miniature picture, is one thing; a ceiling piece, is another: that which well becomes a church, ill suits a cabinet: that which occupies half a pannel in a parlour, is certainly distinct from a vista deception in a park; and requires no less distinction of management. But, having fixed the height of the eye, and having chosen a distance from whence  
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the objects represented in the picture may be most conveniently seen, we proceed to prepare the picture for practice: by which, I mean nothing more than inscribing upon it those imaginary lines, to whose properties we have already paid some attention. *First*, rule the horizontal line, then, having determined its center, erect there the vertical line; thus we have two lines, whereon all relative planes (*i. e.* horizontal or vertical) will vanish. Moreover, as all horizontal planes will vanish on the horizontal line, we have the proper vanishing point for them in the center; because the vanishing point to any plane (in whatever direction) is that point at which a line drawn from the eye, parallel to that particular plane, strikes the picture.

Observe further, that, these two planes are of necessity *perpendicular* to each other; I say the horizontal plane is perpendicular to the vertical plane, and the vertical plane to that: for as to the situation of this or of any plane, with respect to the natural horizon, let that now be forgot.

We have already observed, that planes are in fact of a similar construction, whatever be their position; and therefore the vertical plane is perfectly correspondent in its construction, and its properties to the horizontal, and differs only by situation, as being erect upon it. The center beam, or ray, from the eye, is parallel likewise to the vertical plane, and gives the central point of this plane for its vanishing point: *i. e.* where the horizontal and the vertical planes intersect each

other. To demonstrate this, take any perspective example, turn it, till the vertical plane becomes the horizontal plane, and you will see, evidently, that it is governed by the same center, and conducted by the same principles.

Thus far, I hope our principles are clear, and luminous; referring to the examples for certain instances of their application, I shall now offer a few remarks relative to the introduction, and the appearance, of objects represented in perspective.

I think it most familiar to my auditory, to revert to the mirror, to illustrate this particular, as the reversion of objects will hereafter appear to be of no real detriment, or consequence: in fact, whenever geometrical plans of original objects are used (and on many occasions they are to a learner very convenient), their perspective representations become reverse; but such plans are not always necessary, as, by the given dimensions of objects, a master will generally ascertain their representations.—To proceed,

That upright looking-glass represents an upright picture; the slab before it, the ground; where the bottom of the glass touches the slab, is, of course, the ground line. I lay on the slab, this square board, close along the bottom of the glass, which, on looking into the glass, I see thus: the slab, and the board are *parallel* to the ray shot from the eye to the center, (or received by the eye into its center,) which ray is *perpendicular* to the glass. Now, as the center is the natural vanishing point of all lines perpendicular to the

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the picture, the two perpendicular sides of the board apparently tend to that point: *i. e.* the center; the nearest part of the plane to the eye: the other two sides of the square being parallel to the picture (the glass in this experiment) suffer no change of form from any perspective connected with them, except an apparent diminution of magnitude, as they recede: the most distant being the smallest. By the by, this want of perspective in the parallel sides of a square, obliges us to seek for some line which may have a determinate, and exact, relation to a square, and also to the horizon; this we obtain, by means of the diagonals, whose angular declination from the sides being 45 degrees, gives 45 degrees from the center, on the horizontal line, for their vanishing point; as is illustrated in the examples.

But, my chief design in this experiment is to shew, that the effects we have been noticing arise from the *parallelism* of the visual rays and the ground plane. Now, in design, we cannot cause a variety of planes, and of lines, to *project* perpendicular from a picture; we therefore transpose their places, and imagine the eye and its system of rays turned upward, and the slab, &c. (*i. e.* all before the ground line of a picture) turned downward; and this restores the parallelism, and produces the same effects; so that now a single sheet of paper contains the whole process.

Right lines, having a regular, and determinate perspective tendency, are easily put into perspective representation; and angular figures, being composed of  
right

right lines, have little difficulty; since we have accurate *data* to conduct us: but, circular, or curved, lines offer no such data, and therefore oblige us to call in assistance from our worthy friends, whose tendency is regular and determinate.

A circle, is a figure so complete and perfect in itself, that it eludes every attempt to discover to what point in perspective any part of its line has any peculiar relation: any relation of which we may take advantage: the readiest way therefore to obtain the representation of a circle, is, by inscribing it in a square of equal diameter, and, taking advantage of those points wherein the two figures correspond; hereby we obtain a sketch, or skeleton, of the circle; which is capable of more, or less, accuracy, according to the divisions, and sub-divisions, of the original square. Eight points are generally thought sufficient in practice; but more may easily be obtained, if the square be large enough to render them necessary.

Nor on this occasion only is a square of great utility; a little consideration will find it a very consequential figure; as well, because its form is perpetually occurring, (as is likewise a circle) as because any other figure inscribed within it, by properly subdividing the square, may be represented with little trouble.

Having said a square, and a circle, are figures perpetually occurring, give me leave to authenticate my position. If we examine objects in the street;—the fronts of houses are square, their windows square, their  
doors

doors square;—churches the same; or at least, squares combined with circles: their domes are circular, as are all arches, and so on. The internal parts of our dwellings are equally composed of squares;—apartments, and their furniture, tables, chairs, &c. mostly squares: not only so, but many of our domestic squares generate circles, as for instance, all which turn upon hinges; the hinge becomes a center, while the door itself in opening describes a circle on the floor: not only architectural columns are compositions of circles, but so are many other objects which might be named, even to tea-cups and saucers.

By a kind of analysis similar to this, we reduce a piece of perspective to its first principles. Buildings, may be considered as right lines, or as composed of right lines, crossed by other right lines at certain angles, and describing solids, or apparent solids, either elevated on, or adjoining to, each other; and, extremes of lines are mere points.

By an inverse process we compose the whole; first, we find the perspective situation of one point, then of another beyond it; these united make a line: in the same manner other lines are made; which attached to the former, by degrees become a solid: solids raised on each other, or adjoining to each other, compose buildings; whose extent, how large soever, is merely an addition of solids to solids, and parts to parts, so related, that, having adjusted one part truly, the others are easily determined.

The almost irresistible effect of regularity may be very justly inferred from hence; and not less justly,  
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the necessity of a careful beginning, and an orderly progression. Perspective, in this respect, is an emblem of life; how many persons have proceeded from a point to a line, and from lines to a superstructure, whose termination they did not foresee, when the first line was suggested, or the first point conceded.

Since I have thus introduced analysis, I shall request your attention, LADIES and GENTLEMEN, to a few additional remarks. The perspective, I have the honour to introduce to you, is founded on the doctrine of planes; and planes are in effect more universal than superficial observation may imagine. We have already said, they appear around us in the street, and so they do in the parlour; the sides of a room are planes, as well as the ceiling, and the floor. What is this table but a plane? its face is a horizontal plane; as I let down a flap, that flap becomes an inclined plane; a door is an inclined vertical plane when partly open, though not distinguished when shut; a chair becomes an inclined plane when falling; and if we go out of the room, the stairs are inclined planes, and so are ceilings above them; so are roofs of houses, and so are all inequalities of hills and dales in the most extensive prospect.

These principles will be more largely explained in the examples; which I beg you not to pass over slightly, but to delineate with care. It has been my endeavour so to select, and arrange them, that each naturally leads to its successor; and that they might

compose a connected chain of precepts, in which a student may proceed gradually,

Thought following thought, and step by step led on—

I shall just hint, that it is not always necessary to have, on a drawing, every line to every point, at once; but, after those relating to one object have been drawn with the pencil, and the requisite parts inked in, the pencil lines may be dismissed. In some cases it is scarcely necessary to draw lines at all, but, by laying the edge of a ruler from point to point, so much of that line may be taken as occasion requires.

Nor would I advise my friends to draw by the regular process of perspective, every minute particular in a composition, every ornament of a moulding, or every inequality of surface: the principal lines and spaces, if justly inserted, will regulate the inferior; and trifling objects are not worth the time, and the trouble, they waste. Be it always remembered, that the utility of perspective is to deceive the eye of a spectator; and surely an eye and a hand accustomed to inspect, and to operate, by judicious principles, whose intelligence arises from systematic knowledge, will be very adequate to such deception; always supposing, that the objects in question have been well understood, and that practice has imparted a facility in their delineation; and indeed, I may justly assert, that many objects are with more ease and readiness delineated from their originals, by an accurate hand, than by the rules of perspective; of which the capitals of

columns, especially of enriched, *e. gr.* of Corinthian columns, are decisive, but by no means singular instances.

As in the study of music, notwithstanding an instrument may be very accurately constructed, and very nicely toned, to excel in playing on it requires a good natural ear, improved by attention, and practice; so in the arts of design, of which perspective is a principal part, be the rules ever so judicious, clear, demonstrable, and extensive, yet to execute any composition happily, and gracefully, requires the guidance of an eye accustomed to observation and remark, exercised in effects of natural objects, sensible of their most beautiful combinations, and disposed, and ready, to imitate them: thus accomplished, it may justly hope, not only to apply with facility the principles of science and taste, but,

“ To snatch a grace BEYOND THE RULES OF ART.”

I have thrown out these hints, because I earnestly wish to divest this study of every incumbrance by which it has long been held, as it were, in thralldom; entangled by operose diagrams, and infinite radii of lines; whose perplexities contribute to render that difficult and complex, which is, and which ought to be, represented as simple and clear. I rather desire to disentangle, and to explain, difficulties, where difficulties must in some sense, be expected, in which undertaking I have to request your candour, and, if success crown my endeavours, I have to expect your applause.

OBSER-

## OBSERVATIONS

*On the Plates belonging to LECTURE II.*

**I**N the following plates, it has been endeavoured to preserve an uniformity of references and marks, in order to inform the student, at first sight, which are the principal lines, and points, made use of in their construction. Thus, *I*, means the place of the natural *EYE*, which is *transposed* according to the principles explained in the *Lecture*, page 57. *HL* is used to mark the *HORIZONTAL LINE*, *C* denotes the *CENTER*, or direct ray from the eye to the picture, and the bottom of each example is the ground line.

It is further to be noticed, that the *DISTANCE* is throughout these examples, generally, too short, for objects situated *laterally*, in order to avoid the multiplication of plates; for the same reason, the examples are drawn on the horizontal plane, but it will be very advantageous to the student to turn them, and to accustom himself to view, and to delineate, them, in various positions, as their construction is precisely the same in all. By this method every example becomes as useful, as two, or three.

It is obvious to remark, that, all figures put into perspective by means of geometrical plans are *reverse* from their originals: this reversion is easily accommodated to truth, by changing the position of the plan, by which means all confusion is avoided. Perspective plans may be formed without the geometrical figure, by given measures, and angles.

## P L A T E X V.

## LINES IN PERSPECTIVE.

No. I. This example shews the method of putting into perspective a RIGHT LINE, as  $AB$ ; or part of a right line, as  $A1$ ; or a simple point, as  $A$ . Having placed ( $HL$ ) the horizontal line, and determined the center ( $C$ ) and the distance ( $CI$ )  $I$  is the transposed place of the natural Eye. If  $A$  be considered as a point, unite it to the ground line, by a right line in any direction at pleasure (as at  $B$ ); rule from  $I$ , a line, parallel to this line, towards  $HL$  (as near  $L$ ); then, the point where it strikes  $HL$ , is the vanishing point to  $AB$ : unite  $B$  to this point by a line, in some part of which line will the representation of  $A$  be found. To ascertain its exact place on this line, unite  $A$  to  $I$ , the intersection of the two lines marks the spot as at  $a$ . It is evident, that the representation of the line  $A1$  may be determined, by treating the point  $I$  as we have already treated the point  $A$ ; which will give its seat on the line  $BL$  at  $2$ . The representation of the whole line  $AB$ , which is  $B, 2, a$ , is equally readily found, as appears by the figure.

The direction of the original line, drawn from the point  $A$ , to the ground line, is of no consequence, or effect; in every direction its parallel from  $I$  must be drawn to  $HL$ .

No. II. Is a variation from the former example, by supposing the original line to be *perpendicular* to the picture. The principal systematic lines are as before. In this case, as the line  $AB$ , or the line  $DE$ , would naturally vanish in  $C$  (which is its parallel), we are concerned only to determine its length; this is obtained, in  $AB$ , by uniting  $A$  and  $I$ , the intersection gives  $Ba$  for the length of  $BA$ : but, as  $DE$ , if united to  $I$ , yet continues a mere line, we must find other lines by whose assistance to cut off its proportion: unite  $E$  to the ground line, by a line in any direction, as  $c$ ; and by a parallel line unite  $D$  as  $d$ ; then, by a parallel from  $I$  to  $HL$  we obtain a point, to which, when the intersections  $e$  and  $d$  on the ground line, are united, they give  $fg$  for the representation of  $DE$  the original line.

## P L A T E XVI.

No. I. A SQUARE is a figure composed of four sides; two perpendicular to the other two: if a square be situated with two sides parallel to the picture, it is evident the two other sides will be perpendicular to that picture: these may be considered as two lines, placed as in the foregoing example, which naturally vanish in C, to which therefore unite them: to determine their lengths as seen in perspective, rule a diagonal line from the opposite corners of the original square, which line unite to the ground line; rule its parallel from I to H L, and unite its seat on the ground line to that point in H L so procured; its intersections, will cut one line of the two drawn to C, in its nearest part, and will cut the other line, in its furthest part: from these intersections, lines parallel to H L will complete the figure. *Ex. gr.* A, B, D, E, is an original square; produce A D, and B E, to the ground line, as, 1, 2, these vanish in C; produce also E A, to the ground line, this vanishes in its parallel I L, and gives *adbe* for the representation of the original square, A, D, B, E.

N. B. The diagonal of a square being naturally 45 degrees, if an angle of 45 degrees be made from I and continued to H L (as at H), it will give H for the vanishing point of such a line; without the necessity of recurring to the lines of the original figure.

No. II. Represents a square lying *obliquely* to the picture: continue the sides E B, E D, to the ground line, as 1 2, and also the sides D A, B A; as 3, 4: find the vanishing points on H L, by lines from I, parallel to E B, and to E D; the seats on the ground line (1, 2) of the original figure, united to those points, give *adbe* for its representation.

## P L A T E   X V I I .

No. I. Is a TRIANGLE in perspective: its representation is obtained, by uniting two of its sides, DB, and AB, to the ground line, as 1, 2; lines parallel to these originals, drawn from I to HL, give the vanishing points of those two sides; to which points, rule their intersections on the ground line, which give *b, d*, for their length; a line parallel to HL, uniting these intersections, completes the figure, and gives *a, d*, for the representation of AD. The veracity of this process is *proved*, by uniting D and A to I, which equally give the points *a, d*.

On this plate and the foregoing, the reader will observe slightly marked figures of like nature with the principal; shewing how to adjust a series, as of squares, &c. forming for instance, a pavement. This is accomplished by using the dimensions of the perspective representation already obtained, as a scale, and marking them on a horizontal line, level with such representation. In the plate of squares, the scale is shewn advancing toward C: and if the original square be supposed to be in width any number of feet, 10, 20, &c. this scale shews the progressive diminution of that dimension. The reader will also observe how readily a figure *reverse* from the first is procured, &c. The same process may be used on the vertical plane, for vertical objects.

## P L A T E XVIII.

No. I. Is the process of putting into perspective a PENTAGON, and is in its operation precisely the same as former figures. A D E B F is an original figure; unite the various sides to the ground line (as A D at 1: E B at 2; and A F, B F, as near F): parallel to D A 1 draw from I, I K; parallel to E B 2 draw from I, I J; draw likewise from I, parallels to A F and to B F. The various seats of the original lines on the ground line, drawn to their respective vanishing points, form the figure. *E. gr.* 1 to K gives *a d*; 2 to J gives *b e*: and so of the others: a line from *d* to *e* parallel to H L completes the process.

In treating a square, No. I. Plate XVI. we observed, that if an angle of 45 degrees had been made at I, it would have given the same points for vanishing points as the formation of an original angular line does. In the same manner, the points for a regular pentagon, and for any polygonal figure, may be found according to the following TABLE.

Sides.	Angles at the Center.	Angle made by the Sides.
4. A square makes an angle of $90^{\circ}$	—	$90^{\circ}$
5. A pentagon	72	108
6. An hexagon	60	120
7. An heptagon	$51\frac{3}{7}$	$128\frac{4}{7}$
8. An octagon	45	135
9. A nonagon	40	140
10. A decagon	36	144
11. An undecagon	$32\frac{8}{11}$	$147\frac{8}{11}$
12. A duodecagon	30	150

The angle at the center of a regular polygon is found by dividing 360 by the number of sides: thus 360 divided by 5, gives 72 degrees for the angle at the center of a pentagon: 360 divided by 6, gives 60 degrees for the angle at the center of an hexagon. But the angle made by the two adjacent sides of a polygon is found by subtracting the angle at the center, from 180 degrees; thus from 180 take 72, there remain 108 degrees, which is the angle made by the sides of a pentagon: if from 180 we take 60, there remain 120 degrees, for the angle made by the sides of an hexagon, and so of others.

## P L A T E XIX.

No. I. This example shews the readiest method of putting a circle into perspective: first, form the square A, D, E, B, round the circle, which it touches in four points; each angle of the square is bisected, by ruling through the centre of the circle diagonals to the opposite corners; where these strike the circumference of the circle, rule lines parallel to AD, and to BE; thus we have four additional points: unite the original lines to the ground line, and likewise one for the diagonals, as at A: these, prolonged to the vanishing points, will give for the seat of the circumference of the circle, *first*, the sides of the square; *secondly*, four additional points (1, 2, 3, 4, corresponding to the same numbers in the figure) indicated by the interfections of the transverse lines: these eight points, united carefully, will describe a circle. It is obvious to remark, that the same eight points would represent an octagon, if united by right lines, instead of circular.

No. II. Is a circle put into perspective by means of its given diameter 1 2: the systematic lines as usual. Set one foot of the compasses in H, and with the opening HI, strike IB: then with the opening LI, strike IA: through the middle of 1 2, draw a line from C, likewise another from H, and another from L: then the points which form the circumference are thus found; 1 and 2 are already given; as being the original line; 3 is found by drawing L 2, which cuts the line 3 C in 3; 4 is found by drawing L 1, which cuts the line 3 C in 4; 5 is found by drawing B 2, which cuts the line 5 H in 5; 6 is found by drawing B 1, which cuts the line 5 H in 6; 7 is found by drawing A 1, which cuts the line 7 L in 7; 8 is found by drawing A 2, which cuts the line 7 L in 8; the points thus procured, must be carefully united: this method serves for an octagon also; and is the readiest way to represent circles within others.

## P L A T E XX.

No. I. Shews the effect of circles forming a cylinder, standing erect, and is an advance toward putting solid bodies into perspective. C is the center; CY the horizontal line. The distance is somewhat more than double CY, and may be conceived as placed at the other extremity of that line, but is omitted in the plate, and its half distance marked \*.

We may observe, that, as a cylinder is apparently to the eye, two circles united by right lines, so to put this figure into perspective, form first the inferior circle (by No. 2, if you please); then erect perpendiculars, and form the superior circle by the same method. This example may likewise be performed, from having only a single line given as a diameter, as 1 2; which has been already illustrated.

No. II. Represents the effect of circles when parallel to the picture; as in a cylinder lying along the ground. Circles, parallel to the picture, suffer no change in their shape, but only in their size. On the ground line as at A, and B, place the distances between the circles. *First*, Ascertain the seat of the cylinder, which rule to the center C, its proper vanishing point; then rule A and B to their vanishing point: at the intersection of A, with the seat of the object, raise a perpendicular; and, taking the proposed diameter of the circle, strike the circumference from *a*: rule *a* to the center C; and on this line will be situated the centers of every other circle, necessary to describe the figure: as appears at *b*, &c.

## P L A T E   X X I.

No. I. Shews how to represent a solid square, or cube: and is performed by finding first the perspective seat of its plan; vide No. I. Plate XVI. which gives  $ab$  for the seat of A. B. On the ground line erect the proposed height of the object, as at D, which unite to C: then at  $a$  and  $b$  erect perpendiculars, which will be cut by the line DC, at their proper height, and form the nearest face of the square, as at  $ab13$ . The further face of the square is found by the same means; and the top of it, by ruling from the interfections with DC, lines parallel to HL, as 24, and 13, to complete the figure.

No. II. Illustrates the principles of the perspective representation of a pyramid: first, find its perspective plan; vide No. II. Plate XVI. For the height of the object, take  $fg$  perpendicular to the ground line; find the center of the plan of the pyramid, by drawing the cross line  $ab$ ; then draw  $d$  towards C, till it intersects  $ab$ ; raise on this center a perpendicular; where it is cut by  $gH$  is the top of the pyramid; to which rule  $abd$  to complete the figure.

## P L A T E    X X I I .

No. I. A cube in perspective, standing oblique to the picture: find its perspective plan, as before: erect perpendiculars from its extremes; for the height, draw  $5 H$ , which gives by its intersections part of the top; from  $L$  draw lines through these intersections, which by cutting the remaining perpendiculars complete the figure. Observe, that when the square stood parallel to the picture, as in No. I. Plate XXI. the height was ruled to  $C$ , the center; but when it stands oblique, the height is ruled to the vanishing points of the sides.

A cube, like a cylinder, is composed of similar faces united by right lines, and therefore may be considered as being two perspective plans of the same figure, at different heights, connected together; and the same idea may be attached to various polygonal figures.

No. II. Is a double cross in perspective:  $ABCD$  is the ground line, on which the thickness of the upright is to be marked, as  $BC$ ; and the extent of the cross bar, as  $AD$ : these measures are ruled to  $L$  (the center in this example), and by the diagonal  $D$  ruled to  $H$ , form a square, which is the plan of the figure. On  $C$  erect a perpendicular to receive the measures for the heights, as  $GF$ , and  $E$ ; from the intersections of the plan, raise perpendiculars for the upright, as from  $b c f$ ; where these are cut by the measures  $GL$ ,  $FL$ , and  $EL$ , rule horizontal lines for the situations of the bars, whose lengths are determined by perpendiculars from the plan below: thus  $1 2$  are governed by  $ah$ ; and  $3 4$ , by  $de$ : the figure distinctly describes the whole.

No. III. Another cross which stands oblique to the picture: it follows the same rules as the former, except as to the obliquity of its vanishing points, as appears by the figure.

## P L A T E XXIII.

Though circles parallel to the picture be extremely easy, yet the most troublesome subjects in perspective are representations of circular members, and objects, in compositions of architecture, when seen obliquely. Their squares and cubes follow the principles recently illustrated, but by way of explaining the difficulty of their circular parts, we shall offer the following method of delineating them.

## THE TUSCAN BASE IN PERSPECTIVE.

The difficulty in this instance is, to represent the swell of the torus: to accomplish which, make a sketch of the parts intended to be represented, as near as convenient to the place they are to occupy, as at X, divide this into as many parts as are requisite, as horizontally at 2, and vertically at x.

Take  $ax$  for the height of the plinth: divide the torus itself in half, as at 2, for its height, and  $x$  for its width: rule  $x$  perpendicular, and 2 horizontal: then where the line  $x$  touches the outline of the torus, rule lines parallel to 2, as 1, 3; rule also 4, 5, parallel to 2.

Put the plinth into perspective as usual. Having procured the perspective center of the base,  $o$ , by ruling the diagonals of the plinth, raise a perpendicular, as  $oK$ ; through  $o$ , draw a line for one diameter, parallel to  $DB$ , and from the half of  $DB$  as  $A$ , draw through  $o$ , to the vanishing point  $S$ , for the other diameter. Procure the plan of the circles as already explained. At  $A$  erect a line, which is to receive the divisions made on the original sketch, 1, 2, 3, 4, 5; this now represents their heights: to represent their projections, set off their measures from the point  $A$ , as to  $J$ , from the points  $A$  1, 2, 3, 4, 5, draw lines to the vanishing point, cutting the line  $oK$ , in 1, 2, 3, 4, 5. Thus we have the line  $A5$  for the heights of the figure next to the eye, and the line  $oK$  for their heights at the semi-diameter of the column. Now rule the measures of the projections, which are marked between  $A$  and  $J$  to their vanishing point, and where they strike the plans of the circles already formed, erect perpendiculars, as at  $a, b, c$ , the points where these perpendiculars are cut by the lines  $A$  1, 2, 3, 4, 5, in their progress to  $oK$  1, 2, 3, 4, 5, are so many points on the outline of the torus, and other parts of the original sketch, which if carefully united, will describe its whole form.

Having found the perspective representation of the figure in its part nearest to the eye, rule from the line  $oK$ , horizontal lines which denote heights, 1, 2, 3, 4, 5; and as before, on the points where the plans of the circles are cut by the widths of the members, erect perpendiculars, forming so many sections of the figure, in such parts of the circumference as is may be thought necessary.

## P L A T E XXIV.

## A TUSCAN CAPITAL IN PERSPECTIVE.

In order to vary the application of the foregoing principles, this object is seen *underneath*. Its dimensions are obtained by forming a sketch of its parts adjacent to the space it is intended to occupy, as A, 1, 2, 3, 4, 5, 6, 7. Then fix the extent of its broadest part nearest to the eye, the abacus, as CD: in the middle of this, let fall a perpendicular, as Jr, which is to receive the heights marked A 1 to 7, and from J towards D, set off the widths, *a, b, c, d, e, f, g*, as marked on the original sketch. Rule the heights to L the center, and the widths to H the vanishing point, their interfections give points which must be carefully united, to form the outline.

As there is some patience required in treating such objects, the best way is to procure the extremes within which the parts to be represented must fall: as in the former plate between A 5, and *c, d*, so in this plate between the line Jr, and the interfection which finds the upright line *g*; then take the larger members first, and having placed them, with their proper intervals, the lesser members which fall within those intervals will follow more readily. In fact, when the student becomes acquainted with the forms of objects, and considers their appearances in nature, which after having thus investigated them he will survey with greatly increased accuracy of eye, he may by means of the leading circles only delineate with sufficient exactness the forms attached to them. It is well to know how to use such principles, when occasion requires; but to employ them on all occasions is not necessary to a practised eye.

These examples should be turned, and drawn on the vertical plane, &c. The principles are the same.

## P L A T E    X X V .

Shews the inside of an apartment: C the center; HL the horizontal line; the windows are placed according to measures given, and set off on the ground line A. 1 2 3 4 refer to the distances of the window panes, &c. and being ruled to H, cut the line AC, at the proper places, from whence perpendiculars being raised, the wall of the window is found. The panes being supposed at the outer edge of the wall, require the continuation of the lines 2 H, 3 H, cross the window fill 5, 5, in the nearest wall, parallel to HL. The upright measures, 5, 6, 7, 8, 9, determine their heights, not only in the nearest wall, but (by being ruled to C) in the furthest wall, by their intersection with it; to which 5, 6, 7, 8, 9, are parallel. The lines are continued cross the window fill for the panes, in the further wall, to C, as before, along the floor; and their distances from each other are regulated by the original measures on the ground line, drawn to C, as appears at 1, 2, 3, 4, under the window. All measures for horizontal objects must be placed on the ground line, or on a line parallel to it, in some convenient part of the picture; and all measures for vertical objects, on an upright line.

No. II. Is a representation of a bureau, with the flap open; which is much the same as the trap door, in the next Plate: *e* is its hinge, *f* its edge, *abc* the circle it forms in opening, OO on the line OX, two points which assist in drawing the circle; X the distance of that circle: A is one side of the bureau perpendicular to the picture, and B the ground line.

## P L A T E XXVI.

Supposing these examples sufficient to explain the manner of treating solid bodies, &c. we proceed now to shew the nature of other objects. It has already been observed in LECTURE II. that all rotatory objects form a circle at their circumference, of which the hinge is the center: on this principle are the doors in this example put into perspective.

Fig. 1. C is the center, HL the horizontal line; the breadth of the door is marked on the ground line, as AB; and AD is the depth it must be in the room. Draw DH, cutting AC in E; draw from E, a line parallel to the ground line, as EF; which is cut by BC in F, and determines the width of the door at that part (if half open); F ruled to H will give *e* for the edge of the door, if supposed shut: the semi-circle on the floor is formed by the ordinary methods. From the bottom of the door E, to the circumference of the circle, gives the situation of the door: the same line continued to HL gives its vanishing point, as at I: perpendiculars from the bottom of the door, and its edge, are cut by a line from I, to determine its height. In Fig. 2. the door is seen open somewhat differently: the same process gives K for its vanishing point; as is clear by the figure.

Fig. 3. Is a representation of a trap-door in the floor: AB its breadth; which of course is the front of the aperture. The door C, and its hinge D, are found exactly as the same parts in the foregoing figures; *g* is one vanishing point for the quarter of a circle, corresponding to the square A, D, *e*, *f*.

If this figure, and those of the former numbers are turned, and viewed sideways, they mutually illustrate each other.

## P L A T E    X X V I I .

No. I. As all horizontal and vertical planes, and objects, in every situation, however diversified, follow the rules already laid down; we presume what has been said may suffice to explain the method of representing them in perspective: we proceed now to illustrate the nature of planes not perpendicular, or parallel, to the picture, but *inclined* to it.

In this example, C is the center of the picture, CI its distance, HL the vanishing line of the ground plane RQ. The line R\* marks the inclination of the plane to be represented, with the picture (and is here supposed 70 degrees.) Through C, draw CG, parallel to the line R\*, and of equal length to the distance CI; perpendicular to CG, erect CS: through S, draw ASB parallel to CG; this is the vanishing line for the plane proposed, S its center, and SG equal to its distance.

This object has faces in three different inclinations; first, that lying on the ground, which accordingly vanishes in the vanishing points to the ground, as *df* and *ek*; secondly, other faces perpendicular to the ground, as *eklg*; thirdly, an inclined face not parallel to either, as *dflg*; which is our immediate object. EDF is an original plan, whose lines being continued strike the ground line in R, and Q, &c. Rule R to L, being coincident with the ground plane; and Q and its parallel to H; by which we obtain *df* for the representation of DF: and by the same means, we obtain *ek*, which now completes the perspective plan of the object. From *d* draw *dB*; from *f* draw *fB*: erect on *e* a perpendicular, which cuts *dB* in *l*: and from *l* rule *lL*, cutting *fB* in *g*; which completes the figure.

MK Shews the side-elevation of this object.

## P L A T E XXVIII.

Figure 1. Represents an inclined plane, one side of which is parallel to the picture: erect on the center a perpendicular at pleasure; and at H, form such an angle as the plane to be treated is supposed to make; as at K. Rule a line in that direction from H, till it intersects the perpendicular from C, as at I: through I, rule a line parallel to HL, as VI; which being the vanishing line to the plane, governs its perspective. To I (its center), rule D and E; to C, the center of that part coincident with the ground, rule DC; on *a* erect a line, which cuts DI in A; from A, a line parallel to HL completes the figure: or A may be found by its proper diagonal (being a square) ruled to V, its vanishing point, as appears by the figure.

Figure 2 is a similar example, and the square *edfg* is found as squares in general: VI being its vanishing line.

## P L A T E   X X I X .

No. I. Is an application of the foregoing principles to a natural object, and represents a flight of stairs in perspective: C is the center of the horizontal line; O is the angle made by the ascent of the stairs; and gives V for the transposed center, to which the inclined lines are ruled. The measures of the stairs are set on the ground line, as at 1 2, and 3 4. The shadow of the rail D is found by taking A B as a ray, to which all shadows that fall on the uprights of the stairs are parallel; those which fall on the horizontal parts of the stairs follow their direction and vanish in C.

## P L A T E XXX.

## INCLINED PLANES ON INCLINED PLANES.

Figure 1, Represents a prism (one of whose sides is perpendicular to the ground) resting on an inclined plane: this figure is an advance on Plate XXVIII. *C* is the center of *HL*, the horizontal line; *Z* is the original plane, and *Y* the prism standing on it. Draw through *C*, a line perpendicular to it, as *VCO*: place the prism *Y* at the point of distance *H*, and rule lines equal to the angles it makes, to *O* and to *V*; through these points, *O* and *V*, draw lines parallel to *HL*, which thus become vanishing lines to its upper and under faces. The upper faces of *Z* and *Y* being parallel, have the same vanishing point (*O*). The plane *B*, Figure 1, follows exactly No. 2. Plate XXVIII. take *gh* for the seat of *A* on *B*; from *V* draw *Vg*, *Vh*, beyond *g* and *h*; and by the diagonal *Ng* prolonged beyond *g*, cutting *Vh* in *b*, we obtain one termination of this face, which is completed by ruling *ab* parallel to *gh*. Now rule for the other face *aO*, *bO*, which, cut by the diagonal *bK*, will give *cd* for the termination of the other face; or, it may be found, by erecting a perpendicular from *g* to *c*, and drawing *cd*. *ef* on the ground line marks the width of *A*.

In Figure 2, the plane *A* is constructed in a similar manner with *B* in Figure 1. *eg* vanishes in *V*; and *f* denotes the middle of the object: *abcd* is a square lying oblique to *A*; whose sides *ab*, and *cd* vanish in *K*: and *ac* and *bd* vanish in a corresponding point on the other side *O*.

## P L A T E XXXI.

No. I. Is an application of the principles and management of inclined planes to landscape: in this example, we have a flat country, intersected by a descent ( $I b a G$ ) and a rising ground ( $d n K c$ ). For the flat country,  $H L$  is the horizontal line, and  $C$  the center.  $E B F$  is the vanishing line of the descending plane, (consequently below the horizon)  $B$  its center,  $L B$  its inclination.  $S A$  is the vanishing line of the ascending plane, (consequently above the horizon)  $A$  its center,  $H A$  its inclination. First dispose of the flat country, by drawing  $I C$ ,  $G C$ , the house  $M$  (whose vanishing point is  $D$ , &c.) Then for the descending plane, draw  $I B$ ,  $G B$ ; a diagonal from  $G$  to  $E$  gives  $b$  for one termination of this plane, which is completed by a line ( $b a$ ) parallel to  $I G$ . The posts  $U T$ , and their shadows, all vanish in  $B$ . For the ascent, take  $d c$  as a ground line, and rule  $d A$ ,  $c A$ , cutting  $I C$  in  $n$ , and  $G C$  in  $K$ . The water is of necessity horizontal, and therefore vanishes in  $C$ .

To find the point  $k$  in the water ( $a o$  being its surface), draw the perpendicular  $K k$ , and  $a C$ , cutting it in  $r$ , which is the seat of  $K$  on the water; make  $r k$  equal to  $r K$ , for the reflection of  $K$  in the water:  $q$  is the reflection of  $p$ .

The shadows are cast by the sun supposed to be parallel to the picture, in the inclination  $R$ ; parallel to which draw  $l i$ , and parallel to  $H L$  draw  $b i$ ; unite  $l i$  for the shadow of  $l l$ : to continue the shadow on the water, draw  $i C$ , which is cut by the bank at  $m$ ; unite  $m n$ , which completes the shadow of  $l l n$ .

No. II. Is another application of these principles to landscape:  $C$  the center,  $H L$  the horizontal line,  $D G$  the ground line,  $D A$  the height of the rising ground, if it was situated on the ground line;  $N B$  its height at  $N$ ;  $K I$ , if produced to  $H L$ , is the distance. The house  $E$  vanishes in  $C$ . The rest is explained in the former figure, or is too obvious to need explanation.

As the whole process of practical perspective is intimately connected with the foregoing list of plates, it is proper to request the particular attention of the student to them; especially, as he is assured, that they contain nothing superfluous, or that may be dispensed with, but are inserted with design, that he may easily carry in his memory the rules they exemplify. It is necessary to be explicit on this subject, because it is very uncommon to treat this science so concisely in regard to the number of plates; but there is much reason to imagine that multiplied examples, and too numerous plates, have frequently prevented that attention from being bestowed on it, (because seemingly attended with difficulty) which the science deserves: whereas, in fact, its principal rules are by no means either difficult or complex; and the trouble connected with any part of it arises rather from the nature of certain objects to which it is applied, and from the inventions of ornamental decorations, whose composition is intricate. Now as the members of any part of a building are but divisions or portions of a certain extent, it is clear, that, if we are able to represent that extent, and to divide it into such portions, we are also able to treat whatever those portions may contain: and thus the use of perspective appears most evidently in those articles, whose just representation is naturally difficult, and without this assistance impossible.

It will be extremely easy for the student to multiply examples similar to those here offered him; and indeed it is adviseable that he should vary and diversify

verify them at his pleasure ; whether by giving various directions to his original lines, or by drawing on the right hand, what is here given to the left, or by any other change which fancy may suggest.

It is also proper to remark, that the construction of horizontal pictures is precisely the same as that of vertical pictures, which is easily experimented by looking up to the ceiling ; in which case, the center beam or ray from the eye equally regulates every other line : the same if a person from a high parapet looks down to the ground ; the wall of the house which supports the parapet, answers to the situation of a horizontal plane, and the ground is to him vertical. But as it is hardly to be supposed that our readers should undertake such subjects, the present hint is thought sufficient without examples.

Perspective has by some persons been applied to represent as receding what really approaches, and to bring forward what retires ; but at the same time that this is allowed to be curious, it is equally considered as useless, and merely is the effect of irregular surfaces forming one picture.

It is amazing to see the errors committed by artists (not otherwise without merit) in their representations of sundry objects, and even frequently of spaces and distances : whereas, if they would insert on their designs merely three or four of the principal directing lines, they could not possibly commit such mistakes. Even in compositions of figures, it is adviseable to make use of a height correspondent to that of a figure, and to graduate the same towards the

horizontal line, as a directory for figures, &c. removed from the front of the picture. The same scale would serve to proportion other objects, such as houses, &c. since it would then be scarcely possible to represent dwellings so small as to be uninhabitable, or their doors so straight as to deny a passage; as on the other hand, it would prevent their dimensions from suiting giants rather than men.

With regard to planes inclined to the picture, and to the horizon, it may be observed, that it is not always necessary to delineate them by the process here given; but if the situation of the extremes of that portion of the plane which is wanted, can be determined by means of any points already obtained, they may be represented very easily: as for instance, the roof of a house, if the part where it joins to the front wall be supposed, or given, and the same at the ridge of the roof, it is evident, that these points united by a line, give the direction of the roof; and as the ridge is usually parallel to the front wall, it equally directs the roof in every part. The same remark applies to landscape: it is not always necessary to draw the inclination of a hill, &c. *geometrically*: by a little practice, the eye will quickly discover the true bearings of surfaces to each other, and will accordingly treat them with sufficient accuracy, after having been taught by correct principles.

## LECTURE III.

**I**F the principles, which in the preceding LECTURES have been honoured with your attention, LADIES and GENTLEMEN, have been so clearly stated as their importance deserves, I may justly flatter myself, that the remainder of our subject will be easily discussed, and fully understood; for, when we have once acquired accurate ideas of objects as seen in perspective, and know how to represent them justly, and on genuine principles, we shall need very little exertion of genius, or of study, to comprehend aright, the natural effects of their SHADOWS, which, at this opportunity, are the subjects to be investigated.

Shadows, are privations, or absences, of light; caused by the interposition of bodies sufficiently dense to prevent the passage of luminous rays; and, though it cannot, with exact propriety, be asserted, that shadows are the offspring of light, yet it must be granted, that, without light, there could be no shadow.

Darkness was anterior to light, and seems more intimately connected with this lower world; since so soon as the great dispenser, and cause, of light, withdraws his beams, obscurity returns, and continues, till the activity of the solar rays again dispels the gloom.

But,

But, though “light is pleasant, and it be a cheerful thing to behold the sun,” yet is too much of this invaluable blessing not only uselefs, but injurious: so that, beside the wonderful provision made in our visual organs for excluding redundance, our sense of sight is also not a little refreshed by reviving shade; especially if for a length of time it has been exposed to the action of intense light.

If shadow be merely an interruption of luminous rays, we may, without reluctance, bestow a few minutes attention on some of the properties of light, since perhaps by enquiring into these, we may more easily comprehend their contraries. The rapidity of light is so vehement, that it is justly considered as to us instantaneous, so that directly as a body is exposed to it, or removed from it, the effect is visible: but, those laws whereby the course of light, or of luminous rays, is determined, more nearly concern the subject of our attention. For, if, instead of constantly keeping a direct line, its course was oblique, or spiral, or volutory in any manner, we should be to seek for different principles whereby to ascertain, and to explain, its progress: but, as by the Almighty *fiat*, which said “LIGHT be, and light was,” it takes invariably the nearest course from point to point, we acquire, by a simple experiment, a perfect knowledge of the principles which determine its direction.

Whoever will interpose an opaque body between the origin, and source, of light, natural, or artificial, and any proper substance exposed to its rays, will easily perceive their illuminations are pre-

cluded from the object furthest off, by their striking against that which is nearest; and also, that a direct line, from any part of the space wherefrom light is suspended, to the luminary, will pass through a corresponding part of that object which suspends the light. For instance, when I hold my hand between the candle and the wainscot; it prevents the rays of light from passing further, and, consequently occasions a blank of light on the wainscot; which blank is directly strait from the candle. And, so very minute and correspondent are the rays of light, to the form of whatever impedes their progress, that they assume exactly its figure and outline, and describe a figure perfectly similar, on the nearest superficies which may receive it.

Considered as related to Perspective, light divides into two kinds: each of which claims a proper attention: FIRST, the NATURAL light; the solar, or lunar light, whose origin being immensely distant from us, and beyond all proportion, with respect to objects illuminated by it, is usually (and with propriety) considered as *infinite*: its rays, therefore, are not divergent, but *parallel*, and alike; and this, not only during the radiance of noon, but equally parallel are the beams of “grateful evening mild.”

Taking their ideas from circumstances of artificial light which are familiar to them, some have thought that, the sun may enlighten us from *below*, as does a candle when placed on the ground, though our distance from it be considerable: and, certain artists, not sufficiently attentive, have enlightened their figures under the eye-brows, chin, &c. in evening pieces:

pieces: but, that it ought not to be so, is demonstrable; for, since the horizon, which is the height of the eye (how high soever that eye be situated), is likewise the boundary of the solar rays; it is evident that boundary can be only *parallel* to the eye. And it may further be observed, that, were the horizon sufficiently defined, all the figure below the eye would be in demi-tint: this effect we see occasionally in high mountains; on various elevations of clouds; and to this much of the variety of their tints must be referred.

It scarcely needs remark, that the altitude of the sun in the heavens, according to the time of the day, and according likewise to the season of the year, produces variations of shadow: for in the morning, as in the evening, the shadow occasioned by the sun's place is infinite; whereas, at noon, the shadow describes a certain angle with every perpendicular object. In the same manner Spring and Summer differ: for the sun's place in the ecliptic is perpetually changing. What is in this respect true of the sun, applies with equal propriety to the moon; which sometimes rises near the horizon, and speedily disappears below it, sometimes pursues a track, whose arch seems near the zenith.

Nor ought I here to omit observing, that the various situations of countries, make a difference which deserves notice; for the sun being the origin of light, and its elevation being unequal, in unequal latitudes, these variations must needs occasion a diversity of shadow, as well as of general effect.

GERARD DE LAIRESSE relates an incident, which confirms the propriety of this observation: "Being employed by a gentleman, who had been a governor in India, to paint a scene in that country, I made (says he) a sketch of it, in his presence, which satisfied him; and having painted the picture, was desired to see it hung up: after the gentleman had viewed it, he whispered to me,—‘It is very well done; but I forgot to tell you one thing of great moment; you can alter it in half an hour’s time.’ To be short—I had taken the sun *too low*, and had also made him fall into the piece *sideways*, which occasioned long ground shades: whereas, he should have been nearly vertical; as in that country he generally appears." The artist could not but acknowledge the fault; though it was by no means to be rectified so easily as his employer supposed, since every light, and every shadow, throughout the composition was erroneous: and to rectify one, or even many, had been to little purpose, without rectifying the whole.

Your recollection, LADIES and GENTLEMEN, will furnish you with other particulars to which these hints may be adapted, since they are of very general application. I shall mention one circumstance, which, not having studied from nature, I confess my incompetence to determine; and that is, the difference (if any) of shadow, or of light, in the two hemispheres, and, whether the southern and northern, are alike in this respect; whether they offer the same shadows, of the same kinds, and

of the same appearance; or, whether there be any sensible, or permanent, difference: and moreover, what is the general appearance and effect of the shadows caused by a vertical sun, which I suppose, is sometimes rather curious. Time has been, according to HERODOTUS, when those who, having passed the line, asserted that the sun was at their backs as they proceeded south, were considered as lying travellers; nevertheless, that fact is now acknowledged; and is the strongest argument for the truth, and the actual performance, of the voyage of which HERODOTUS professed to doubt. The same cause may perhaps produce other differences allied to our subject: but not inclining to undertake a voyage to the line, or to either pole, merely to investigate the subject of lights, though I think many amusing peculiarities must occur to the surprize perhaps of the instructed observer, I rest content with a knowledge of the lights procurable in old England, and proceed to offer a few hints on the effect of ARTIFICIAL LUMINARIES; which is the SECOND kind of light to be considered.

The immense distance of the sun, or of the moon, renders the rays they emit parallel; but, as artificial lights, a torch, or a candle, have not, cannot have, equal distance, the rays they emit are easily traced to one point, around which they spread. Thus, although it be impossible, by changing the distance of a figure illuminated by the sun, to shew any variation of lights, and shades, in such a figure, yet merely the alteration of distance produces very remarkable diversity in the same figure, seen by artificial

ficial light; for, hereby the shadows are rendered shorter, or longer, and the lights become brighter, or weaker. Moreover, the extent of shadow projected from an object, by means of artificial light, bears no proportion to the size of the object itself, but may be made to exceed it by very much; as, when I approach my hand to the wainscot, in proportion as it advances toward the seat of the shadow, the shadow corresponds to its natural dimensions; but, when, withdrawing my hand from the seat of the shadow, I advance it toward the light, it intercepts a much greater body of rays emitted by the luminary, and, consequently, its shadow occupies a space proportionably greater on the wainscot; and this shadow may be increased till half the room is deprived of light. You see, likewise, that by placing it *above* the candle, its shadow appears on the ceiling; an effect which we very well know it is impossible should attend the rays of the natural luminaries; and you see too, that the light *always* preserves its direct line; so that let me move my hand on either side of the luminary, and to any situation within reach of the rays, the place of the shadow corresponds perfectly to the immediate station of the candle.

The infinite variety of situations, wherein torches, lamps, &c. may be placed, produces a correspondent variety of effects; and precludes any determinate remarks on any specific instance of effect; since, what observations might be very just, when applied to one instance, might be utterly inapplicable, perhaps false, to another. Indeed, we have

no need to wish for better principles on this subject than we possess, as our rules are so general, and so simple, that they readily apply to all cases, in which art is likely to require assistance.

The first principle requisite toward treating shadows in perspective, is, to find the *seat* of the luminary; then the situation of the planes around it, on which its light falls, and lastly, the relation of the objects enlightened to those planes.

I venture to differ from general opinion, and method, in placing first the principles of artificial light; because, I conceive, that the expression, and the nature of the *seat* of a lamp, or of a candle, considered as a luminous body, is more easily understood, than the *seat* of the sun; and especially, as I wish to appeal to nature in all cases, and as this may, with the utmost ease, be reduced to the test of experiment; which is more than can be said concerning natural luminaries, though by fair inference we justify our principles respecting them.

This table is an horizontal plane, on which the candlestick stands; you comprehend without difficulty, that, perpendicularly *under* the flame, is the *seat* of the light on that plane: this is too clear to need enlargement. With equal evidence it appears, that the *seat* of the light on the ceiling, is, immediately perpendicularly *above* the flame; to prove which, we have only to suspend a small ball at the end of a line, and, by placing it over the candle, the shadow of the ball on the ceiling demonstrates the truth of this principle. By similar methods is  
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the seat of light found on any other plane, it being always that spot, which is indicated by a straight line drawn from the center of light, to the most direct, and proximate, part of the plane;—as on the side of this room, the seat of the light is, in that part nearest to the luminary, and thereby most exposed to its immediate, and vigorous rays.

I persuade myself, this system is too evident to require further explanation; and not less simple, and facile, is its application; for, if we desire to trace the course of a shadow which falls on any plane, we have little more to do, than to consider the direction of the object which casts it; and by finding the situations of the shadows of its extremes, or terminations, we have almost in a general view, accomplished our purpose.

If an object be perpendicular to a plane, the course of its shadow will be, a continued divergence, or receding from these at of light on that plane, as from a center; and the length of this shadow will be determined, by lines from the luminary through its extremes; intersecting the course of the shadow. If an object be oblique to a plane, rays drawn from the luminary through each extreme, or termination, give the seat of its shadow on the plane; if it be parallel to a plane, the shadow follows the course of its parallel, and vanishes in its vanishing point. It is true, that as well objects, as planes, *may* be so tortured into awkward shapes, and forms, as to occasion much trouble and embarrassment to find the images of their shadows;

yet, if we can ascertain their representations on any one plane, the others become manageable.

Artificial lights seem more directly under our controul, and regulation; I have, therefore, introduced them before the observations I intend to offer on the principles of shadows occasioned by the sun, or the moon; but the rules to be adopted, in treating these, are founded on a similar mode of reasoning, though on a scale differing in extent.

It is, indeed, impossible to *fix* a natural, and real, seat for the sun, on any part of our small survey of this our globe, because, very distant from us, is that spot where he is vertical; yet, as we know his light has an apparent seat on our horizon, (considered as a plane) and that shadows of objects always bear a certain reference to the seat of light, as lately explained, and always recede in straight lines from it; by finding a point correspondent to the apparent situation of the luminary, and another, the nearest that can be drawn from that situation to our horizon, for the seat of its light (which is evidently an application of the procedure just suggested) we possess principles which apply to this occasion also.

The center of the picture, the horizontal and vertical lines, have already engaged our attention, and we shall receive from them much assistance on the present occasion. Let us imagine the vertical plane to be erect before us; and then—the sun to be on one side of it,—to the *left* first, in the present instance. It is evident, that, according to his *obliquity* from that plane, his rays will be more or less

declined, with respect to ourselves, and to our situation. If we keep our station, while the sun, by degrees, approaches toward the direction of that plane, the declination of his rays gradually lessens, till at length they become union with it, and we receive them full in the face. When the sun in his progress is advanced to the *right* of the plane supposed, the declination of his rays is proportionably augmented, till at length they shoot directly *across* the center beam of the eye: that eye looking the same way as at first.

During his progress hitherto, we have been able to ascertain, on the picture, a point correspondent to the situation of the luminary, which may be denominated his *place* on the picture; and, which is, where a line drawn from the eye to that elevation at which he appears would cut the picture. This *place* on the picture must, of necessity, be *above* the horizontal line, as we may be said, in effect, to see the luminary, only very obliquely; but so soon as he passes behind us, his place on the picture falls *below* the horizontal line, and the greater his elevation, the lower is that place; till as he sets behind the horizon, it becomes union with the horizontal line. In this course (if we incline to the supposition of a lengthened day) he may twice be in union with the vertical plane; once, right before the spectator; afterwards, right behind him. And if the sun was, during the whole *nucthemeron*, (or day of twenty-four hours) above the horizon, as he is in the polar regions, in summer, he might also be twice in  
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the plane of the picture, and twice in every angular horizontal obliquity.

*A propos*—methinks it must somewhat embarrass natives of these medium latitudes to distinguish day from night, should they visit the polar regions, during their summer, when, as we have said, the sun is constantly above their horizon. The idea is curious, of a night-piece by *sun-light*: or, can it justly be denominated *night* while the sun shines? If it may, it palliates the ignorance of that painter, who unable to represent a moon-light, illuminated by sun-shine, even his midnight subjects.

But there is no need, that we, personally, should spend a whole day in watching the course of the sun; since all fixed objects may be said to do it for us. The windows of our houses, for instance, may confirm these remarks; suppose they have a south aspect, then, in the morning, the sun shines *along* the front of the house, but not into the windows; at noon, he shines direct into the rooms, through the windows, and the shadows of the window frames, which, until noon, had fallen to the right, gradually fall to the left: till at length they become one with the wall of the house, as the sun advances to his evening station.

Or, further to illustrate the principle, let us advert to a horizontal sun-dial in an open place; and this the rather, because, the lines which mark the hours, form at once a register of the progress of the light, and shadow, and of those effects which they have produced during the day, *i. e.* they deter-

mine, and note the obliquity of the sun. Let us suppose the gnomon of such a sun-dial to be a large transparent picture. The gnomon is always set north and south. Now, at noon, when the sun is south, he is in the plane of the gnomon, or picture, consequently, he has no obliquity, or angular declination, but, his elevation in the heavens is the only thing necessary to be considered; whereas, at one o'clock, two o'clock, three o'clock, &c. it appears, by the hour lines, that his obliquity is considerable, and increasing; let him keep on his course till six o'clock; and here, let him wait a few minutes, till we have made our remarks.

If we go behind this large transparent picture, we shall see the body of the sun *through* the picture; to determine his place, we have only to mark the spot he appears to occupy; and, to find the *seat* of this luminary, we must let fall a line from this spot to the horizon; that part of the horizon where this line falls, will be the point toward which all shadows on the horizontal plane, though falling from their objects *towards* us, yet will seem to tend: this then is their vanishing point:—the vanishing point, on the horizon, of all shadows falling on the horizontal plane.

Let us exemplify this, in relation to the person whom we have supposed to be the spectator: as the rays of the sun pass through our transparent picture, they naturally fall on the person who is behind it, and he, by intercepting them, casts a shadow on the ground behind him; now, if from the place where  
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the shadow of his head falls (he standing upright) a line be drawn through the seat of his feet, this line will strike the horizon, precisely in the point where the seat of the sun, *i. e.* of the sun's light, is on the horizon before him; and such a person will see the whole of the shadows falling from objects, and the whole of the darkened portion of those objects.

Reverse now the supposition; the spectator remains no longer behind the large transparent picture, but, he comes before it, and turning his back to the sun, he inspects *that* picture in front which lately he looked through from behind. It is true, he will see another horizon, and another set of objects; but though he has changed his scene, he has not changed the principles which regulate the shadows of all objects which compose it. For we are to recollect that the shadow from his head, which formerly fell *behind* him, now falls *before* him: and this effect being the reverse of what was the case formerly, let us so far reverse our procedure, as to draw our line from the seat of his feet through the shadow of his head; and we shall find, that by *carrying up* this line to the horizon, we obtain a point, toward which, all the shadows falling on the horizontal plane seem to tend. These shadows no longer fall *toward* the spectator, but *from* him; he no longer sees the whole of the shadow, but he sees the wholly enlightened portion of the objects.

That attention to the natural effect of light which I have mentioned, requires both more time and more patience than is absolutely necessary to acquire  
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a sufficient insight into the nature of the angular declination of the solar rays; since a spectator, by *turning himself* round, may produce all those declinations in a minute. If the sun be at first behind him, he may gradually turn himself, till the sun shine full in his face; and may continue turning, till the sun be again behind him. In this revolution, he will observe every obliquity of light and shadow accompanying the moving plane of his own circulating picture; and he will perceive the stability of the principles, though his situation be constantly varying. Thus it appears, that these principles also, may be brought to the test of experiment, whenever the sun shines, and therefore, to that test we shall refer them. But, though we may thus easily experiment the different angular obliquities of the sun to the picture, yet, for the different elevations of the sun in the heavens, which form a necessary part of our principles and attention,—for these we must wait the course of the sun's diurnal progress.

We have now illustrated three chief situations; that of the luminary, that of the spectator, and that of the picture; *first*, when the sun is in the plane of the picture; *secondly*, when he is direct before the spectator; *thirdly*, when he is direct behind the spectator: after this, very little trouble can attend the representation of any degree of obliquity at which the sun may happen to be; for, if we place him at the obliquity of one o'clock, two o'clock, or three o'clock, (adverting to the sun-dial) we readily discover by the course of the hour lines, at what point

we are to look for him in one case; or in the other, we can easily draw a line from the shadow of our head, through the seat of our feet, and where that line cuts the large transparent picture, there erecting a line to strike the horizon, we can procure the seat of the sun with certainty.

Having thus pretty fully, and I hope clearly, treated of shadows cast on the horizontal plane: I shall only observe as to shadows cast on the vertical plane, that they follow the same rules, and are of the same construction. I think it not necessary, here, to occupy our attention with them, as well, because they resemble those of the horizontal plane, as because, by far the greater number of shadows are cast by objects situated on the horizontal plane; as trees, houses, men, animals, &c. for the same reasons, shadows cast on inclined planes are dismissed with merely being mentioned.

It must be owned, great truth is produced in a picture by just representations of shadows; and indeed, without this, the lights, which always are the most attractive part of a composition, lose half of their power; yet, too great an attention to the accuracy of shadows, is apt to produce a hardness, by precluding that blending, that gentle, and delicate regulation of shades, which, if it in some small degree sacrifice truth to grace, yet amply compensates that sacrifice, by establishing a general harmony throughout the performance.

The method of practice is easily deducible from the principles we have stated. It is necessary to  
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have in a perspective representation of shadows, four chief points: *First*, the center, which is the soul of the system; *secondly*, the place of the sun according to his elevation, and to his obliquity; *thirdly*, a point on the horizontal line, perpendicularly correspondent to, (*i. e.* *under* or *over*) the place of the sun, (which is a kind of transposition of that place to the horizontal line, serving for shadows on the horizontal plane); *fourthly*, a point on the vertical line, perpendicularly *lateral* to the place of the sun; which also is a kind of transposition of the sun's place to the vertical line, serving for shadows on the vertical plane.

In discoursing on artificial light, we observed, that, it was in our power to ascertain the *real* seat of the light, and to place objects beyond that seat, from us; consequently, to enlighten them differently, merely by moving them straight forwards or backwards: but, this we cannot do in the present instance; on the contrary, all we can accomplish is, to approximate as near to that seat as our horizon will permit, and thereby to tend *toward* the sun's apparent seat. If we inquire after his real seat, it is, perhaps, in the morning in the South Sea; at noon, in Africa; in the evening in South America; *i. e.* on that line wherever it be, where he is meridional; therefore evidently beyond our immediate application. But we remark, that the sun's rays being at an infinite distance, are parallel, and therefore as to sense, his apparent seat answers every purpose of his real seat. And thus it appears, that  
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although, by his magnitude, and his immense distance, the sun obliges us to vary the application of our principles; yet the principles themselves continue to be of permanent, and of manifest, utility.

By this time, I flatter myself, the nature, and the effects, of shadows, as related to perspective, have been sufficiently illustrated: it is not the business of the LECTURE to apply them to specific objects; for that I refer to the examples; and shall now offer merely a few thoughts on reflected appearances.

Had I been inclined to introduce here an eulogium on the science of perspective, I certainly might have congratulated myself on a happy opportunity, since the principles we have been discussing are closely allied to the sublime; but I rather wish to impress on the minds of my auditory, an abiding conviction of their UTILITY. It is true, they are too much neglected and disregarded; but I will be bold to say, no person possessing natural taste, or liberality, after once acquiring them, would be induced to forget them. What shall we say, then, to the inattentive indolence of many artists, who omit to cultivate an acquaintance with them, or if acquainted with them do not scruple to violate their precepts?

In the article of REFLECTIONS (whose principles are extremely simple) this violation occurs very frequently; and, though nothing is easier, than to say, that the inferior appearance, or the counter-part, of an object, must not exceed in dimensions, &c.

the object itself, yet this easy precept is too often neglected, or forgot.

When reflections of any kind present themselves, consider, that the angle of incidence and the angle of reflection are equal. As we stand before a house, for instance, we see the reflection of the sun, appearing like another sun, in its windows; what then is the true place of the heavenly luminary? It is just so many degrees of a circle distant from the direct aspect of the window (whether ten, twenty, or thirty degrees), as our own situation. Or, bring the principle to the test of the mirror: although to see ourselves we stand right before it and close to it, yet, when standing at a little distance from it, if we wish to see a particular object obliquely situated on the further side of a room, we must inevitably retire from the direct front of the glass, to a station which corresponds with the angle made by that object with the glass; and this effect is the same, whether the spectator change his station, or the direction of the glass be varied.

With regard to houses, &c. seen in water, we continue, in idea at least, the plane of that water, whereon we assume a line on which they are supposed to stand; or we trace by lines from the objects, what their seats would be; then we let fall perpendiculars from the principal parts of the buildings, which preserve their original forms, tend to their original points, keep their original angles made with each other, and differ merely by being *inverted*: the procedure has little difficulty. The effects

fects of reflection differ according to the nature of the reflecting medium; whether it be tranquil and clear, or agitated and discoloured; according also, to the variations of force in the objects, and to the situation of the enlightening luminary; but reflections, in general, should always be *kept down*, or abated in their strength, rather than permitted to dispute with their originals.

These principles, and their consequences, I submit, LADIES and GENTLEMEN, to your consideration, and conclude my discourse, by reminding you, that they are of daily utility, and may be brought to the test of daily experiment.

## OBSERVATIONS

*On the Plates belonging to LECTURE III.*

## P L A T E XXXII.

No. I. Is intended to explain the nature of the feat of the light, and its effects as the rays diverge. The inspection of the figure shews, that its principles are very simple; for having drawn, from the feat of the light, lines through the bottoms of the sticks 1, 2, 3, 4, 5, 6; and, from the point of light, lines through their tops, the interfections of these lines give the lengths of the shadows; short to some, and long to others, according to their heights, and to their appearances in perspective.

The shadows of No. 5 and 6, being interrupted by the surface A, instead of continuing their course, receive a direction corresponding to that surface.

No. II. Is the same principle applied to solid bodies. The feat of the light being fixed, on the ground plane, from that point, as from a center, rule lines through the principal seats on this plane of the bodies whose shadows are required, as *a, b, c*, and from the luminous point rule lines touching the other extremes of these bodies, as *d, e, f, g*, the interfections of these lines give the extent of the shadows, as 1, 2, 3.

No. III. Shews the same principle, but the face of the object is enlightened, being beyond the luminary from the spectator.

No. IV. Needs no explanation.

PLATE.

## P L A T E XXXIII.

Exhibits the seat of light on various planes: the candle is supposed to stand on the middle of the table, in which case, its seat on the floor, is found by the intersection of diagonals drawn from the legs of the table. A horizontal line, drawn through this center to the opposite sides of the room, gives the points (as F) at which perpendiculars being raised will pass through the seats of light on the vertical plane: a horizontal line from the point of light determines the exact seat, as at A and B. On the same principle, a line uniting the extremes of A and B on the ceiling, intersected by a line drawn from the luminary, as at D, gives the seat of light on the ceiling. To find the seat of light on the further side of the room, rule from the seat of light on the floor, to C (the center of the picture); where this line touches the bottom of the wall, erect a perpendicular, on which the required point is determined, by a line from the luminary to C, as at E: the same may be obtained by a similar process from D on the ceiling.

The shadows of all objects perpendicular to a plane, diverge from the seat of light on that plane. Thus the shadows of 1 and 2 on the ceiling, are found by the intersections of lines drawn from the seat of light, D, through their bottoms, with others from the luminary itself, through their tops.

The same is precisely the effect of 3, whose shadow diverges from B.

The object 4 follows the same rules; and the shadows of its sides, as *c*, recede from the seat of light on the floor. The shadow of 5 falls at 6, and, not being perpendicular but *parallel* to the plane B, the shadow of this side of the object 4 vanishes in C; as do the shadows on the ground of the sides *a* and *b* of the table.

One instance of the utility of shadows appears in 5; which may, or may not, be united to 4, by its situation in the figure; but which is determined by the shadow at 6 to be affixed to it: while 7, which seems to be equally annexed to 4 (if we consider its outline only), by its shadow is proved to be distant from it.

## P L A T E XXXIV.

To represent shadows caused by the SUN, we must fix a point in the picture for the luminary, and, as its seat, a point on the plane on which the shadow is to be cast: this is found, by letting fall a perpendicular from the luminary; whose situation with respect to the picture we shall quickly attend to.

No. I. R is a ray from the sun; I the spectator's eye; of which J is the *seat*. The rays of the sun being parallel, a line parallel to R passing through I gives T for the place of the sun in the picture; a line from the *seat* of the sun, through the *seat* of the eye (J) cuts the picture perpendicularly under T: produce this perpendicular, till it cuts the horizontal line, as at H, for the vanishing point of shadows on the ground.

C is the center of the picture: if the sun was *perpendicular* to the plane of the picture, and of consequence directly at the back of the spectator I J, the line H T would become union with the vertical line C G; as, if the sun were on *this side* the spectator, the line H T would be removed toward L. If the sun was *nearer the horizon*, the point T would be proportionally elevated toward H; or, if the sun was *in the zenith*, it would be immediately over C G, and would occasion no lateral shadow.

When the spectator is *between* the sun and the picture, as in this example, the seat of the sun on the picture, as at T, is *below* the horizontal line; but when the picture is between the spectator and the sun, the sun's seat on the picture, is of necessity above that line, as has been explained in the LECTURE.

No. II. In this example, the picture is between the sun and the spectator: and the plane on which it is proposed to find the shadow is vertical (as E.)

I is the spectator's eye; J its seat; R the inclination of the luminous rays; S the seat of the luminary on the ground; and S K the declination of the rays. F is an object perpendicular to E.

To prepare this picture, first draw J h parallel to S K, and at h erect a perpendicular; then draw I T parallel to R, cutting the line from h in T, which is the sun's place in the picture. C is the center of the picture, through which produce a perpendicular, as D d, which is the vanishing line of the perpendicular plane E. Draw T D perpendicular to T h, then is D the seat of the sun on the vertical line, and the vanishing point of shadows on that plane; as H is, on the horizontal line.

## P L A T E XXXV.

No. I. Figure 1. To the foregoing example, this adds the method of finding the shadow on a plane *inclined* to the horizon, but perpendicular to the picture.

The first part of the process, is exactly as the foregoing: I the spectator's Eye; J its seat: R the luminary; S its seat; ST the declination of the rays: procure the point H as before, by drawing from J to the picture a line striking it beneath *v*, from whence erect a perpendicular, and from I draw (parallel to the original ray) *Ir*: erect at C a vertical line, which, cut by one perpendicular to it from *r*, gives D for the seat of the sun on the vertical plane.

Now to procure the vanishing points for the shadows on the inclined plane Y; through C draw CV, (corresponding to the direction of the plane Y) cut by *r* D at V; which is the vanishing point for the shadows of horizontal objects on Y. The line VC continued till it intersects *r* H, (as at *v*) gives *v* as the vanishing point for shadows of vertical objects on Y.

Of the shadows in this example, *p q* tend to H; being on the horizontal plane: *k*, shadow of *g*, tends to D; being on the vertical plane: *o*, shadow of *e*, tends to V; being horizontal on the inclined plane: and *z* being vertical, its shadow *y* on that plane tends to *v*.

Figure 2. Shews the systematic lines, freed from objects and shadows, and in their proper bearings as seen *direct*. The references are the same.

Supposing the foregoing figures sufficient to explain the general principles of shadows projected either by a lamp, or by the sun, we proceed to notice the application of these principles to illuminated objects.

## P L A T E XXXVI.

WHEN THE SUN IS IN THE PLANE OF THE PICTURE.

Figure 1. *HL* is the horizontal line. The shadow falls to the right hand. The rays of the sun being parallel, we must in the first place determine its elevation in the heavens, and assume the direction of its rays accordingly, as *R*. The sun being in the plane of the picture, the shadows it occasions are parallel to the ground line, so that we need only procure their lengths by intersections parallel to those rays.

From the bottom of the house, *A*, rule a line parallel to the ground line; to cut this line for the shadow of *B*, rule from *B* a line parallel to the radial line, as *RB*, which gives *a* for the shadow of *B*.

The side *B, F*, vanishing in *L*, so does its shadow *af*: or, the point *f* is equally found by ruling a horizontal line from the seat of *F*, cut by a radial parallel to *R*.

Figure 2. The same process; the shadow falling to the left hand. Rule *A 1*, horizontally, which is cut by the radial *B 1*; let fall *D* to *C*; rule *C 2* horizontal, which is cut by the radial *D 2*. Rule *E 3*, horizontal, which is cut by the radial *F 3*: unite 1, 2, 3, to complete the shadow of *B, D, F*. 3, ruled to *L*, gives the shadow of the further side of the roof of the house.

## P L A T E XXXVII.

## THE SUN BEHIND THE PICTURE.

No. I. In this subject, the place of the sun in the picture, is beyond the limits of the picture; but its half elevation is marked, as *S*. The place of the sun being determined, also its feat on the horizontal line as *H*, rule *S B*, *S C*, *S D*, *S E*; let fall *D* to *d*; then from *H* rule for the interfections *H A*, which gives 1 for the shadow of *B*; *H c*, which gives 2 for the shadow of *C*; *H d*, which gives 3 for the shadow of *D*, *H e* which gives 4 for the shadow of *E*. Unite 2, 3, 4, to complete the shadow of *C*, *D*, *E*.

## THE SUN BEFORE THE PICTURE.

No. II. First determine the feat of the sun, as *S*, and its feat on the horizontal line, as *H*, rule to *S*, from *B*, *C*, and *D*, let fall *C* to *c*; interfect these lines by others to *H*, as *A H*, which gives 1 for the shadow of *B*; *c H* which gives 2 for the shadow of *C*, &c.

Such are the general principles of shadows occasioned by the sun, in which we are to observe, first, the parallelism of the sun's rays; secondly, the place of the sun, and the direction of those rays; thirdly, the feat of the sun on the horizontal line, for the shadows of objects on the horizontal plane, or on the vertical line, for the shadows of objects on the vertical plane; and so of any other plane, as already shewn. We shall add a few examples of other objects.

## P L A T E XXXVIII.

IN THESE EXAMPLES, THE SUN IS BEHIND THE PICTURE.

HL is the horizontal line; C the center: supposed to be *out of the picture* immediately above L (as may be found by tracing the radial lines) is the place of the sun, consequently L is its transposed seat on the horizontal plane.

No. I. Is a cube with one face parallel to the picture: 1 is the shadow of A, 2 of B, 3 of D; as BD vanishes in C, so does its shadow 2 3, being parallel to it.

No. II. Explains the shadow of a cross: the seat *bd* of the cross-beam (BD) is found by letting fall perpendiculars which are cut by a line from C, through the bottom of the cross. Radials are ruled from the principal parts, as A, B, D; and intersected by lines from L, through the seats of those parts, as 1, 2, 3, &c.

No. III. Shews the passage of the shadow over a block lying along; the block vanishes in C; the line describing its *further* side at bottom, being drawn, the shadow of the cross is traced to it, it mounts directly up that side, and appears again on the surface, where it recovers its former course. The shadow of the end of the block, at 4, 5, is found by the same method as in No. I.

No. IV. Is a cube, whose shadow is found by ruling, from the place of the luminary, lines through its upper corners, as *ab*; which are intersected by lines from its lower corners drawn to L, as 1 L, 2 L: this shadow, 1. 2. being parallel to the side *ab*, tends to the vanishing point of that side.

No. V. To find the shadow of a cylinder, select three or four points in its upper surface, *abcd*; find their seats at the lower surface, by letting fall perpendiculars; rule radial lines, from the upper surface: and from L, the seat of the luminary, rule through the corresponding points below, till they intersect the former, as 1 2 3 4: unite these carefully to complete the figure.

## P L A T E    X X X I X .

IN THE FOLLOWING EXAMPLES THE SUN IS BEFORE THE PICTURE.

H is the *seat* of the sun on the Horizontal Line.

A is the vanishing point of the rays of light; or, the supposed place of the sun on the horizontal plane.

No. I. Is a cube erect; the lines from its upper corners are ruled to A, as *ab*; those from its bottom corners, are ruled to H, as *cde*: their interfections determine the shadow, 1 2 3.

No. II. Is treated on the principles of No. II. in Plate XXXVIII. by finding the seat of its extremes, and ruling radials to A, as *a* and *c*; intersected from H as *b* and *d*.

No. III. Is an application of the same method to a flight of steps; whose bottom corner, *c*, is ruled to H, and the top of the same step to A, intersecting at 1. The seat of the second step is found at *b*, which, ruled to H, is cut at 2; the seat of the third step is at *a*, which is cut at 3; 4 is the interfection of the seat of the *further* end of the same face, which is found by letting fall a perpendicular from *g*, intersected by *aC*; in the same manner, is found, the seat of *t*; which likewise ruled to H, completes the shadow on the ground. The shadows of the higher steps on the lower are also ruled to H.

The shadow of the stick A is ruled to H, till it meets the step, whose perpendicular course it then follows; on the horizontal part of the step, it is again ruled to H; the shadow of its head, ruled to A, completes the whole.

## P L A T E XL.

IN THIS EXAMPLE THE SUN IS BEFORE THE PICTURE.

R, supposed place of the sun; H, its transposed *seat* on the horizontal line.

The shadow of the cylinder is ruled to H.

The shadow of the board on the top of the cylinder, and which falls on the cylinder, is found, by selecting as many points as are thought necessary between AB and BC; as at B; rule BH; where it touches the top of the cylinder, let fall a perpendicular; where that is intersected by a line from B to R is the shadow of B, as at L. The same for any other point, between A and B.

The shadow of the board on the ground is found by procuring its *seat*, as of ABC, at *abc*; which are ruled to H. The shadow of the wire *e* on the cylinder is found by ruling its *seat* *d* to H, striking the bottom of the cylinder in D; then erecting a perpendicular, which is cut by *eR* at E, for the place of the shadow of *e*: the same method procures G and F.

This figure exemplifies the method of treating columns, &c. in architecture, the shadows of square mouldings, &c. when they fall on columns, &c.

## P L A T E X L I.

No. I. Shews how to find the shadow of a globe enlightened by the sun: here we may observe, that the shadow of a globe is similar to that of a circle *directly* opposed to the luminary; by finding therefore the shadows of certain points in its circumference so opposed, we obtain the whole. R is a ray of light; V the center of the picture; 1 2 3 4 is a supposed section, describing the enlightened part: procure the seat of this circle on the ground, by perpendiculars, as 1 *a*, 2 *b*, 3 *c*, 4 *d*; rule lines parallel to R, from 1 2 3 4 for the shadow; and lines parallel to the ground plane from *a b c d*: their intersections ascertain the seats of the shadows of those points (1 2 3 4) in the original section; which, being joined, conduct the rest of the shadow of the circumference.

No. II. Is a globe enlightened by a lamp: now as the luminary is so near to the object, a much less portion than half the circumference is alone capable of receiving light. We have to suppose a similar section as before; 1 2 3 4; find their seats on the ground, by perpendiculars, as *a b c d*; rule L 1, L 2, L 3, L 4; and from the seat of the light S, rule intersections, as L 1 in *e*; L 2 in *f*; L 3 in *g*; L 4 in *h*. These points, united, indicate the shadow of the original section. Y is the center of the picture.

## P L A T E XLII.

No. I. In this example we have a wall (G), and, at right angles with it, another wall, with a doorway in it. HL is the horizontal line; the sun is supposed in the plane of the picture; the inclination of its rays, to be RH.

First, from the bottom of the projecting wall, rule a horizontal line to the bottom of the wall G; where erect a perpendicular, which, cut by a line from *a* parallel to RH, gives *u* for the shadow of *a*, which unite to *t*. Or, rule from R, *tu*, which equally gives the shadow of the top *ta* at *u*: *c* and *d* are exactly similar.

The shed D is shewn more distinctly in the following Number; the systematic lines are the same.

No. II. The wall B (to which the side of the shed *ws* is parallel) vanishes in L.

The wall A vanishes in H, the roof of the shed in G; T represents the inclination of the rays of light.

First, draw *Aw*, where erect *ws*: then draw R through *t*, striking the top of the shed in *u*; there remains now only that part of the shadow which falls on the roof. Rule G through *u*; intersect it by a line from *a*, parallel to the rays of light, as at *r*, which unite to *s*. Or this part of the shadow may be found, by ruling *Qh*, cutting *Ah* in *h*; then rule *hsr*.

## P L A T E XLIII.

Represents a house standing oblique to the picture.  $HL$  the horizontal line. The sun is in the plane of the picture; and his rays parallel to  $VH$ .

One side of the house ( $G$ ) vanishes in  $H$ , the other in  $L$ : these are too obvious to need explanation. The roof is supposed pyramidal, and a pyramid set on a cube is the same as if standing on a plane. *Vide* No. II. Plate XXI. Rule therefore diagonals to find its center, which is at  $A$ , where erect its axis  $AO$ , and to  $O$  draw its sides.

To represent the garret window; erect  $ac$ , and suppose  $b$  the height of the hole made in the roof; draw  $aO$ , then  $bHcH$  intersecting it: supposing  $m$  and  $x$  the extent of the window, erect there perpendiculars; these, cut by a line from  $b$  to  $L$ , give the square, and, united at  $c$ , the roof of the window.

To find the shadows cast on the roof of the house; lay a ruler from  $T$  through  $A$  striking the horizontal line in  $X$ ; erect  $XD$  perpendicular to  $HL$ , and continue  $TO$ , till it meets that line above  $D$ : rule  $DL$ , which is the vanishing line of the plane  $TOR$ , intersecting the plane of rays in  $Y$ , which is a vanishing point for the shadows on the roof. The shadow of the window is found, by ruling  $fY$ , which intersected by a parallel to  $YH$ , from the nearest corner of the top of the window-square, gives  $i$  for its termination. On the same principle the shadow of  $B$  is found: rule  $YPR$ , which intersected by a line parallel to  $VH$  from  $B$ , gives  $R$  for the shadow of  $B$ . The shadow of the roof on the chimney is found, by continuing to the top of the roof the line where the chimney and the roof meet, as at  $t$ ; through  $t$  draw  $Vtn$ ; or a line through  $w$ , parallel to  $VH$ , will strike the chimney in  $n$ . The figure  $M$  shews the chimney more distinctly; and that its construction resembles that of the window.

## P L A T E XLIV.

Explains as well the manner of finding the shadows of these objects, as their reflections. C is the center; H the vanishing point of the rays of light, i. e. the seat of the sun on the horizontal line.

This figure is a hollow cylinder cut open, its hither end parallel to the picture. To represent its shadow on the ground; find the seat of 3, as at 5, rule this to H, then rule 3 to M, their intersection gives the shadow. The shadows of the other corners are found by the same method. For the shadow of the edge on the internal hollow, rule  $ar$ ,  $bs$ ,  $ct$ , parallel to CM; then rule  $rst$  to C, and  $abc$  to M; their intersections describe the course of the shadow. The object being parallel to the picture, is perfectly circular, as also its reflection W.

The reflection of K is found merely by inverting its height as at  $k$ , the plane of the water being supposed to be continued.

The shadow of K on the cylinder, is found thus: from any point in the outer circumference of the tube, as 2, draw 2C; then find the seat of 2 on the ground, as at  $g$ , rule this to C; and where it is crossed by the shadow of K ruled to H, as at  $f$ , erect a perpendicular, intersecting 2C at  $q$ , for one side of the shadow: as  $u$  gives  $y$  for the other side of the shadow. To continue the course of the shadow, take another point on the circumference as  $r$ , find its seat, rule it to C, erect a line, &c. as before, and it gives S by its intersection with  $rC$ .

The shadow on the inside of the cylinder is found as before; parallel to CM rule  $at$ , and  $bl$ ; rule  $tC$ ,  $lC$ , which intersected by  $aM$ ,  $bM$ , give  $nm$  for the course of the shadow. To find the shadow of this object on the ground; procure the seat of 1 as at  $h$ ; rule  $hH$ , and  $1M$ ; their intersection is hint sufficient. The reflection is merely a counterpart.

## P L A T E XLV.

No. I. Shews the reflection of houses, &c. in water, whose principles are extremely simple. Procure the seat of the objects, and invert their perpendiculars as much below that seat, as they appear above it: ruling their perspective lines to the same points as the originals. Thus, *a* is the reflection and counterpart of *A*; but there being no reflecting medium between *B* and the spectator, *B* cannot appear inverted. *d* is the reflection of *D*; *2* of *1*, *4* of *3*, and *e* of *E*: these all vanish in *C*. *F* vanishes in *I*, and so does its reflection *f* of course.

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## P L A T E XLVI.

No. I. Shews that however the rays from objects, &c. and their reflections may appear to differ, yet in reality they are exactly similar: so that, the supposed reflective depth in the water of *CD*, and *EF*, is equal in appearance to the distance between those objects and the radial intersections.

No. II. If the little figure standing on the hill, be supposed to wish to represent the reflections, &c. of these houses, he would be able to shew but a small part of them, as in fact he sees little beside the house *E* and the tower *D*.

No. III. Exhibits a variety of objects whose reflections explain themselves, being exact counterparts. Of the sticks *D*, and *E*, the first being upright, its reflection is upright also: but *E* being allant, that part of it which is under the water, becomes *refracted* by the denser medium, and seems as it were broken, so that though it is a good rule to consider water as a mirror, yet by its transparency and refractive powers, it sometimes differs in its effect.

## LECTURE IV.

LADIES and GENTLEMEN,

WHILE on every subject there may be various, and often, contradictory, opinions, according to the aspects under which it is seen by different persons, we need not wonder, that on the principles of art, and on their application, the sentiments of professors should sometimes disagree. This happens occasionally on the study of perspective: while some masters despise that eye which does not (alone) sufficiently ascertain the natural appearances of objects, others think geometrical scrupulosity is indispensable, in every representation of nature. Shall I say that, both these extremes are to be avoided? or, shall I rather commend them both, and advise to unite them? Geometry alone never yet composed a happy, and pleasing, picture; and if the effusions of practice, unregulated by just theory, may have attained to veracity and correctness, I have not been so fortunate as to meet with such instances.

But, of late, since science is fashionable, and every offered assistance is generally received with avidity, it is much more common for artists to depend on the dogmas of science, than on the observation of  
Nature;

Nature; infomuch, that geometry has been considered as the soveraign, rather than as the assistant of Perspective; and because, hereby we procure such and such representations of objects, it has been asserted (somewhat prematurely, as I suppose) that these representations are conclusively accurate, and demonstrative.

I flatter myself, not any of my auditors whom I have had the honour to address in the preceding Lectures, will entertain a thought, that I am insensible to the advantages arising from mathematical assistance, or that I undervalue our obligations to that science, which alone has afforded, or can afford, certainty and exactness to the study of perspective; and yet I cannot entirely acquiesce in attributing absolute puissance to geometrical inductions: nor do I think such assertions would have been made by writers on perspective, if they had extended their views, and considered NATURE as the supreme authority throughout the imitative arts.

But, since I avow this sentiment, I request your indulgence, while I notice some differences between the effects of geometry and those of perspective; or, rather, I shall offer remarks on a few particulars, in which the rules of both sciences are inadequate to the requisitions of art.

To define perspective, perhaps I should call it a regulated imitation of Nature; in which imitation it receives much assistance from geometry: but, in some instances, geometry is quickly super-

feded, and even perspective fails in its application. We have already observed, that some articles are too minute, or too trivial, to engage the attention of perspective: others depend not on mathematical rules, but on the operations of Nature at large; a reference to which, will not, I hope, be deemed impertinent. Should we request a geometrician to determine the boundaries of an extensive prospect, he would not only find the undertaking more difficult than he expected, but even absolutely impossible to strict geometry: for, by geometry he would *prove*, that the height of a man being supposed five feet, the extent of his vision should be confined by the horizon at about the distance of three miles, on level ground: whereas, we really inspect much farther; because the same principle which occasions twilight (I mean the refraction of the air) elevates apparently the distances of the prospect before us, and renders them visible to us, although in fact they are geometrically *below* our horizon: much after the same manner as a piece of money at the bottom of a fit vessel is rendered visible by the accession of water.

It is not seldom this fact can be demonstrated on land, but at sea it is of perpetual utility; for, hereby the tops of hills and lands are raised up in the air, so as to be discoverable several leagues further off, than otherwise they would be: and this refractive power in the air, is more sensible according to the greater distance wherein it has to act, and the quality of those vapours it contains: to the very great benefit of some parts of our globe.

“Very

“Very far North,” says Captain JAMES, who wintered up Hudson’s Bay, “we found the sun to rise twenty minutes before it should, and in the evening, to remain about twenty minutes longer than it should”—and this refraction shortens the polar winter a whole month; as well as prolongs every day the cheerful sight of the sun in those parts.

The refractive power of the air, has also a remarkable effect on the form of the sun, and the moon, when near the horizon, changing them, from the circular form of which we know they should be, to an oval form, and, especially, raising (and thereby flattening) the under limb, so much, that the general form of the object is of no true mathematical figure: this I myself have observed in a considerable degree: though I suppose no degree which ever occurs in this country, can equal what often occurs in the north.

But not to one region only is the principle of aerial refraction confined, for, in the warmer climates of the east it has its influence. Dr. SHAW, speaking of Arabia round about Mount Sinai, informs us, that when these deserts are sandy, and level, the horizon is as fit for astronomical observations as at sea, which at a distance these parts nearly resemble. It was there surprising, to observe in what an extraordinary manner every object appeared to be magnified; for a shrub seemed as big as a tree, and a flock of Achbobbas (birds the size of a Capon) might be mistaken for a caravan of camels. “This,”

says he, "seems to advance about a quarter of a mile before us."

My auditory will readily perceive, that in order to render this observation sensible, and evident, I have selected instances more remarkable than our temperate climate affords; but, suffer me also to add, that we are not without effects arising from this cause, which are more considerable in summer, than in winter, and perhaps at the morning, than at the evening, twilight.

To apply this to the subject of our immediate attention, I think I may venture to say, not only that we see remoter objects than, geometrically, we ought to see, but also, that objects situated at some distance from us, appear larger and more distinct, than their geometrical situation would indicate.

Moreover, I cannot help thinking, that, in structures of very great extent, this principle has its effect; and, that the remoter parts of such structures are not always so greatly diminished as geometry would determine, or, as we see them represented; for, if they were, such ranges of buildings as—the palace of Persepolis, or—as some of the Italian aqueducts, or—as even some of our own streets, would be nearly invisible at their further ends. Neither, in my opinion, are the distances always so evanescent; for, not only in dimensions, but in effect, the rules of geometry are occasionally evaded by objects, as it does not always happen, that, their force decreases according to their geometrical distances;

tances; but, by a variety of accidents, arising from the vivacity of the light, or from the rarity, or the density, of the circum-ambient air, they vary considerably from their prescribed effects. Nor indeed is perspective itself infallible here; for, if we suppose ourselves to have taken the most accurate view (of a distant town for instance) while the sun has been obscured by clouds, should they be suddenly dissipated, and the sun shine full on that particular spot, it would scarcely seem the same place which we had been designing: or, perhaps some gilded weathercock, just moved by a little shift of wind, may gleam irregularity into the *keeping* of the piece: or some white object may so far surpass its neighbours, as to be extra-distinguished among them. I have often noticed houses at a distance, perhaps, barely sufficient to ascertain them, or their forms, when suddenly, by the parting of clouds, the sunbeams have been reflected with great splendor, even from windows which before were imperceptible. This often happens in the evening, to houses built on hills, and to other objects which are highly elevated: in fact, the article of light is among those least subject to rules, and while it is undoubtedly an indispensable ingredient, it is perhaps the most deceptive of any in a composition.

Is this an advantage, or a disadvantage? An advantage, very certainly, to those who know how to improve it; for, as the variety of accidents which sudden transitions of light occasion, is endless, it furnishes

nishes innumerable opportunities for selection, and for choice, to whoever has skill to choose aright.

You must often have noticed this:—while the sky has been darkened with clouds, sometimes they would separate, and permit a broad passage for the sun-beams; then, gradually closing, they have contracted the illumination to a mere span; and the effect of this light has been various, according to the objects whereon it has fallen; whether on fields, on meadows, on waters, on towns, on gilded turrets, or, on humble thatch: whether on barren waste, or on cultivated land; on woods, on parks, or on corn fields. Which latter objects, be it observed, have, when agitated by the wind, an agreeably graceful movement peculiar to themselves, in the gradual bending, and waving, of the golden grain; to which effect the light very much contributes. If to the idea of clouds, and their intervals, you add that of a brisk wind, impelling them in rapid succession one after another, you may easily imagine its effect on the light, and the perpetual change of illuminated appearances resulting from this alternation; every object being by turns enlightened, and darkened; now resplendent, now gloomy; presently emerging from obscurity into demi-tint; or from demi-tint becoming obscure.

It is, nevertheless, very certain, that these accidents, although exceptions to general rules, by no means supersede their utility: they only prove that Nature offers an infinite variety for our amusement,

our

our recreation, and our study. Happy the Genius, whose enlightened skill attains to an agreeable imitation of them! Happy the Artist, whose works, instead of tedious similitude, present those striking, and energetic, compositions, which are visible alone to the ingenious, and to the well-informed!

This may be a proper place to enquire by what principle some objects, or some parts of an object appear to advance, and others to retire. It is, because the light from that part of a surface nearest to the eye, has so much greater force than that from the further end of the same surface: this effect, although dependent on the principles of perspective, is yet very much changed by the obliquity of a surface, by the situation of a luminary, or by the nature of an object; all which causes vary the degree, and the force of reflection.

In looking at this mahogany table, the hither part of its surface, that adjoining the edge nearest to us, seems enlightened; this light at a very small distance indeed, becomes moderated; a little further off, it is yet more decreased, and, as we advance toward the other extremity, it ceases to be light, and may rather be denominated a slight shade. This effect is very gradual, regular, and constant, because the surface is uniform; and, consequently, its obliquity or declination from the eye is uniform also: but, if in any part of the table we place a surface somewhat more elevated in its position (as this drawing-board) the nearest edge of that surface does not perfectly correspond in its degree of light with that

part of the table where it is placed, but the light is some degrees brighter, and, as it were, sets off afresh on this new surface from its hither end, gradually decreasing to its further end; the waving of grain in a corn field, whose agreeable movement we have noticed, depends much on this: the various directions of the undulating surface, perpetually distinguishing themselves, by breaking the uniformity of the general plane.

But, if instead of a flat superficies, we observe this circular silver vase, the gradation of tint is much more rapid, and from the brightest light to the strongest dark, is but a small distance, in proportion to the circumference of the object. The brilliancy of polished metallic bodies depends entirely on this principle; which, however regular in itself, is too much diversified in its objects, to submit to the rules of perspective; since the forms of objects (which greatly contribute to this effect, and correspondently vary its power) are infinite. This principle, together with an accurate understanding, in the article of reflections, is among the higher Studies of Art; and, when happily applied, nothing more decisively demonstrates superior abilities, or the GREAT Master: for not only veracity, and I may add deception, depend on them, but also harmony, and repose.

A word, or two, on the Article of REFLECTION in shadow, may, here, with propriety, receive our attention.

I know not how better to explain this article, than by recollecting the order in which we have traced

traced the retiring shade: correspondent thereto, observe, that, the nearest end of any surface which is in shadow, seems more deeply shaded than the further end; the shadow in receding being weakened, as it were *diluted*, by degrees, and becoming lighter, and lighter. The very gradual diminution of the force of the shadow prevents this from being conspicuous in adjacent parts; but when we compare the extremes, it appears unquestionable. The result is, that a greater strength of light, accompanied by a greater strength of shade, brings forward those objects to which it is applied; while a correspondent privation of both, or, mutual advances toward each other, produce the appearance of recession, and distance.

The cause of this is, perhaps, not very difficult to assign; for, if we consider, that the rays of light are perpetually diverging in every possible direction, it follows, that in a more extended space, there is room and opportunity for the action and the effect of a much greater number of such rays, than there can be in a lesser space; therefore, although by its nearness to our sight, the hither end of a plane surface appears dark, yet, while the air is illuminated, it interposes so much of its illumination between the distances of that plane and our sight, as prevents the shadow from arriving at our eye with equal strength. Thus it appears, that the air moderates, and diminishes, the resplendence of light, and that it has the same effect also on the obscurity of shadow, endeavouring, as it were, to impart its

own colour to both: and this endeavour it accomplishes, in a space sufficiently extensive; as appears by the azure colour of distant mountains, and in other particulars. This reasoning is strengthened, by remarking, that when the air is deprived of light, every object, distance, figure, and form, is concealed and disappears.

The foregoing analysis may be adapted, not only to objects deprived of light, but also to shadows themselves; which, by increased distance from their origin, and cause, become less determined, and less forcible. When the extremes of a shadow fall on a superficies, near to the shadowing cause, the outline, and the form, of the shadow is very accurately defined, and represented; but, when the object intercepting the light, is at some distance from the superficies whereon the shadow falls, the extremes are confused, weak, and indeterminate; because the rays of light have more power, and are more in number, are more reflected and refracted, as the interval is increased.

The article of shadows is very important; under good management, they contribute greatly to distinguish distances, and to separate objects even though related in colour: for instance, if two walls, of equal height, one behind the other, have but a little space between them, they may possibly seem a continuation of each other; but, if the direction of the light be in the same plane as the walls themselves, it will shine *between* them, and, by this effect, part them: or, if the shadow of one falls upon the  
the

the other, it will equally imply a separation, and distance, between them.

When a shadow is of considerable extent, the objects which are immersed in it, are not enlightened from the same quarter as the object casting the shadow, but by reflections from the opposite quarter; so that, the lights and shadows are situated *reversely*. A person standing under the shadow of a high wall, which shadow falls to the left, will receive a reflected light from the left, and he will cast to the right a shadow on the wall, against which he stands: always supposing no impediment to be interposed, but the air to be free.

Reflections are very much confused, and intermingled, by partaking of luminous rays emitted from other bodies; and, especially, if the reflecting object be near the shadow, it very strongly enlightens it: as that Lady's white dress reflects so clearly on the shadowed flap of the table, as to *whiten* the shadow.

These particulars, and many others which are allied to them, are by no means proper subjects of perspective regulation; they must be studied from Nature; as must also the reflections of colours; for every colour emits rays according to its tint, and these rays colour (or rather, perhaps, discolour) other objects on which they fall. Thus, when a group of ladies stand together, the white dress of one will receive a tinge from the coloured dresses of the others: from a pink, it will become pinkish; from a green, greenish, and so on: while, like a sociable neighbour, it returns the compliment, and renders

renders whitish those parts of the coloured dresses which are nearest to it. On the same principle, when the sun shines on a red carpet, the reflection from the carpet will tinge the ceiling with a reddish hue, and the carpet will receive a whitish tint from the ceiling in return.

It may be worth while, just to observe here, that we consider the reflection as equal to half the direct ray of light, in force, and the re-reflection as equal to half of the first ray; thus, diminishing half its strength continually, it soon becomes too feeble to claim our regard.

It is not very common to consider these principles as forming part of perspective, yet, as they seem to me to be very closely allied to this science, I have ventured to introduce them; and, perhaps, if greater attention to the effects and appearances of Nature, were more commonly introduced into treatises on the subject, the reasonings, and the illustrations, to which such appearances give occasion, might relieve, and entertain, as well as direct, and instruct, the Student, to great advantage.

After having in some particulars speculated, as it were, on extensive, and remote, effects, I shall now, request attention to what more immediately belongs to ourselves; for, after we have investigated objects of every kind, we nevertheless, return with peculiar complacency to the human figure.

We have, on former opportunities, noticed the proportions, the movements, and the appearances, of the figure; and the principles we then illustrated  
and

and adduced, are unquestionably of great utility : but, by this time, I may venture to hope, that we are prepared to regard them also as influenced among other causes by Perspective. An inanimate subject, being void of motion, may be measured to the utmost nicety, and the correspondence of its parts may be determined, minutely ; but in a subject perpetually shifting its situation, and varying its forms, if we fall short of this accuracy we are not to be surprized. Not that I am about to undervalue the most correct and accurate measurements to which the human figure and its parts have been subjected, but, merely to notice some circumstances arising from perspective, of whose effects it is of importance to be apprised.

When I stretch out my arm to its full extent, that person to whom it happens to be in a strait line, sees, properly speaking, little of the arm ; but, the hand might, for aught that appears to him, be united immediately to the shoulder. This, is an extreme instance of a principle denominated *foreshortening*. The same may be the situation of the leg : and, in fact, all the members are capable of it from joint to joint, in a greater, or a less, degree. To comprehend this more fully, we have only to survey a plaster figure ; and we shall find as we move around it, the members assume an infinite variety of aspects. Suppose it, for instance, to be a figure kneeling, in which case the leg from the knee to the foot is parallel to the ground ; on one side of this figure we see the whole leg at its full extent, but by walking round it a little, the distance between the knee and  
the

the foot seems, gradually, to lessen, and lessen; till, at last, the further parts are greatly concealed by the nearer parts: or, at least, they appear receding, and, as it were, flying off.—This is evidently an effect of Perspective; but this is reducible to no laws, whose application is determinable, since what may apply to one member, or to one attitude of a member, may not suit another member, or another attitude.

Foreshortening is, perhaps, of the greatest consequence, where, only, this flying off, or recession, is to be represented: and such instances are perpetually occurring; no attitude can be without them in some of its parts: the principle runs through every member of the figure, and, according to the dimensions of a member is more, or less, apparent. Thus, the arm laid on the table, is foreshortened (to a spectator) from the wrist to the elbow; the fingers are foreshortened in some respect, or other, be the position of the hand what it may. In our imitation of this effect, beside accuracy of outline, the application of that retiring shade we have noticed, is principally to be depended on: for, by its influence in moderating the brilliancy of the parts foreshortened, it seems to increase the vivacity, and the force, of those where the light strikes; as, the front, principally: or, wherever the parts receive another direction, as in the already exhibited case of the drawing-board; so that, it appears, foreshortening and the retiring shade are so closely allied, that where one acts as a cause, the other follows as an effect.

As

As extreme instances of foreshortening — Perspective has been applied, with very powerful effect, to figures placed in particular situations; such as, high up on the sides of large halls, or other great rooms, on ceilings, and on other planes, not vertical to the eye in its usual exercise. That some of these subjects are ornamental, I shall not deny; but, that they are always well chosen, is more than I incline to assert. We have instances of figures represented in such situations (as on a narrow projection; at the height of an hundred feet or more) that the first sentiment they raise in a spectator is, that of fear,—for should they fall, the fall would be fatal. We have instances also of naval triumphs, and, connected with them, of dashing waves, on the coving entablatures of ceilings: surely the eye must be pardoned, if the first emotion it suffers from such representations, is, wonder how the sea should come there, and how it should there abide! To be sure, when an artist has taken the trouble to make a sea, whether stormy or calm, he may claim a right of putting his sea where he pleases; but we may be allowed to wish, instead of exercising his right, he had exercised his judgment; then had he pleased not himself only, but also judicious spectators.

Ceiling pieces are, however, the great instances of perspective foreshortening, &c. in figures; and there are many examples in which such principles are very happily applied; but, this is not the only species of art, in which, after a great master has

originated, and applied, a new principle, his imitators have carried it to excess. The immense concave of a cathedral dome, may require a management, and an effect, very different from the ceiling of a parlour, or a dining-room: that which is so very distant from the eye, and which the spectator knows to be really, as well as apparently, remote from him, may be indulged in [some peculiarities, and even in some liberties, of representation: but, these form no justification for the introduction, or for the unwise treatment, of subjects, whose real distance from us, is but trifling, and which the eye cannot but estimate at little beyond arm's reach. I own, I do not like to see a croud of heathen deities sprawling about—foreshortened into thickneses of every form—and displaying, what mortals ought not to display—on the ceiling of the room, where an elegant company is at dinner: if we take them for real personages, they seem ready to drop on the table; if they be mere ornamental representations—would not propriety choose other ornaments? These remarks apply to those immense compositions which beload some ceilings, under the idea of magnificence; without censuring cheerful embellishment, simple subjects, pleasant, agreeable, lively representations, such as do not imply the *gain* of a broken neck, by reason of the time spent in inspecting them, and perhaps, mispent in comprehending them. Let the subjects also suit their stations: celestial glory in a church;—but celestial glory is no subject for strict perspective: neither is an airy,

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expansive,

expansive, variegated, sky, which, with ornamental accessories, in moderation, may become a palace. If figures must be had, the lighter they are the better; and if perspective representation be indispensable, let rather dexterity than rigour conduct it. We have commended the effect of retiring shade, but on these kinds of subjects, the best effects result from retiring light: when, in, or near, the center of the composition, an idea of infinite distance is suggested, by artful management, the effect is usually grand, and magnificent, while it is also cheerful and pleasing.

To descend from these higher regions of imagination, let us now advert to the appearances of objects much more readily offered us by nature, and much more commonly subjected to the exercise of art.

We return now, to what we have said is closely allied to foreshortening,—the retiring shadow: which may elucidate (more, I think, than is usually supposed) the nature of *finishing*; finishing is simply the bestowing on each part, or place, that tone of colour, and tint, which is proper to it. Thus, suppose the brightest light to be in the middle of an object; a globe, if you please; around this bright light the tint is lowered one degree, around that tint, it is lowered two degrees, then three degrees, and so on; retiring from the bright to the obscure. On this principle, a man's head may be finished, being rotund; not round; but roundish: and so may most, if not all, the members of the body; which

also are not round, but roundish: the various inflexions of the parts, catching indeed, various lights, yet not superseding the general principle of the whole, or, disturbing the keeping of particular parts.

Keeping is, I apprehend, neither more nor less, than, nicely adjusting, and representing, the various tones, and tints, proper to each part; and is readily intelligible from what has been just delivered. Strong lights and shades are proper in front, and in the principal stations, where force is required; and weaker, gradated, and more tender colours in subjects meant to retire.

LADIES and GENTLEMEN, I have thus offered my sentiments on the subject of PERSPECTIVE, as succinctly as possible, and as clearly as I could: I hope I may flatter myself that I have been well understood by my auditory. The importance, the universality, and the constant recurrence, of these principles, have induced me to wish, that, they were generally promulgated, not in the shackles of technical terms, or of abstruse disquisition, but in easy lessons, and in colloquial language. I have done my endeavour, and heartily wish the example may be prevalent. I am not afraid, that (as is said among the faculty, if the simplicity of remedies were known, their efficacy would be denied) I am not afraid, that the facility of the rules I have laid down, should hinder either their application, or their popularity, since, I think, to say of principles they are correct, and to add to correctness, simple and easy, is the highest panegyric of scientific instruction.

A panegyric

A panegyric on the principles of Perspective would be a noble subject for the eloquence of an orator! he might shew its wonders in the microscope, which renders visible *animalcula* thousands of times too small for human vision; he might congratulate his hearers on its utility as connected with our constant occupations, and our daily exigencies; he might trace its effect in the solar orb, and observe the peculiarity of the planetary shadows: he might demonstrate the connection of perspective with the azure heavens, and calculate thereby the various stations of the stellar fires; he might amaze his hearers with the distances of the brightest, and astonish them at the intervals of the paler: those but discernible by the art of man, he might express by the days, or the weeks, or the months, of their light; and might then——No, let him stand, rapt in reverence to that power and goodness, which has imparted to humanity such intellectual capacity, and such energetic genius!

End of the LECTURES ON PERSPECTIVE.

\* \* \* To those of our readers who may not have at hand a plaster figure, proper to elucidate the principles of *foreshortening*, we recommend the inspection of a coach wheel, as a simple instance in point. In looking at the wheel in front, all the spokes seem equal and alike; but in an oblique view, they are greatly changed: the uprights preserving their dimensions, while those on each side are apparently lessened, in proportion to their nearness to the horizontal spokes; which are more *foreshortened* than any others.

††† The peculiarity of the planetary shadows is, their diminution as they are prolonged; for the sun being very superior in size and extent, to the bodies which cast them, the shadows of such bodies (as of our earth for instance) are constantly converging, till, at length, they terminate in a point: so that the rays of the sun are not *absolutely* parallel among themselves, though they be parallel to the purposes of perspective.

## P L A T E XLVII.

## REFLECTION OF LIGHT.

Fig. 1. It is always to be understood that the angle of Reflection and the angle of Incidence are equal: so that  $B, A, C$ , is equal to  $C, A, D$ , and *vice versa*. Wherefore if it be desired to know where the ray  $B, A$ , when reflected from the surface  $e, A, g$ , will strike the perpendicular object  $I, K$ , we erect from  $A$ , the perpendicular  $A, C$ , and make  $A, D$ , an angle from  $A, C$ , equal to  $B, A$ , which gives  $D$  for the point sought.

Fig. 2. When instead of striking an object situated direct, it strikes on one situated obliquely.

Suppose the line of obliquity be,  $e, A, g$ , which prolong to the bottom of the perpendicular object, as at  $E$ ; where erect a perpendicular line: erect also the perpendiculars  $e, f; A, C; g, h$ ; and transfer the heights  $f$ , and  $h$ , of figure 1, to this: then, if the ray be  $B, f, A$ , the reflection will be  $A, h, D$ ; being the point of intersection with the line  $E, D$ . The re-reflection follows the same law.

Fig. 3. Exhibits the same principles, further applied to sundry subjects.  $B, A$ , is a ray of light, which falling on this side the shadow of the board, produces no effect; because its reflection,  $A, D$ , is spent in air; but  $b, a$ , by its reflection  $a, d$ , striking the corner of the board at  $d$ , very much enlightens that under surface, which else would be altogether in shadow: and as all following rays advancing toward  $I$ , would be reflected further on the shadow, it follows, that the whole course of this edge of the board will be enlightened, by such reflections. Now if the ground  $A, a, I$ , be supposed green, the light reflected from it, will render the under part of the board greenish; if it be red, the reflection will be reddish: and so of any other colour.

Fig. 4. But beside the reflections which from the ground may strike upon any object, reflections from objects may (*e contra*) strike upon the ground. As for instance; though no ray of light can pass through the stone,  $B, o, X$ , (whereby the whole surface from  $X$  to  $A$ , is kept in shadow) yet from  $B$  to  $A$ , all may pass freely; and so from  $A$  to  $D$ . By the same rule it will follow, that a ray of light  $E, D$ , may pass by reflection to  $A$ , and so to  $B$ ; now though such a ray would have no effect on any shadowed part, yet a ray to  $M$  would be reflected to  $N$ , and so to  $o$ ; of consequence, all the rays falling between  $D$ , and  $M$ , would be reflected on the space between  $A$  and  $N$ ; thereby enlightening it very considerably; while the part from  $N$  to  $X$  remains dark, being visited by no reflections. As these stones are not parallel but oblique to each other, the shadow of the stone  $B, e, l, X$ , is described by the lines  $A, t, c$ ; so that a portion of the further end of the shadow  $t, c, 2$ ; and  $2, u, t$ , will also be without reflections, and consequently dark. It is true, that in nature, this shadow would be nothing near so visible as here represented; because a variety of rays of light dispersed in the atmosphere, or reflected from various parts, would confuse it by their mingling among it. It would also be further softened by the principles of KEEPING.

## P L A T E XLVIII.

## KEEPING. PLATE I.

Keeping consists in giving to each part that tone of color, and strength of light, or shadow, which is its due: its purpose is, by means of making some parts seem to recede, to make others, by comparison, appear to advance. As to tone of color, we relinquish that here: but as to gradation of light and shadow, we have thought a few examples might be useful. For this purpose,

Fig. 1. The upper figure shews a number of cubes, the light coming on one side; these preserve their distance, and effect, by the influence of the air, but they differ in appearance from columns: because in the circumference of a column no two parts are precisely at equal distance from the eye; but if we take the nearest point in the circumference, all other points are further, or if we take the furthest, all other points are nearer; but in square bodies this is not the fact; the whole front surface being directly opposed to the eye, and equally distant from it. Hence arises the flatness of its appearance; and the no-reflection of its face, so situated. Nevertheless, the further parts of a face obliquely situated, are affected by reflection; and, if light, are darkened; if dark, are lightened; by which they seem to recede from the eye.

Fig. 2. Exhibits the same objects, with the light coming on them in front: now as we see objects, only by means of the light they reflect to our eye; we may expect in this situation of the light that it will be reflected from these objects to us with the greatest vivacity; because most direct: the light then from these squares will be most sprightly and vivid, but it will also obey the same laws, in respect to distance and keeping, as regulated the figures above.

## P L A T E   X L I X .

## KEEPING. PLATE II.

Represents in its upper figure a number of cylinders, the light coming from behind them toward the spectator; on which we remark that the further objects are least distinct, least strongly enlightened, and least strongly shadowed: whence they communicate the idea of distance. The reasons are evident: (1.) They are diminished in size, therefore occupy least space on the retina. (2.) The light reflected from them has a further distance to pass through to the eye than that reflected from the front objects; and, if this passage be through a dense medium, in proportion to such density, will be the feeble effect produced by the light so reflected from them. (3.) This must be referred, not only to the enfeebled powers of the light, but also to those of the shadow, inasmuch that in the same proportion as the lights are obscured, the shades are enlightened, approaching toward the color of the air, and in consequence, these distant objects appear unequal in brilliancy and vivacity to those which are nearer the eye.

The lower figure exhibits the same objects, with the light coming sideways upon them; whereby they are considerably more enlightened, and a greater breadth is obtained; but they continue to appear either to recede, or to advance, on the same principles as before. These figures being round objects, their roundness produces a kind of shade on their enlightened sides, caused by the obliquity of the rays of light reflected from them: as on their darkened sides, their roundness produces a kind of enlightening, which is occasioned by the admixture of light reflected from around, on these parts; which, debasing as it were, the shadow, softens it into somewhat of lightness.

## P L A T E L.

## KEEPING. PLATE III.

Though we said before, in order to render more sensible the difference between round and square bodies, that the whole surface of a square opposed to the eye is uniform, and flat; yet this must not be so strictly taken, as if in plane surfaces of considerable extent, all parts affected the eye alike. Suppose the eye *O*, to survey the vertical plane before it: it will receive a true and perfect image only of that part which reflects the direct ray *O, 1*, whose plan is *A, B*: this line it examines perfectly (especially in the center *1*, less in the point *2*, less still in the point *3*): but the line *O, 5, 4*, whose plan is *A, 4*, being oblique from the direct ray, loses force in proportion to the quantity of its obliquity; as appears yet more strongly by the line *O, 7, 3*, whose plan is *A, b*; for the angle made with the direct ray by this line, being very large, it can depict on the retina of the eye *O*, only an imperfect glimmering.

Fig. 2. If the effect of oblique lines in regard to the same plane be so considerable, when that plane is directly opposed to the eye, the effect of planes oblique to the eye, and still more, of oblique lines deflected to the eye from oblique planes, must be very considerable indeed. To render this more sensible, in this figure several planes are beheld by the eye *O*: the plane, *1*, is direct to it; but the plane above it *2*, is oblique; and so is the horizontal plane *3, 4*; and the ceiling *5*; it will follow—that of these planes, the plane *1*, will make the most vigorous impression on the eye, and indeed, will be the only one perfectly seen by the eye.

To illustrate this yet further, suppose that each ray from the eye shot a little ball against these planes, and that such little ball rebounded from them; in such case, the ball *1*, being shot direct, would rebound direct, and return along the line *1, O*, but the other balls would rebound according to their angle of incidence: *O, 2, O, 3, O, 4, O, 5*, and would fly off still further from *O*. If these balls were shot with design to strike forcibly, and to damage the stone where they struck, only the ball *O, 1*, would produce its full effect; the obliquity of the others depriving them of half, or more than half, their power; from whence we may easily conceive the diminished reaction of these respective points on the eye *O*, which sees them only by the light they deflect to it.

## PLATE LI.

## KEEPING. PLATE IV.

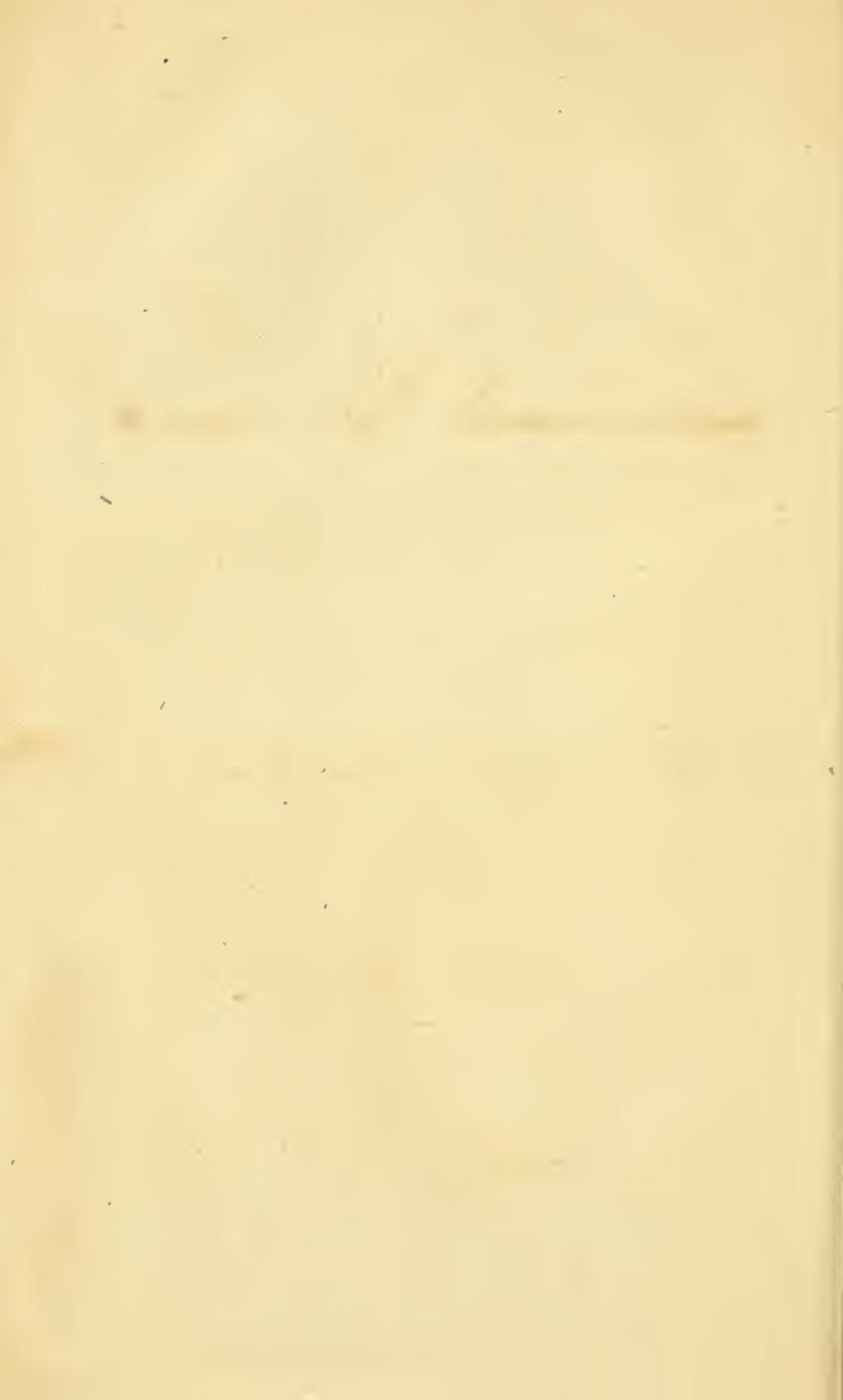
The upper figure illustrates the same principle as the former plate, but in relation to round bodies: for such a body may be conceived of, as formed by a number of planes in various directions. In this case, the point 1, answers to a vertical plane, and the ray O, 1, will have the strongest effect either from the eye O, on the point 1, or, *vice versa*, from the point 1, on the eye O: for all the other rays are weakened by their obliquity, O 2, and O 3, will be stronger than O 4: O 5, O 6, O 7, will be enfeebled indeed, insomuch, that if the back ground to these points was adjusted to them, in color, &c. the eye would not be able to determine the course of the outline.

Fig. 2. Endeavours to realize the principles of AERIAL PERSPECTIVE, by supposing the eye O, to inspect six sticks placed conveniently before it at different distances, and seen by it through different media. If the air was perfectly clear (which it never is) the difference between the first stick and the sixth might be inconsiderable; and only referred to its diminution in size: but if the air was vaporated to the density of A, the eye O, might be able to see the sixth stick but faintly; if the air was vaporated to the density of B, No. 6, might become invisible; and No. 5, only be discerned. By the same rule, at the density C, No. 4, would be the limit of sight; and so on, till at the density *e*, the stick No. 1, or at most No. 2, would be visible.

This subject may also be thus explained: an object seen through a smaller quantity of medium (supposing now the medium to be of uniform density) is more distinct than another object seen through a greater quantity of the same medium: thus, if at the distance O 1, the power of the medium to obscure a stick be as A, at the distance O 2, it increases to B; at O 3 to C; and so on. So that if these distances be supposed extensive, no wonder that at the distance 6, the quantity of medium equals in power of obscuration the tint E. From this principle arises the whiteness of the sky next the horizon, the blueness of distant mountains, and the distant gradations of landscape.

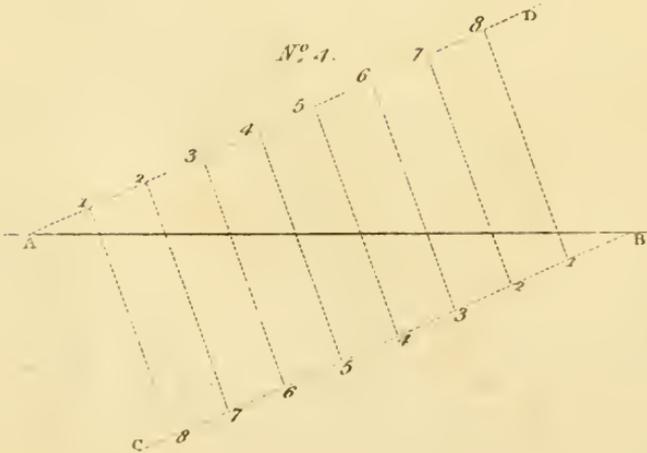
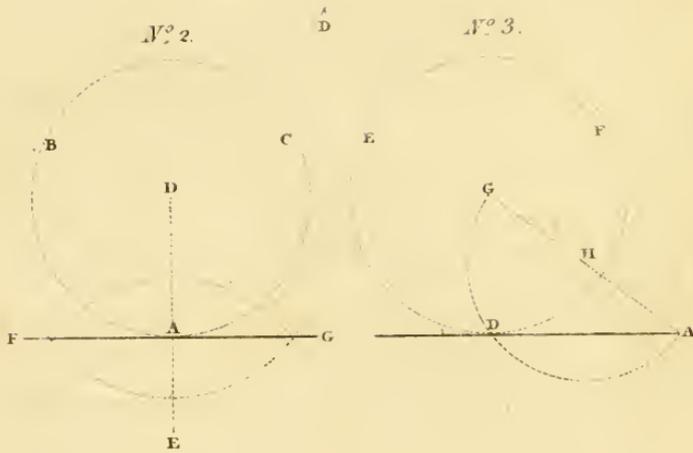
The history of the city of Boston from 1630 to 1800 is a story of growth and struggle. It begins with the arrival of the Puritans in 1630, who sought a place where they could practice their religion freely. They found a rugged coastline and a small settlement that would become the city of Boston. Over the years, the city grew in size and importance, becoming a major center of trade and industry. It was a place of innovation and progress, where new ideas and technologies were often first developed. However, the city was also a place of conflict and controversy. It was the site of the Boston Tea Party in 1773, a protest against British taxation that led to the American Revolution. The city was also the site of the Boston Massacre in 1770, a tragic event that further fueled the revolutionary spirit. By 1800, the city had become a major metropolis, with a population of over 100,000 people. It was a city of great wealth and power, but also a city of great diversity and complexity. The history of Boston is a testament to the resilience and ingenuity of its people, and a reminder of the challenges and triumphs of a young nation.



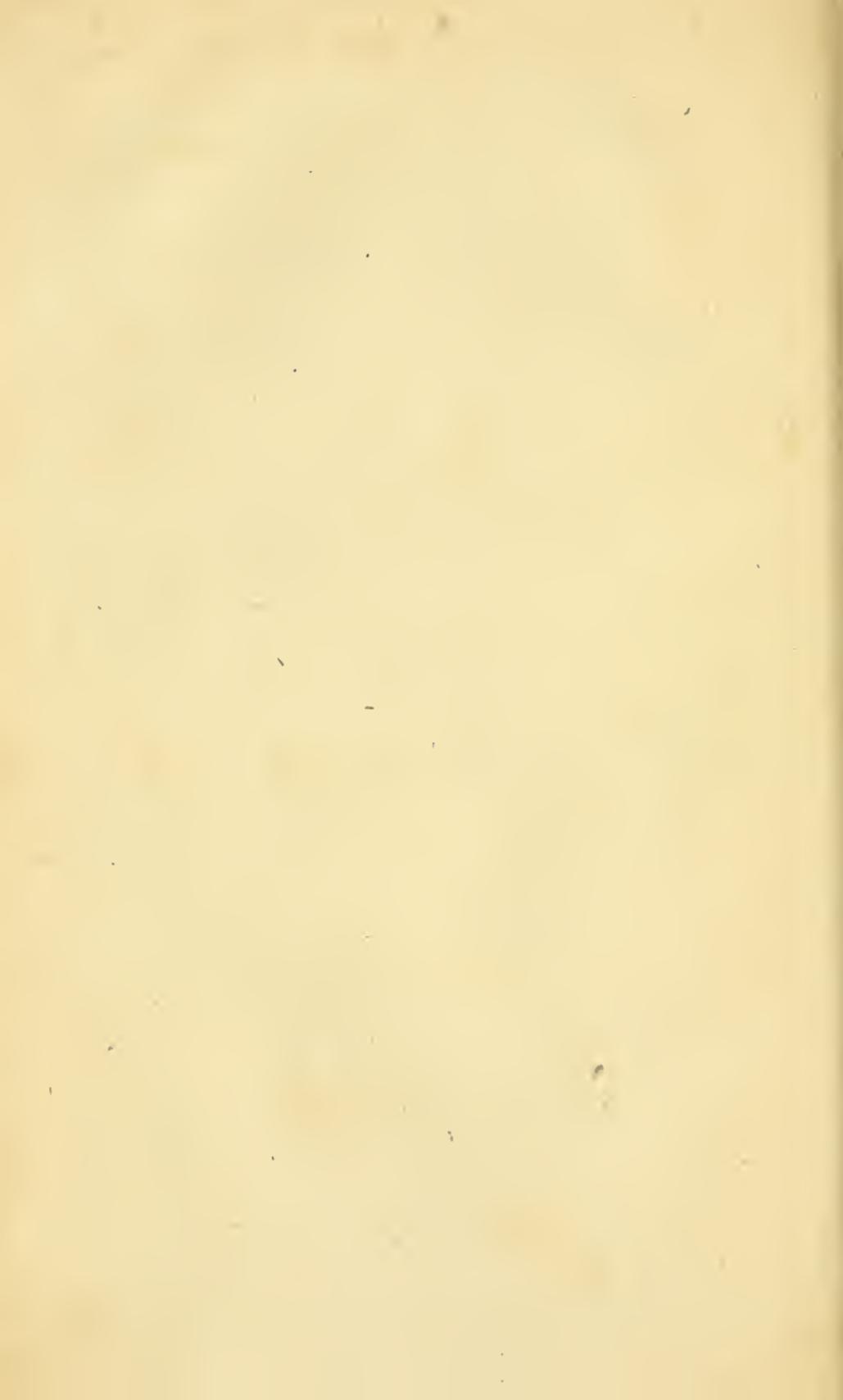




N<sup>o</sup> 2.

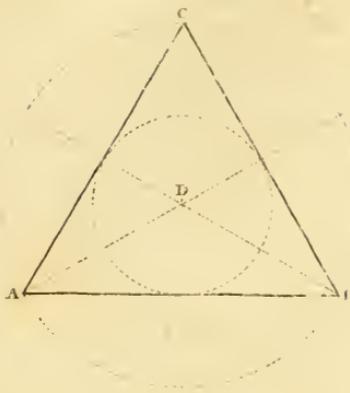




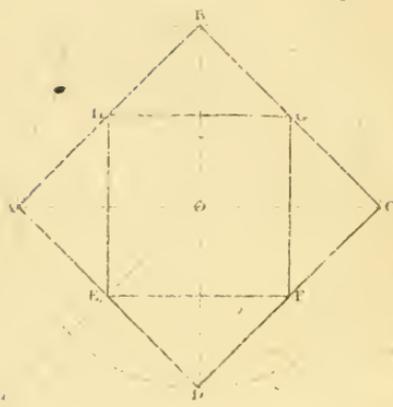




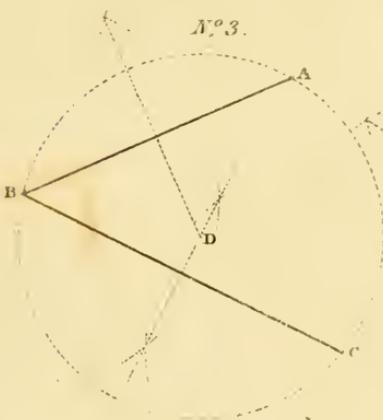
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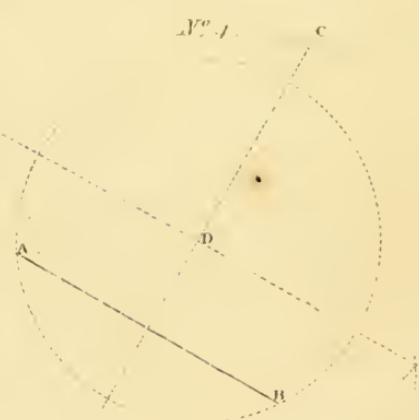
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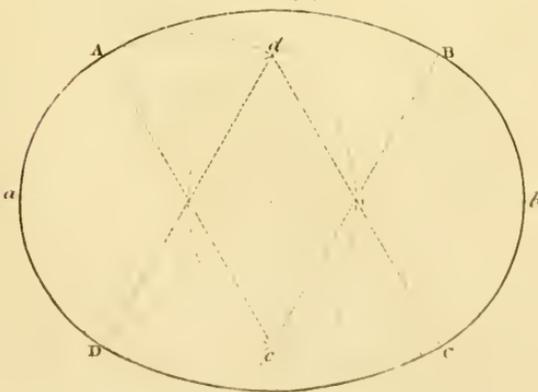
*N<sup>o</sup> 3.*



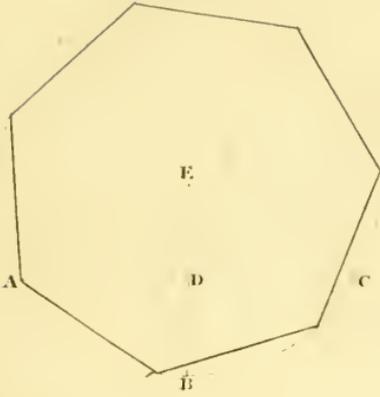
*N<sup>o</sup> 4.*



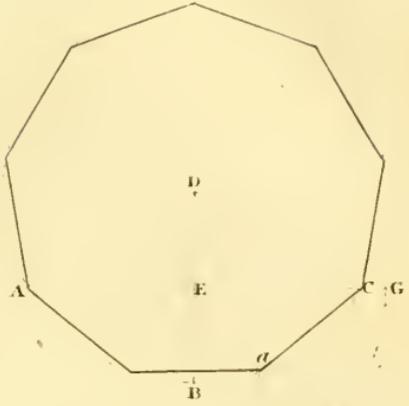
*N<sup>o</sup> 5.*



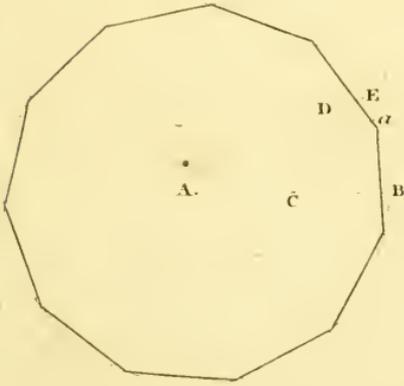
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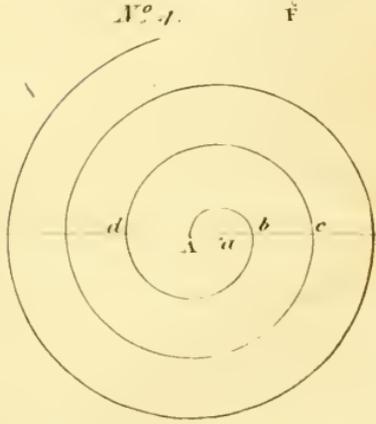
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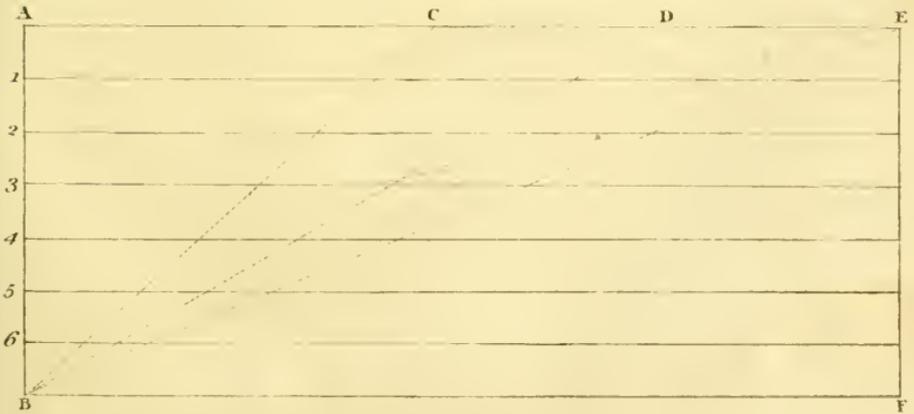
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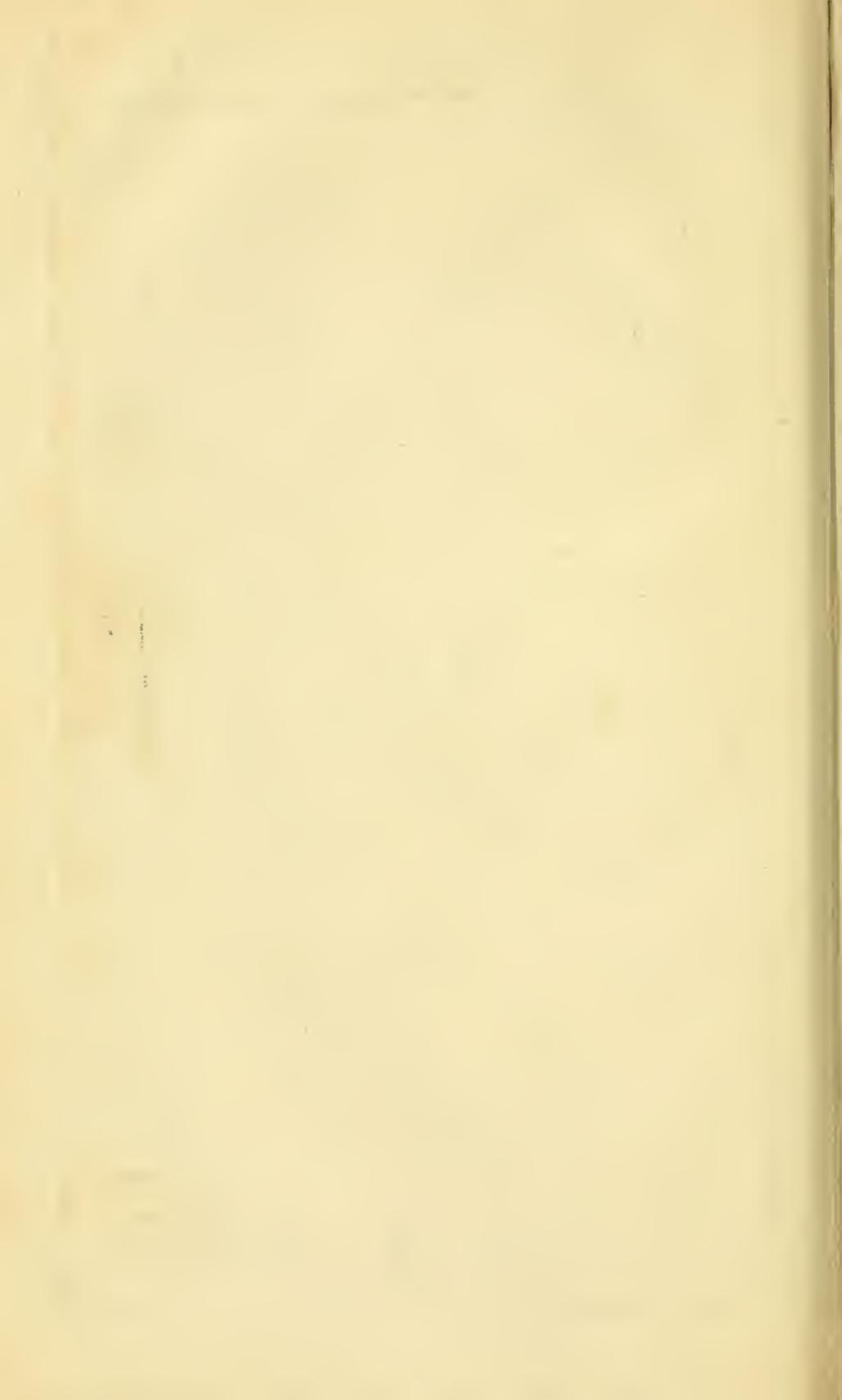


N<sup>o</sup> 4.



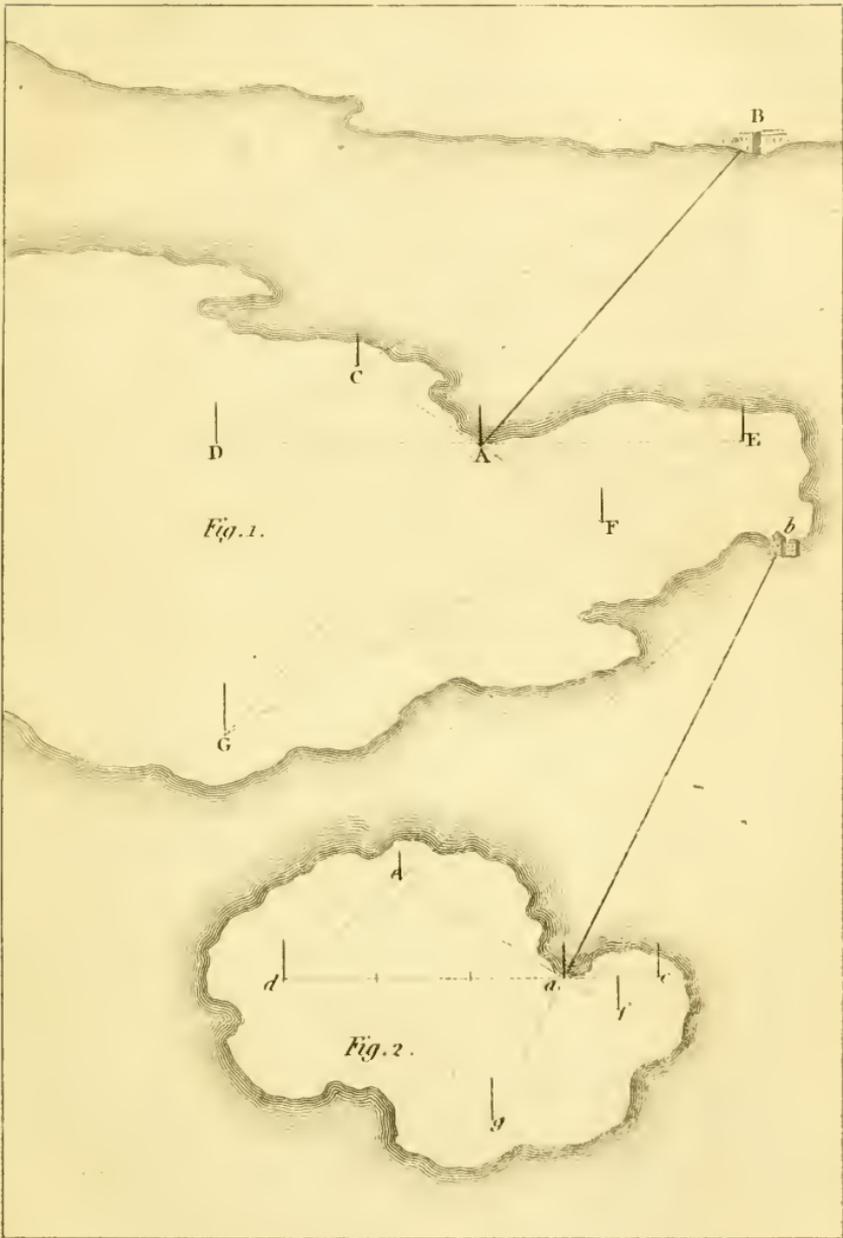
N<sup>o</sup> 5.











*To Measure the distance of inaccessible Places.*

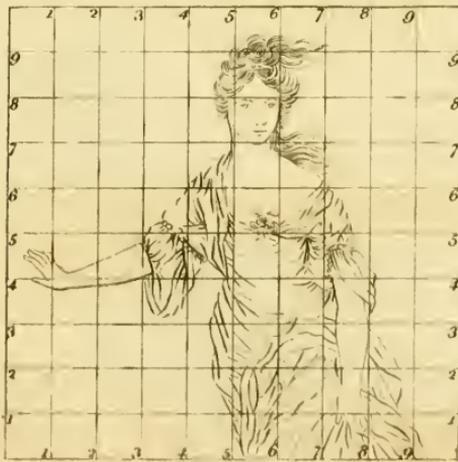


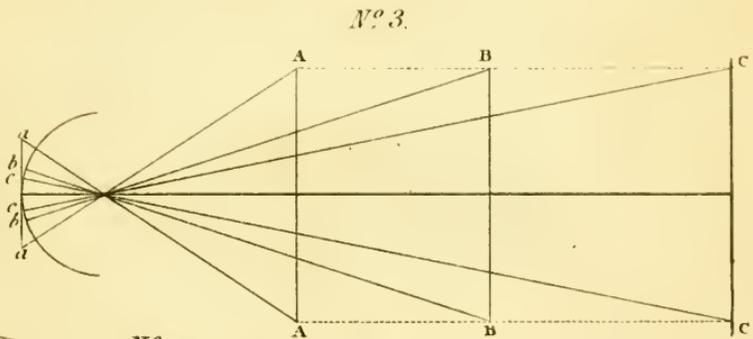
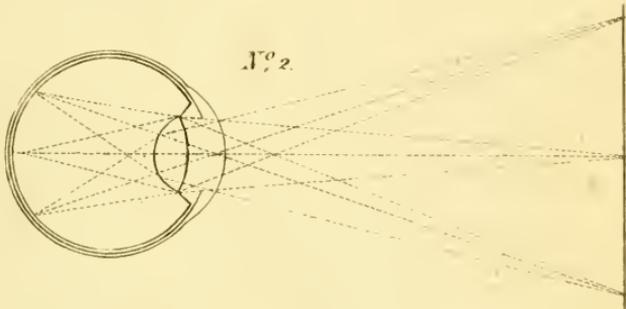
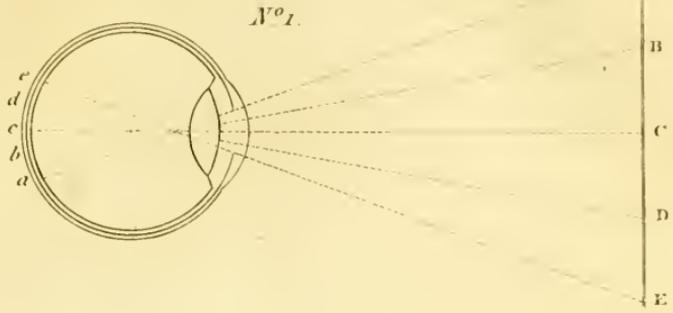


PERSPECTIVE. PLATE VIII. page 11.

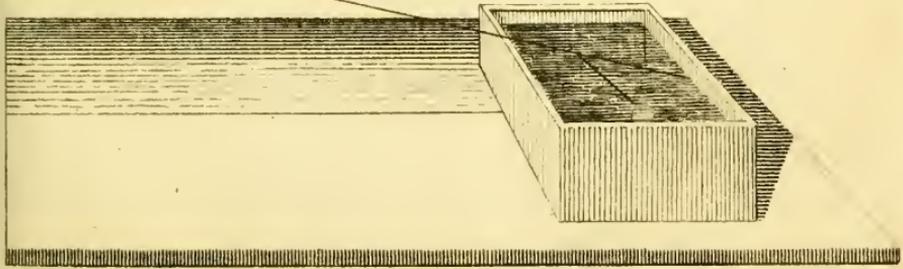


*To enlarge or diminish by means of Squares.*



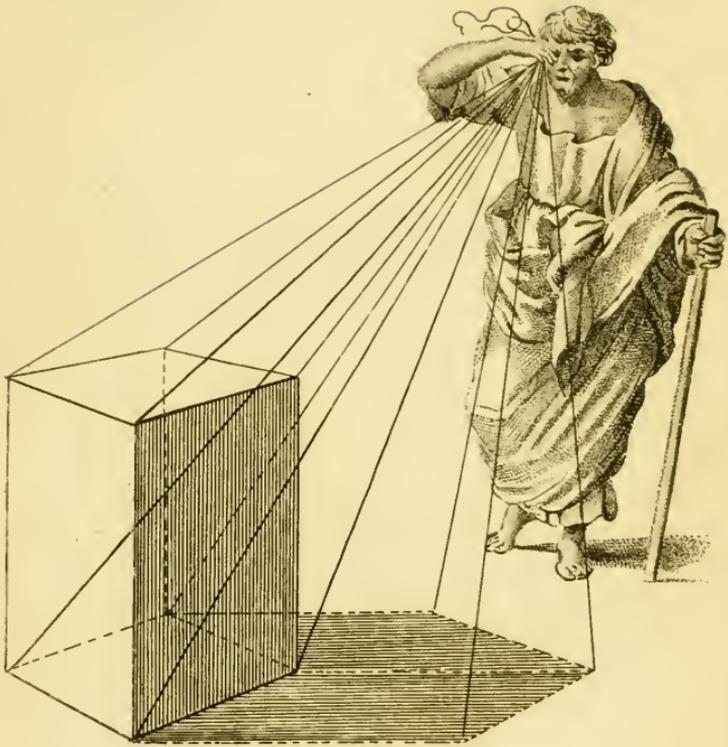


*N<sup>o</sup> 4.*



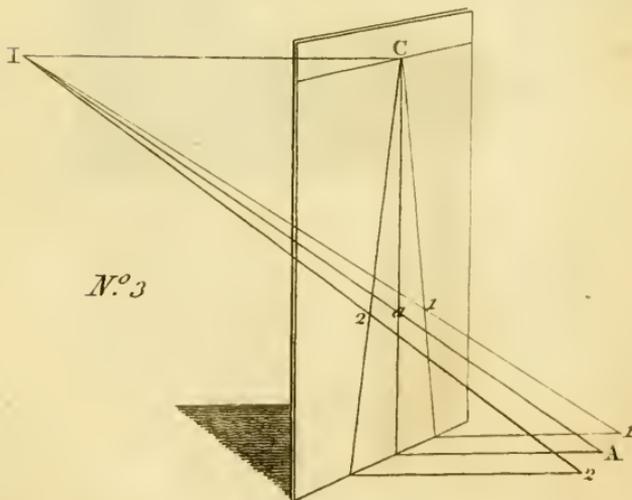
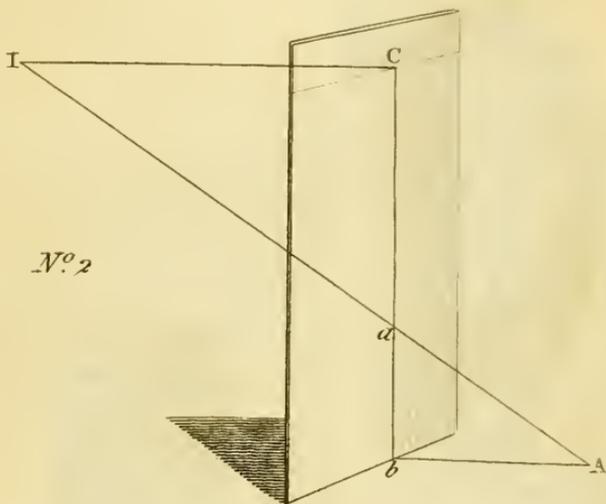
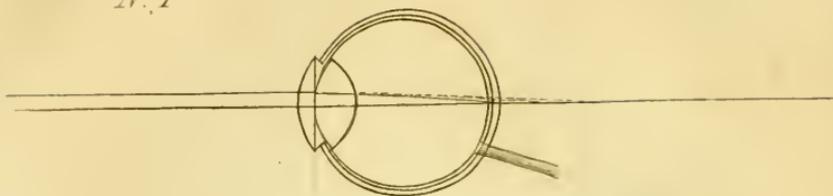


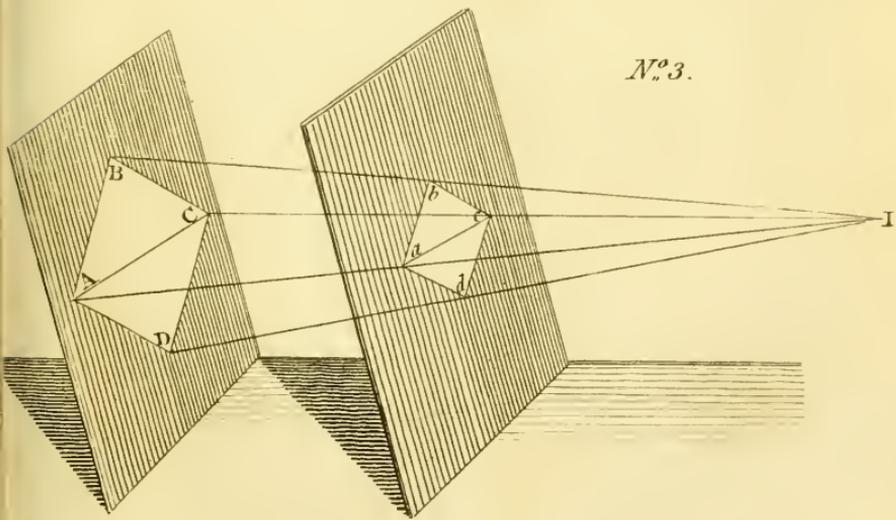
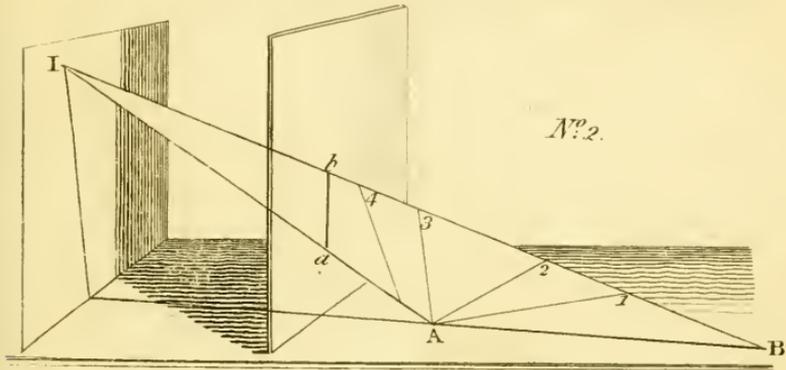
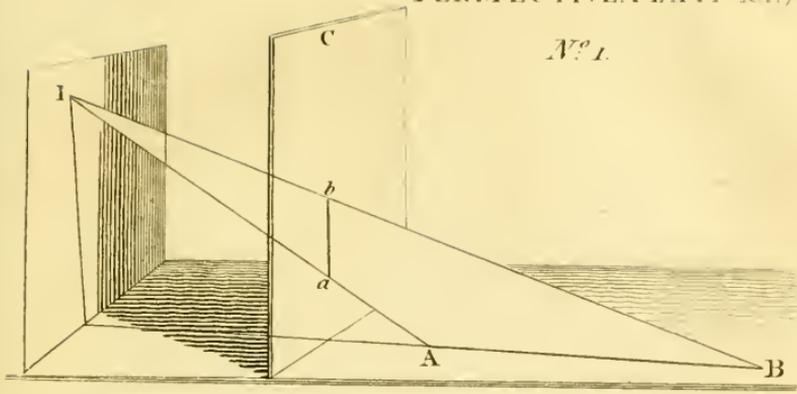






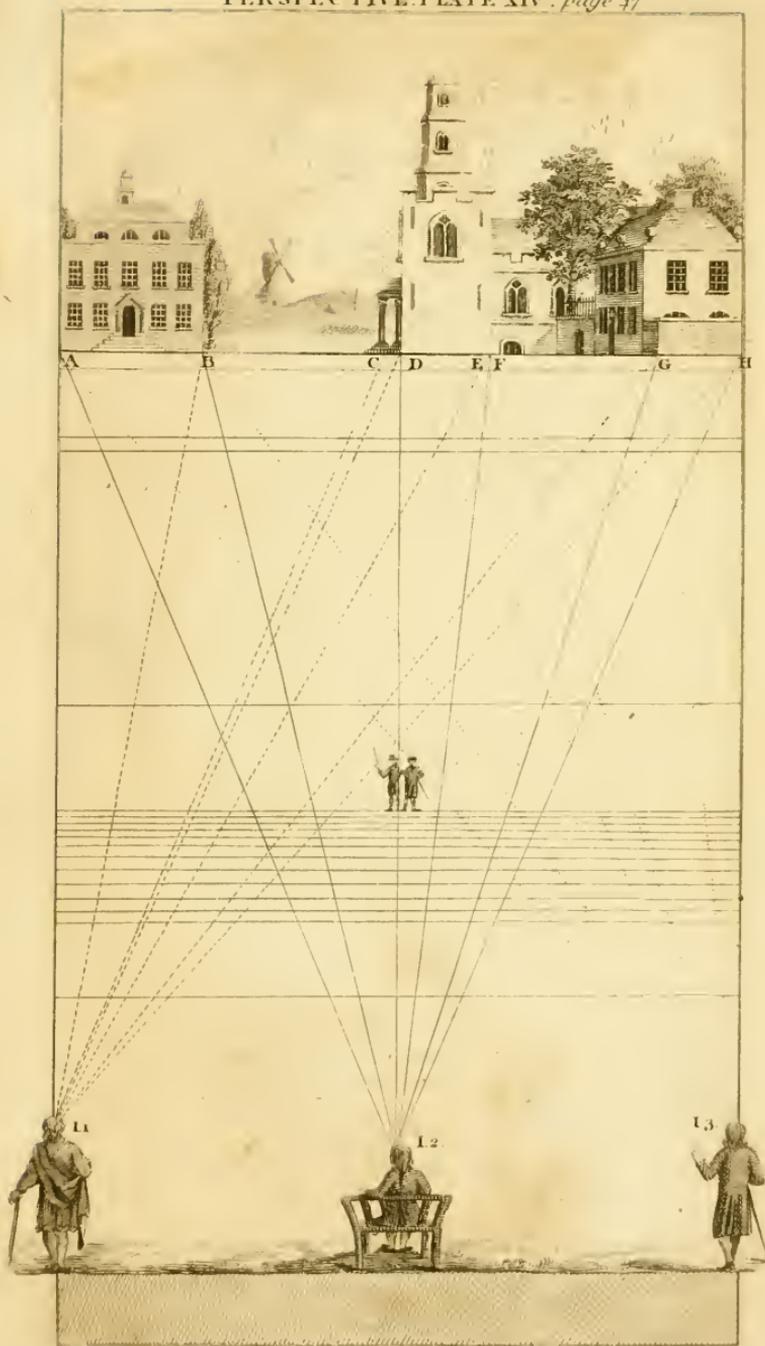
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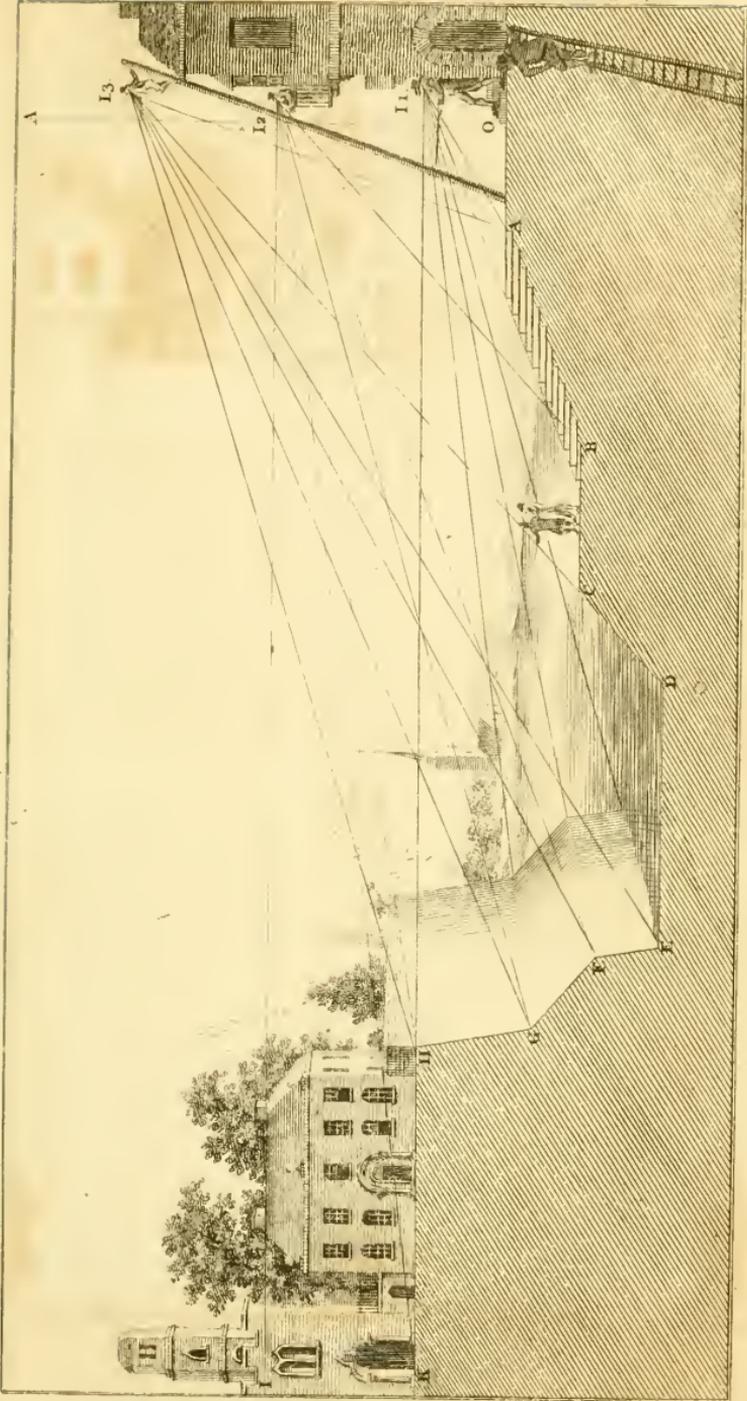






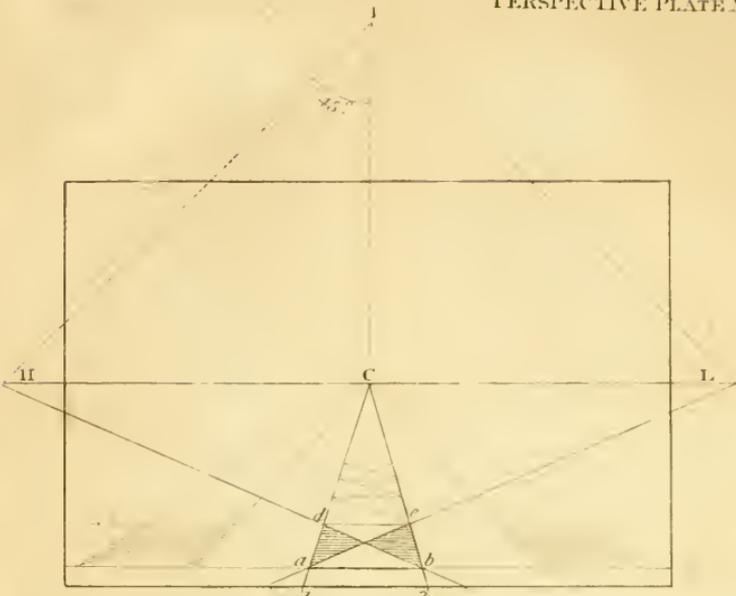




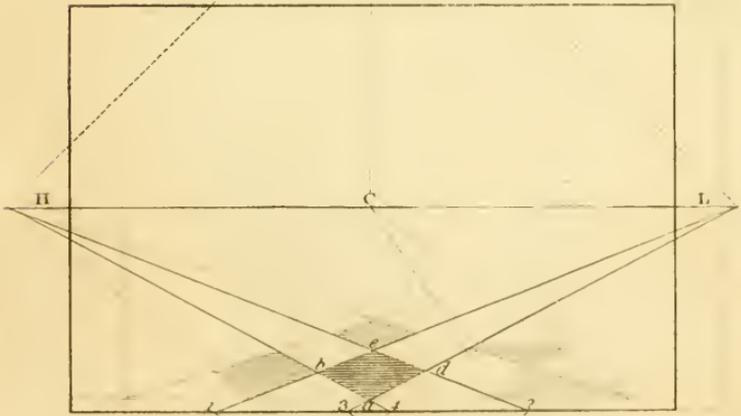






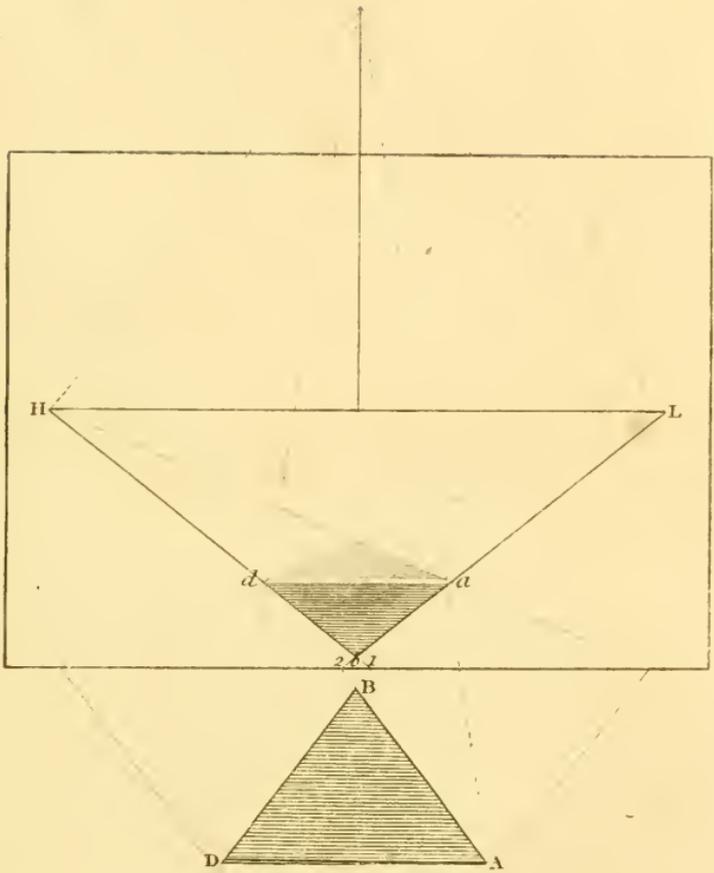


SQUARE  
*in Perspective.*





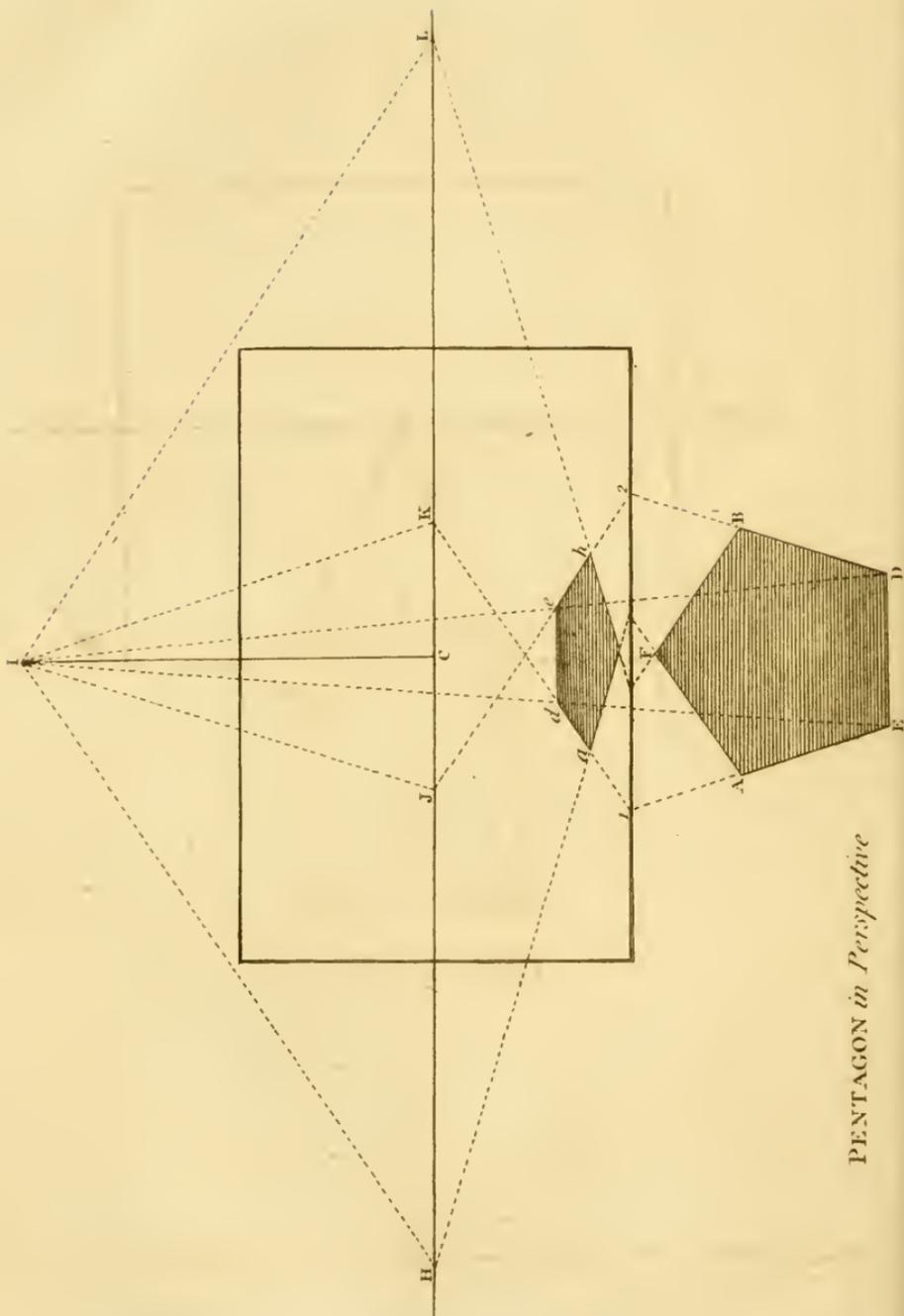




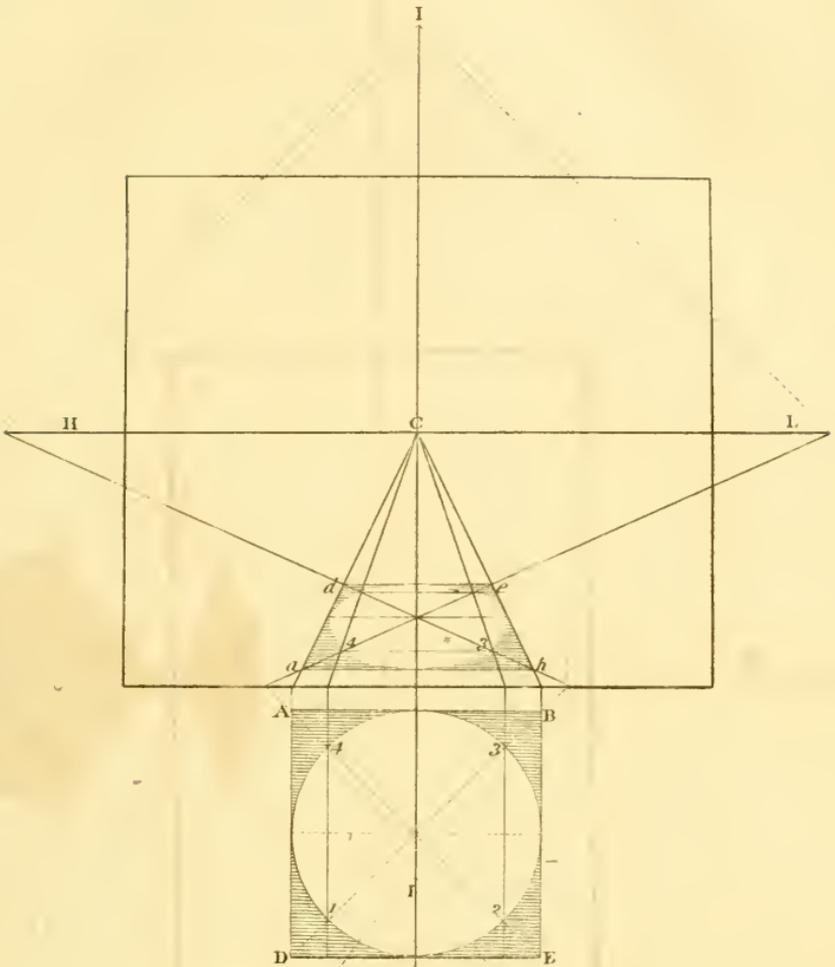
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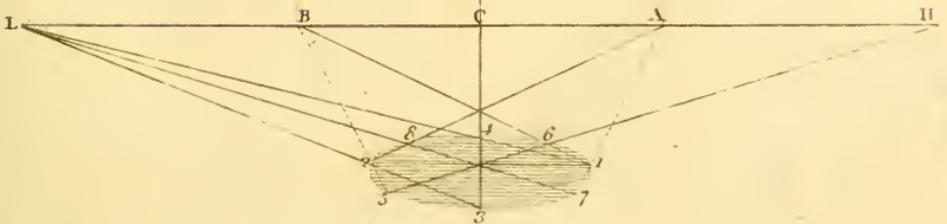




PENTAGON in Perspective



CIRCLES *in Perspective.*





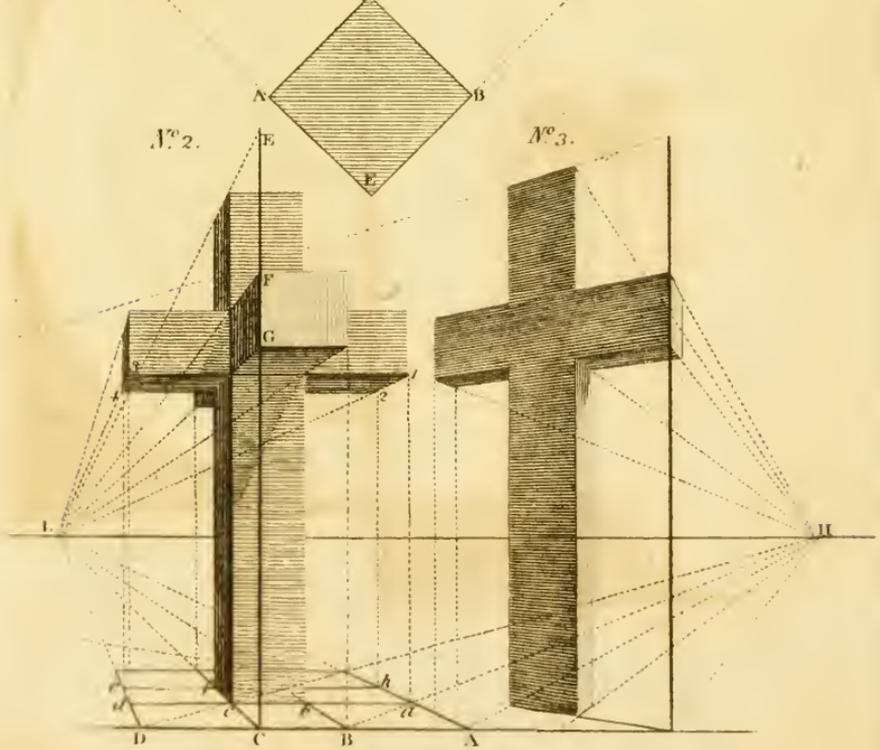
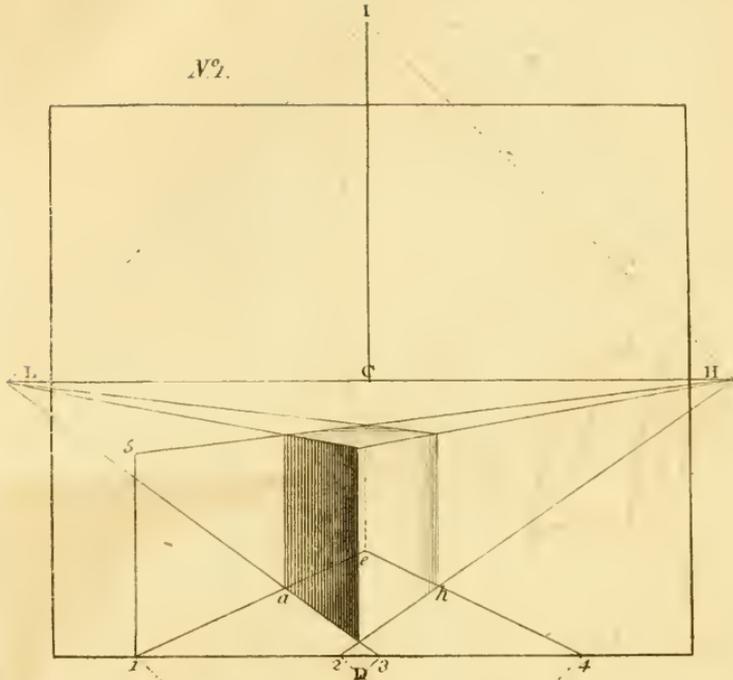




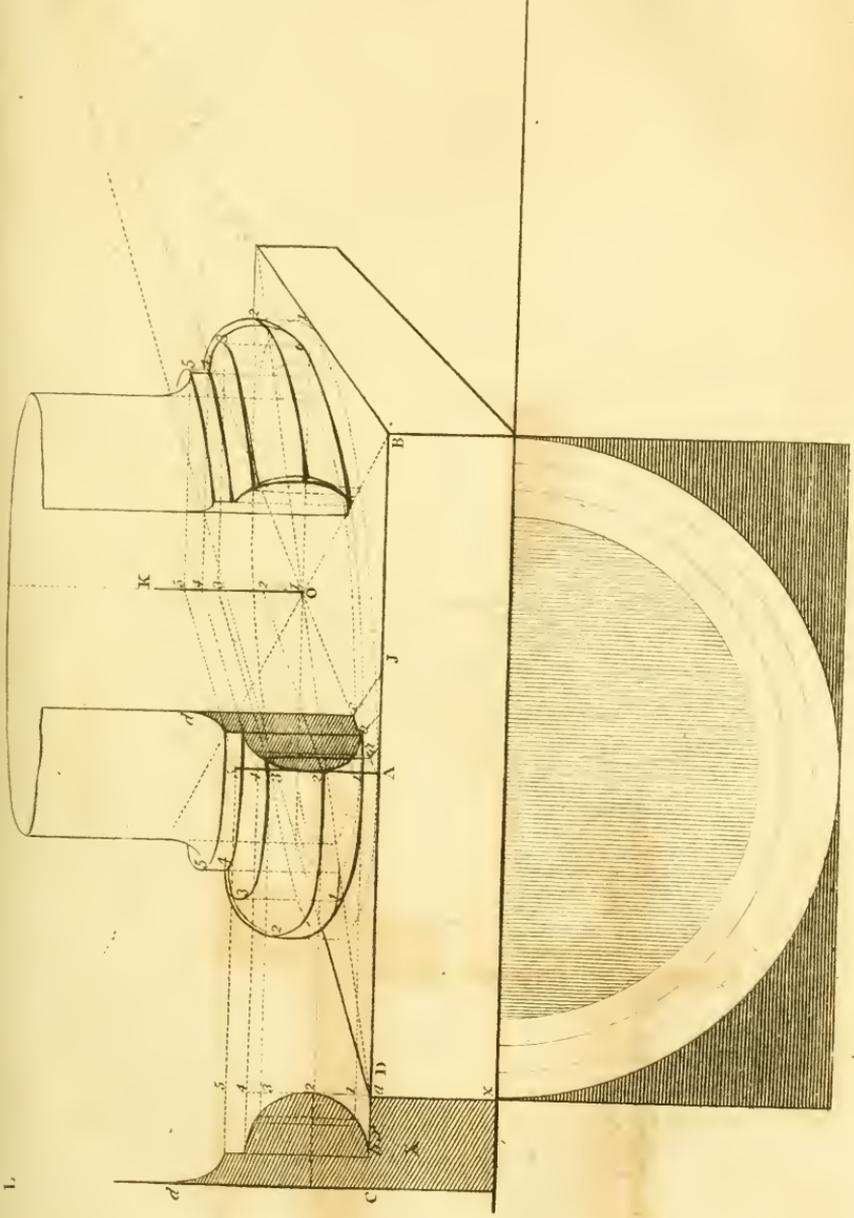








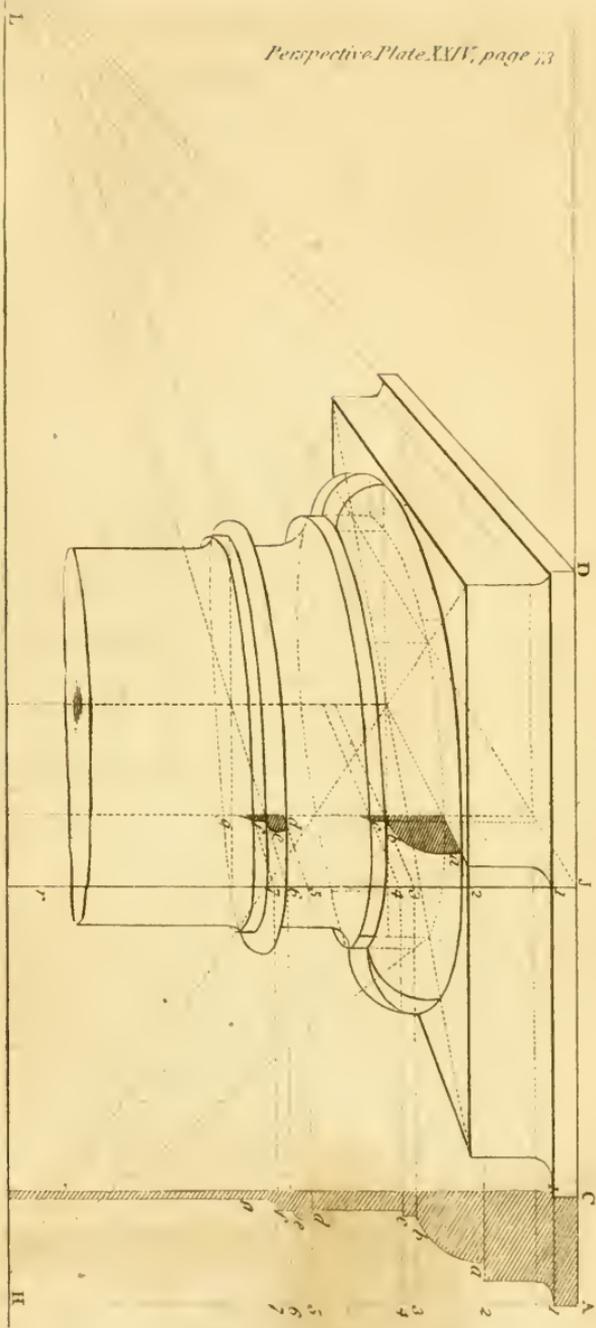
REGULAR DOME, IN PERSPECTIVE

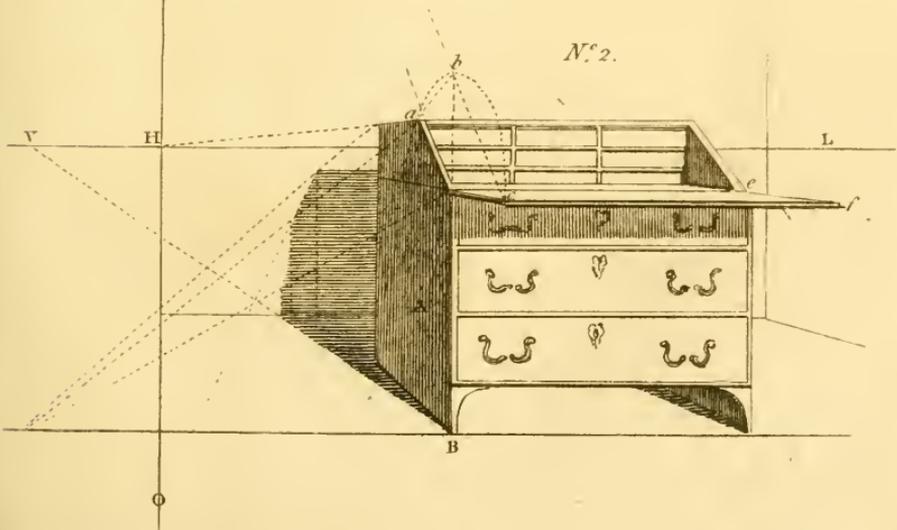
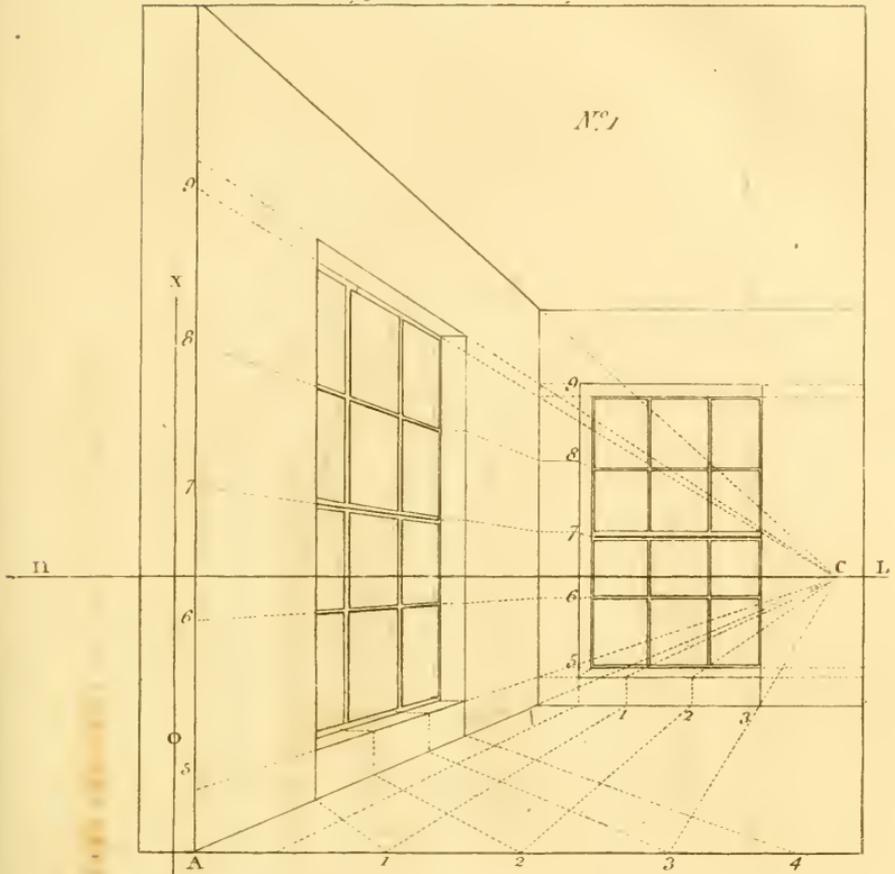






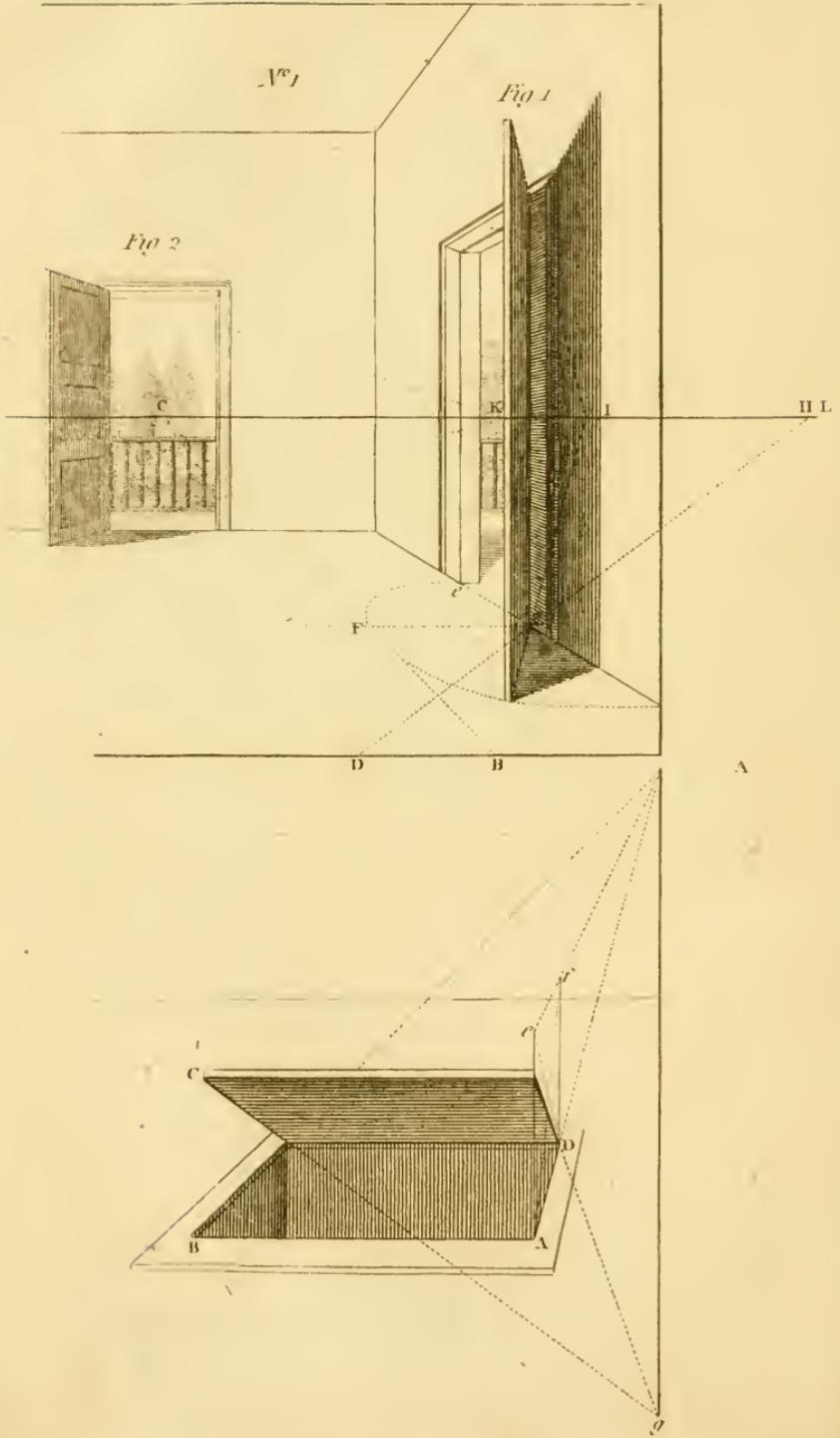
TUSCAN CAPITAL, in PERSPECTIVE.





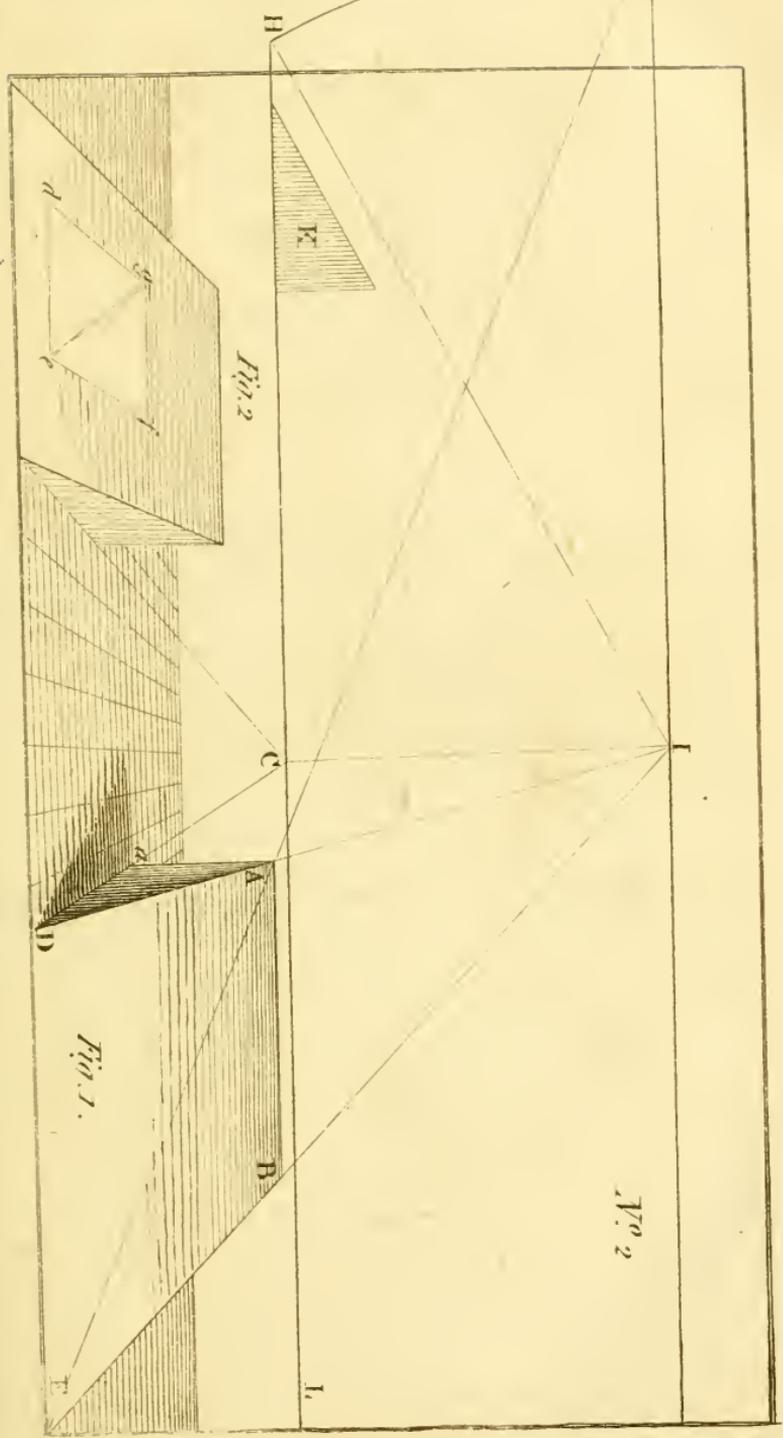


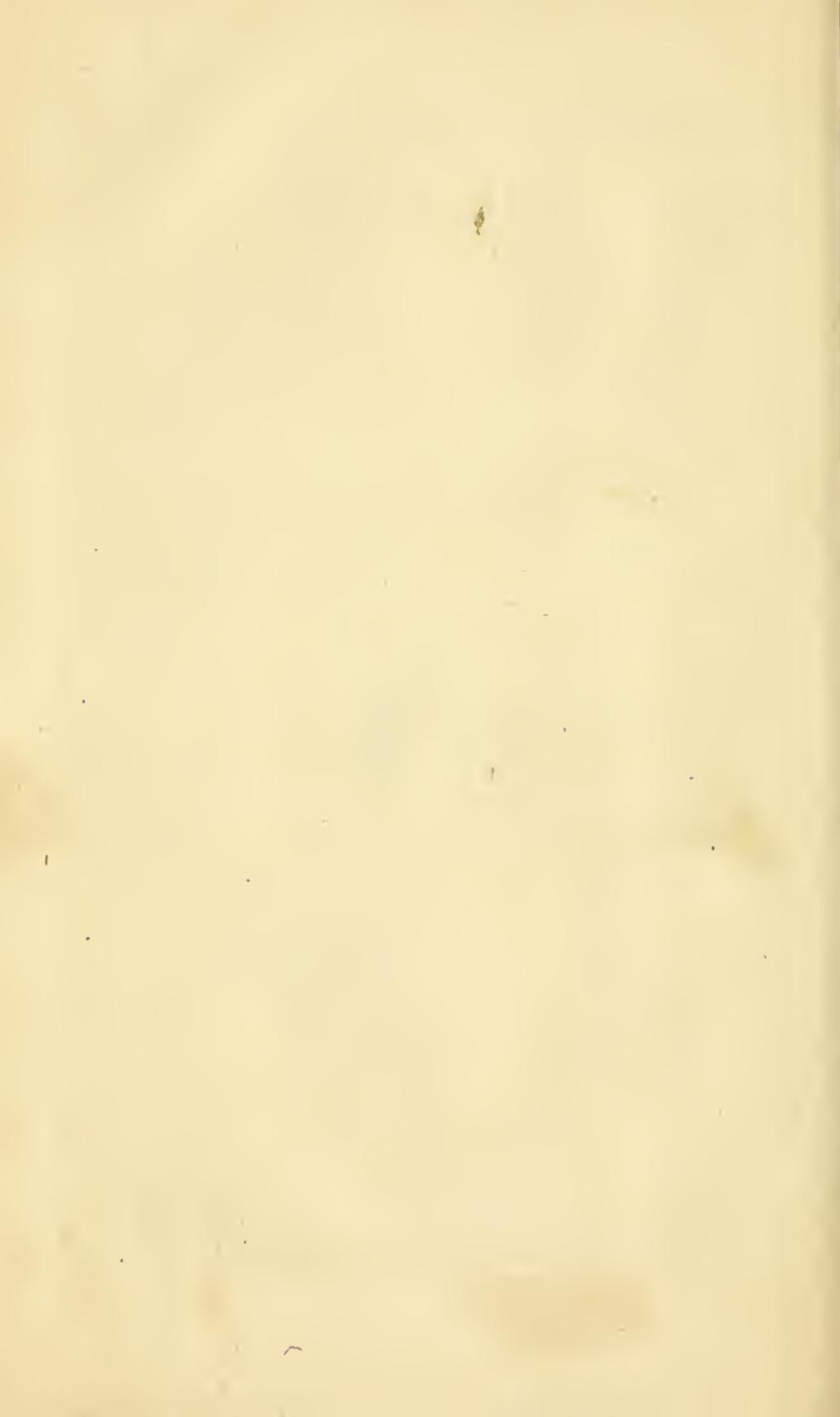




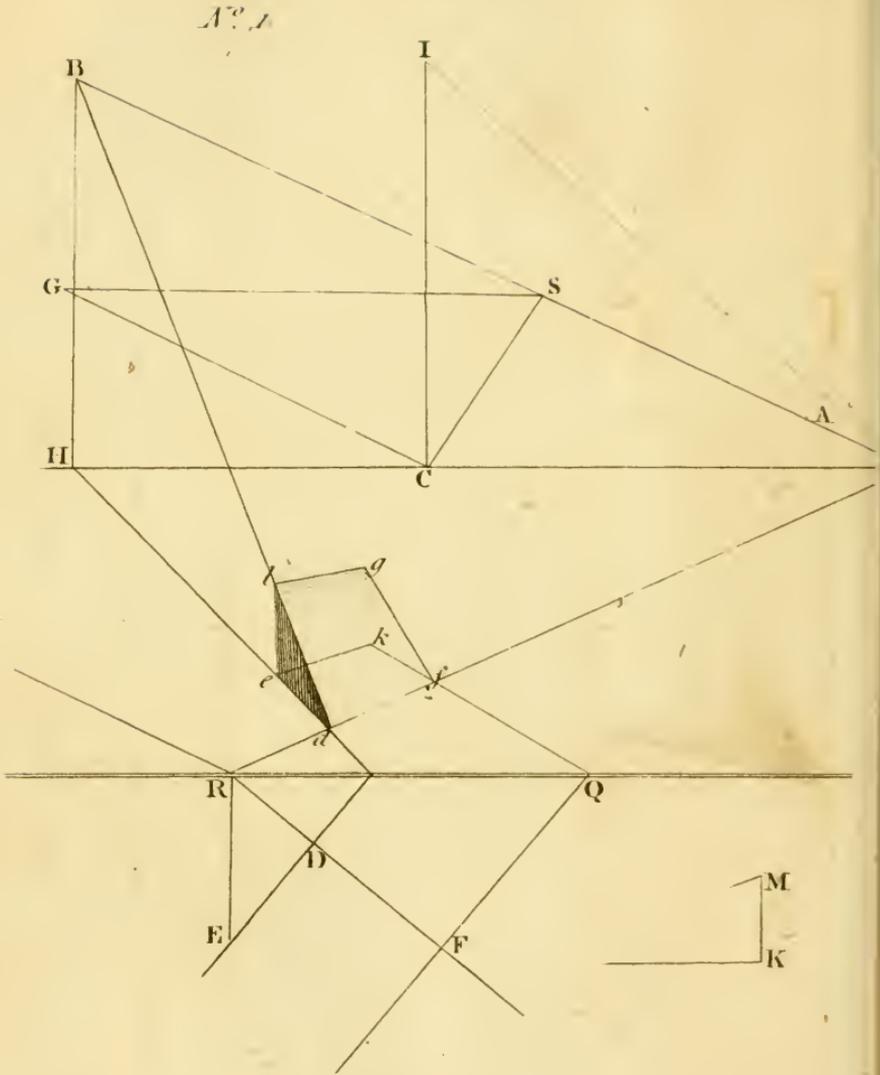














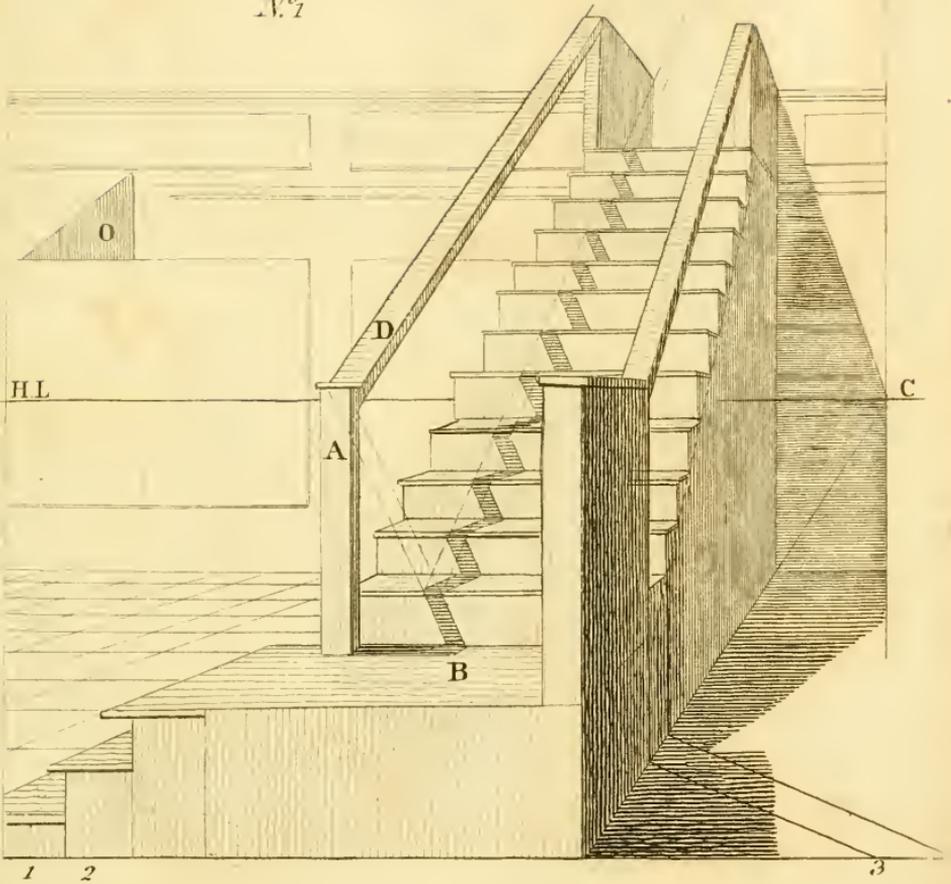


PERSPECTIVE

PLXXIX. p.78.



N<sup>o</sup> 7





N<sup>o</sup> 1.

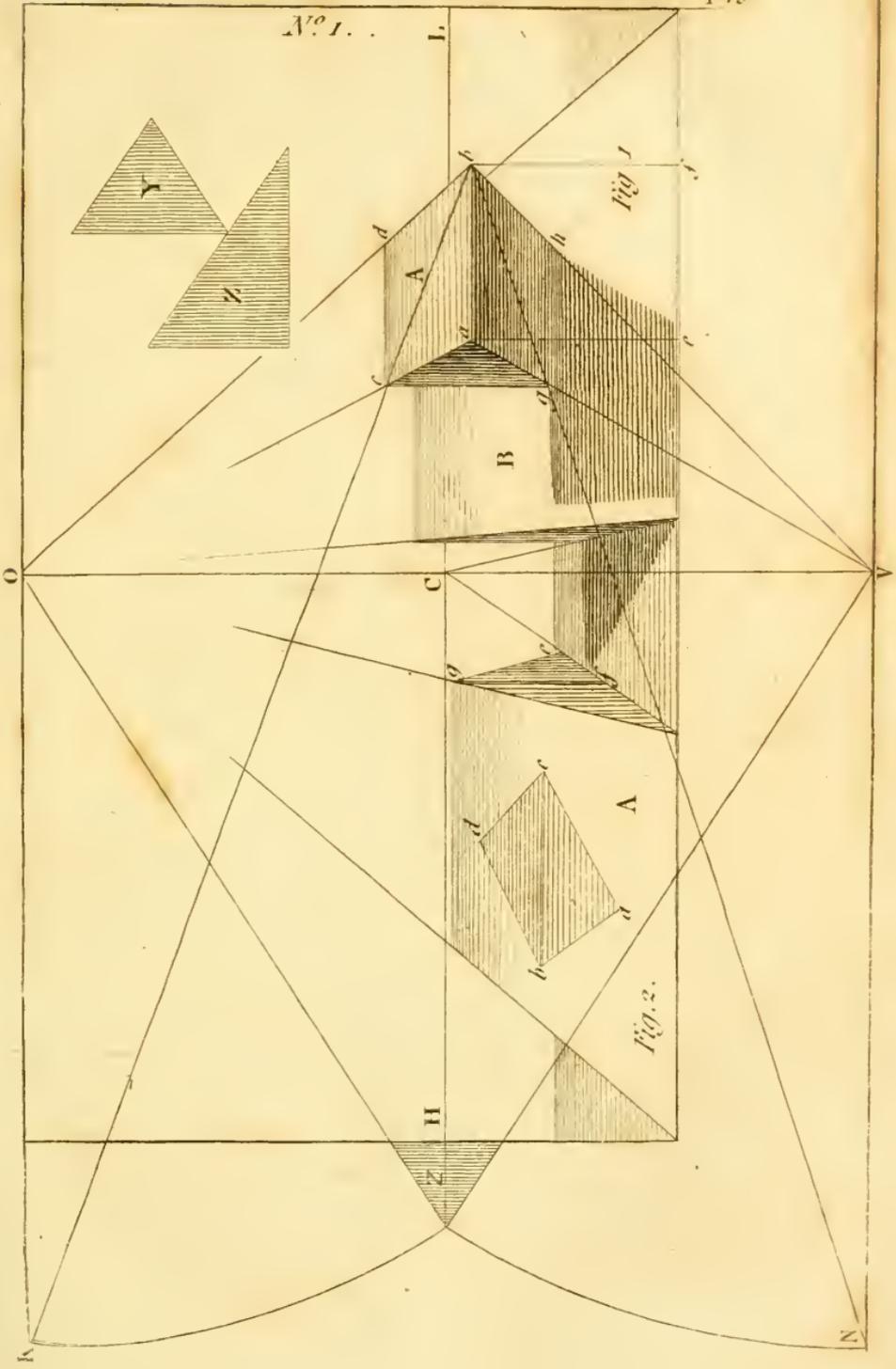
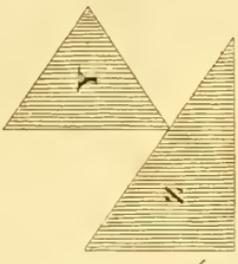


Fig. 1

Fig. 2.



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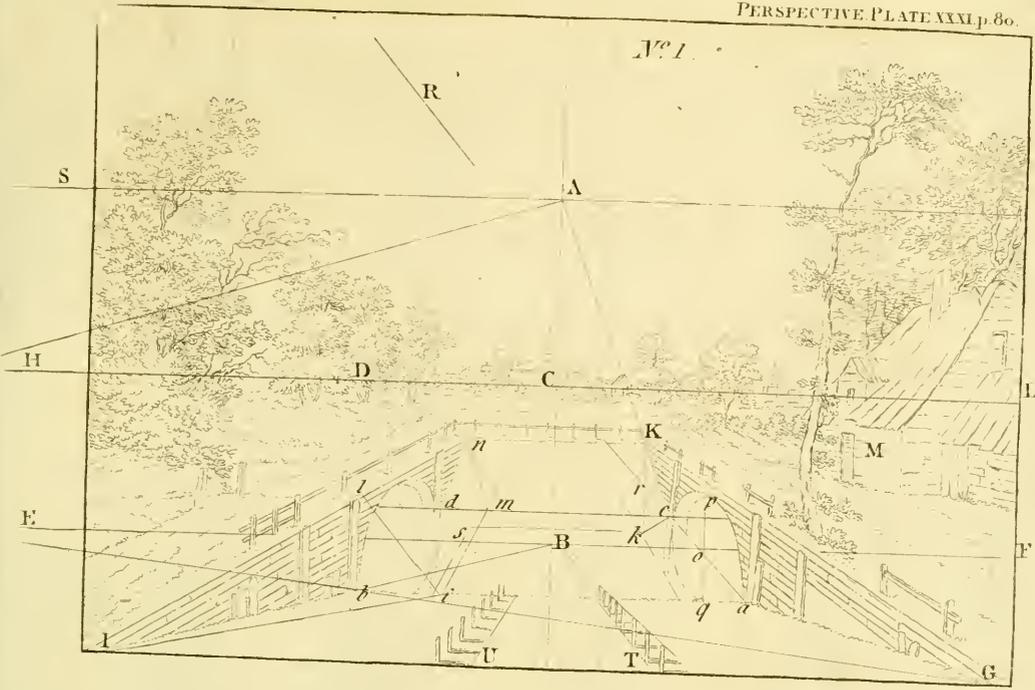
P

Q

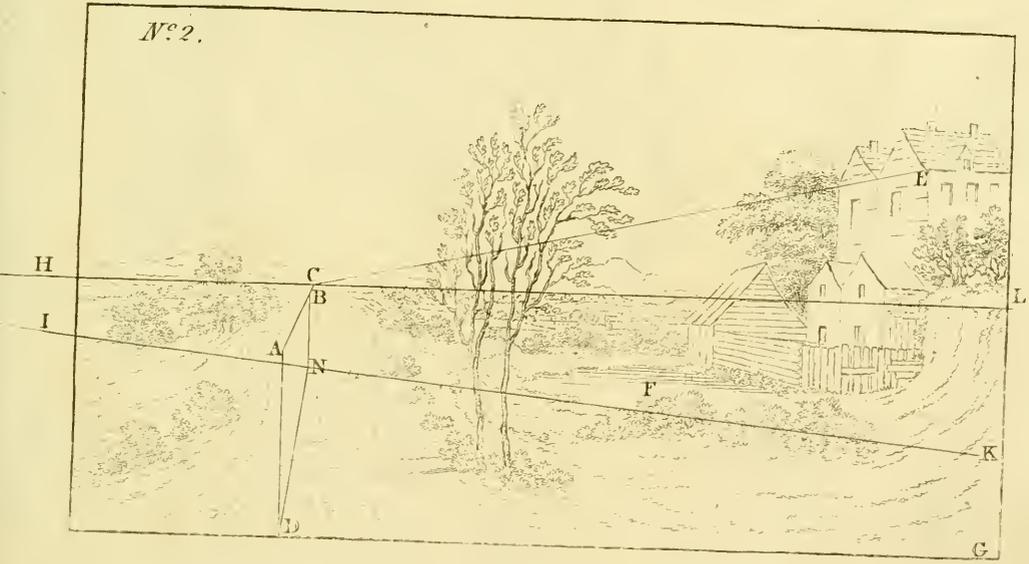
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N<sup>o</sup> 1.

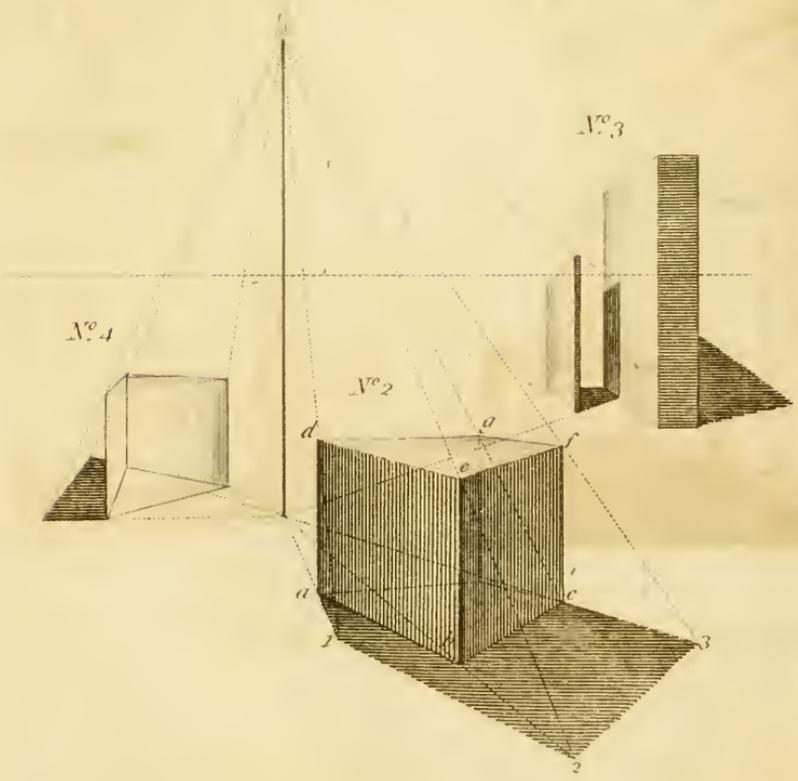
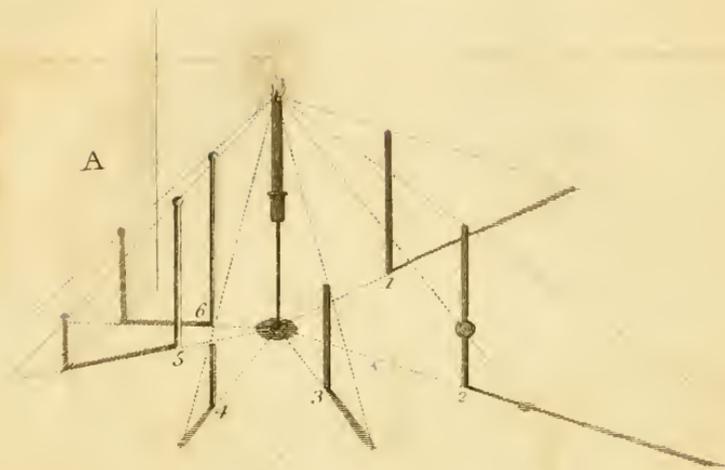


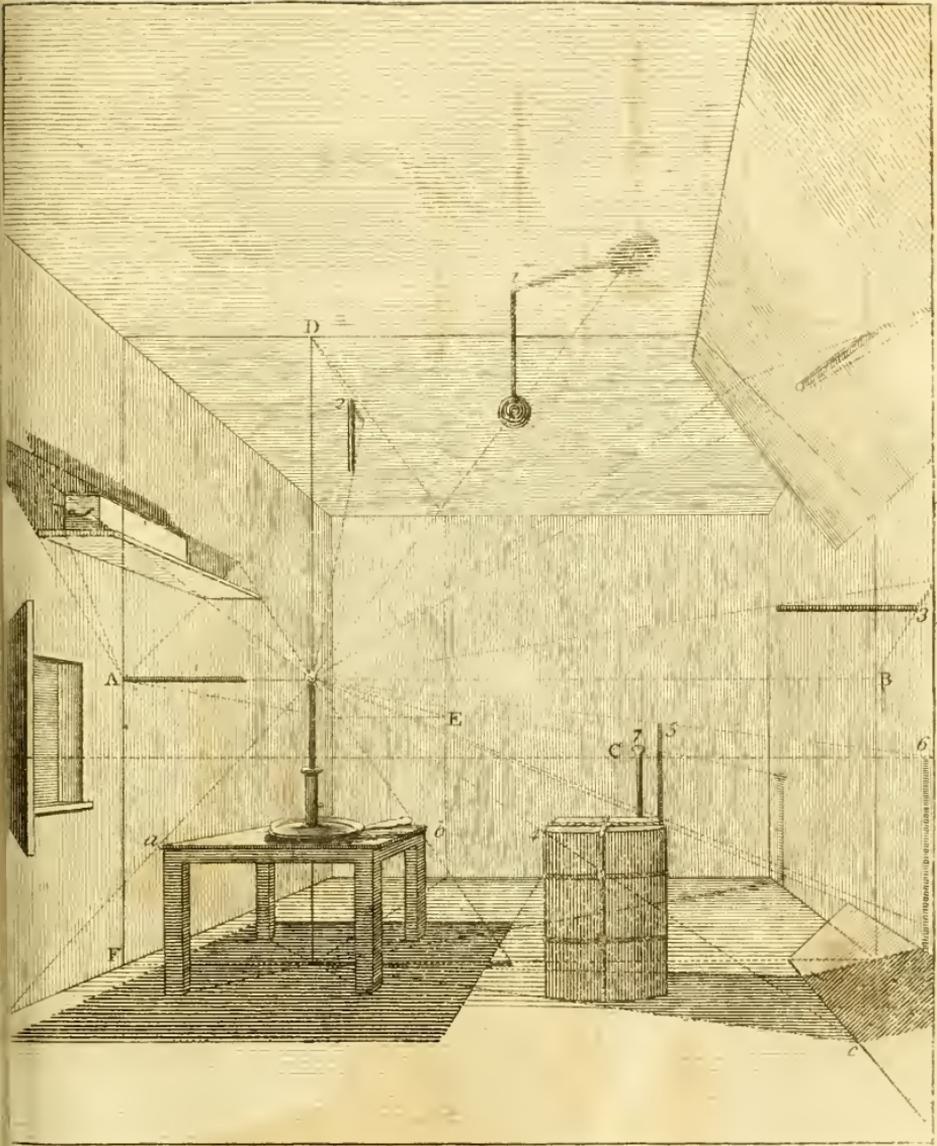
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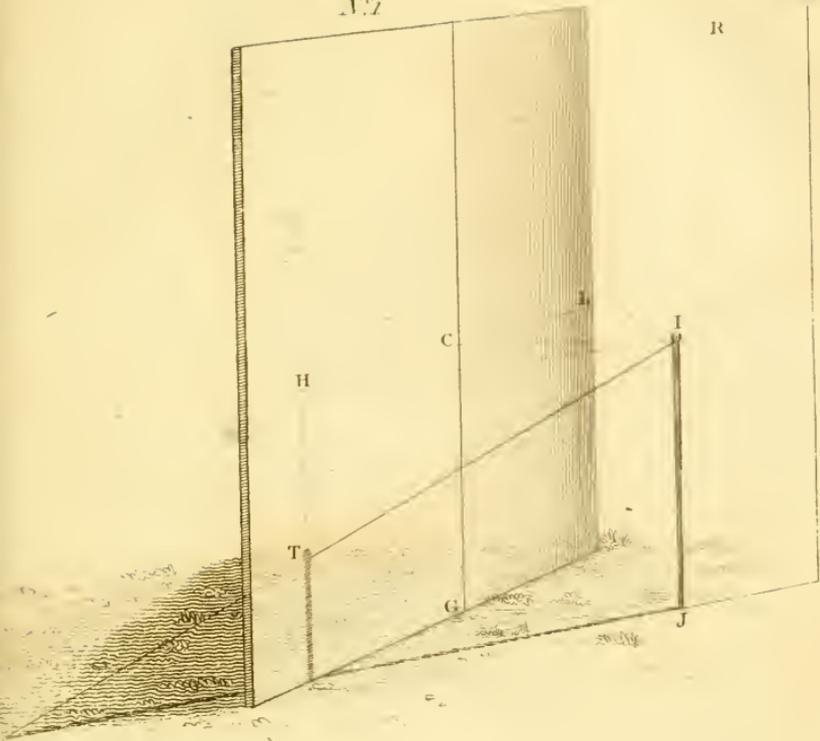




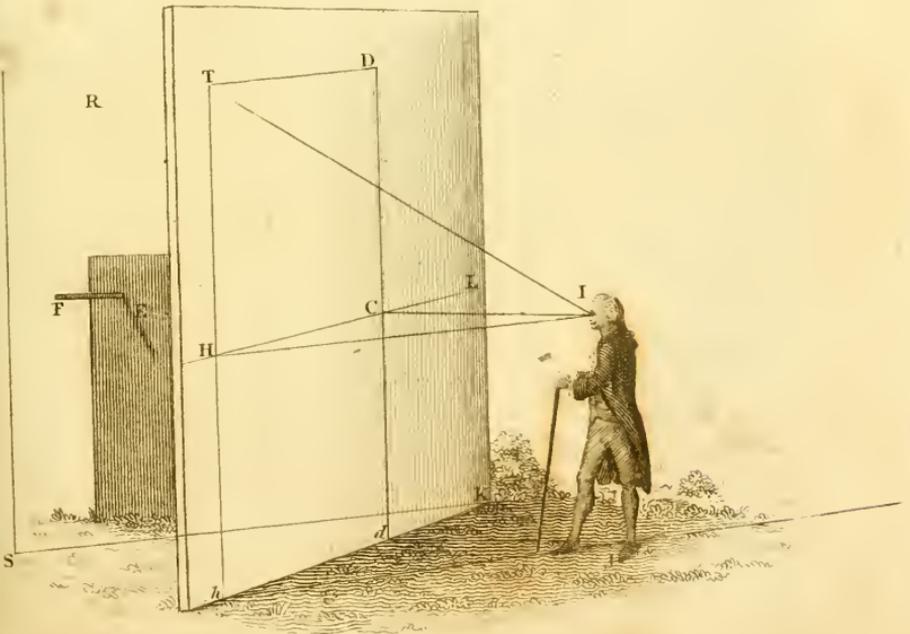




N<sup>o</sup> 1



N<sup>o</sup> 2

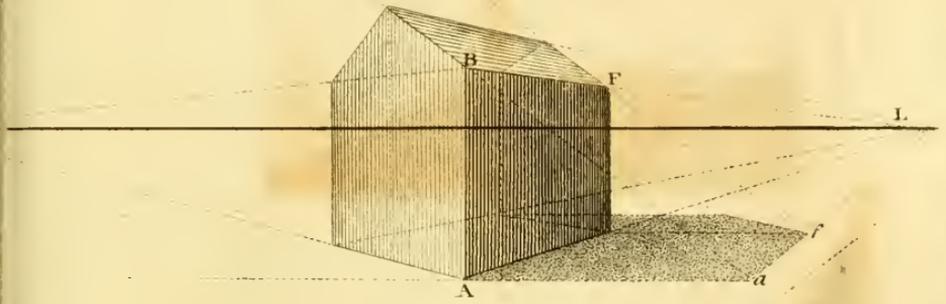




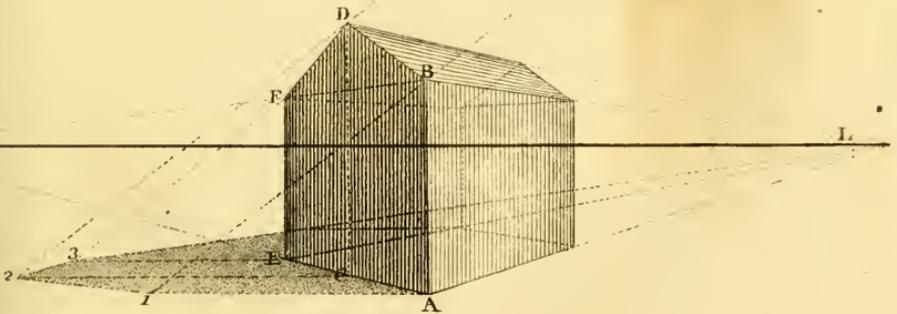




*Fig. 1.*



*Fig. 2.*







half <sup>S</sup> Elevation

Fig. 1.

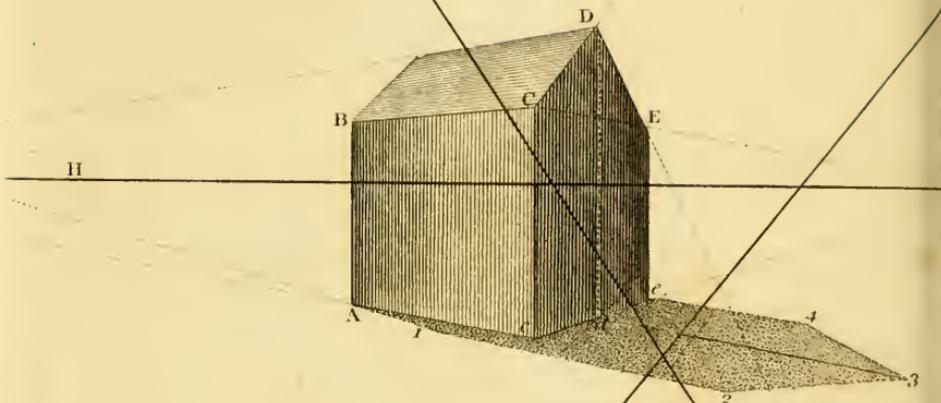
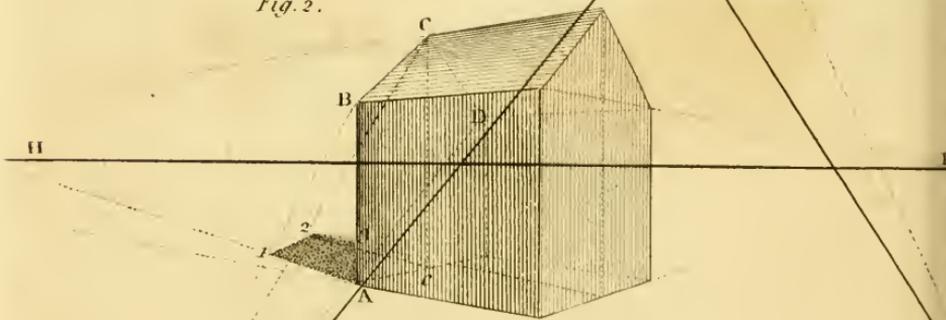
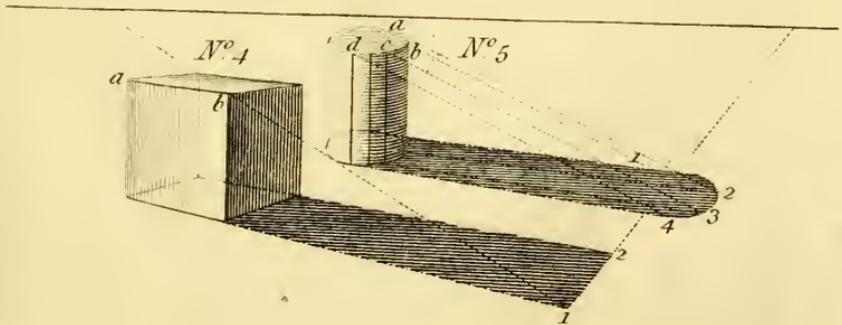
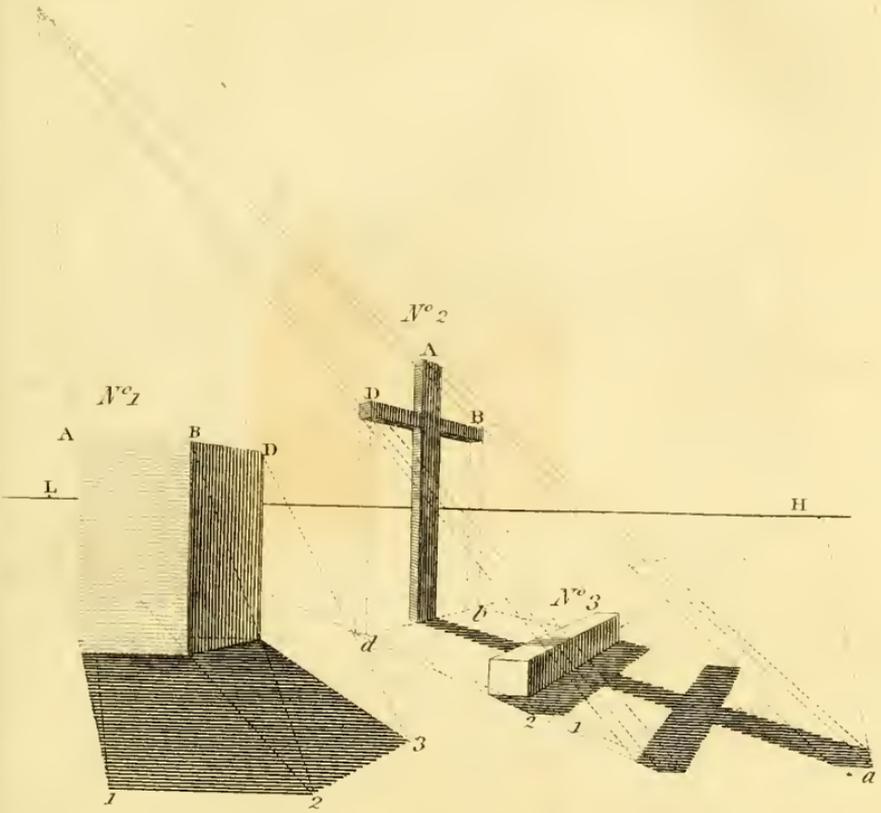
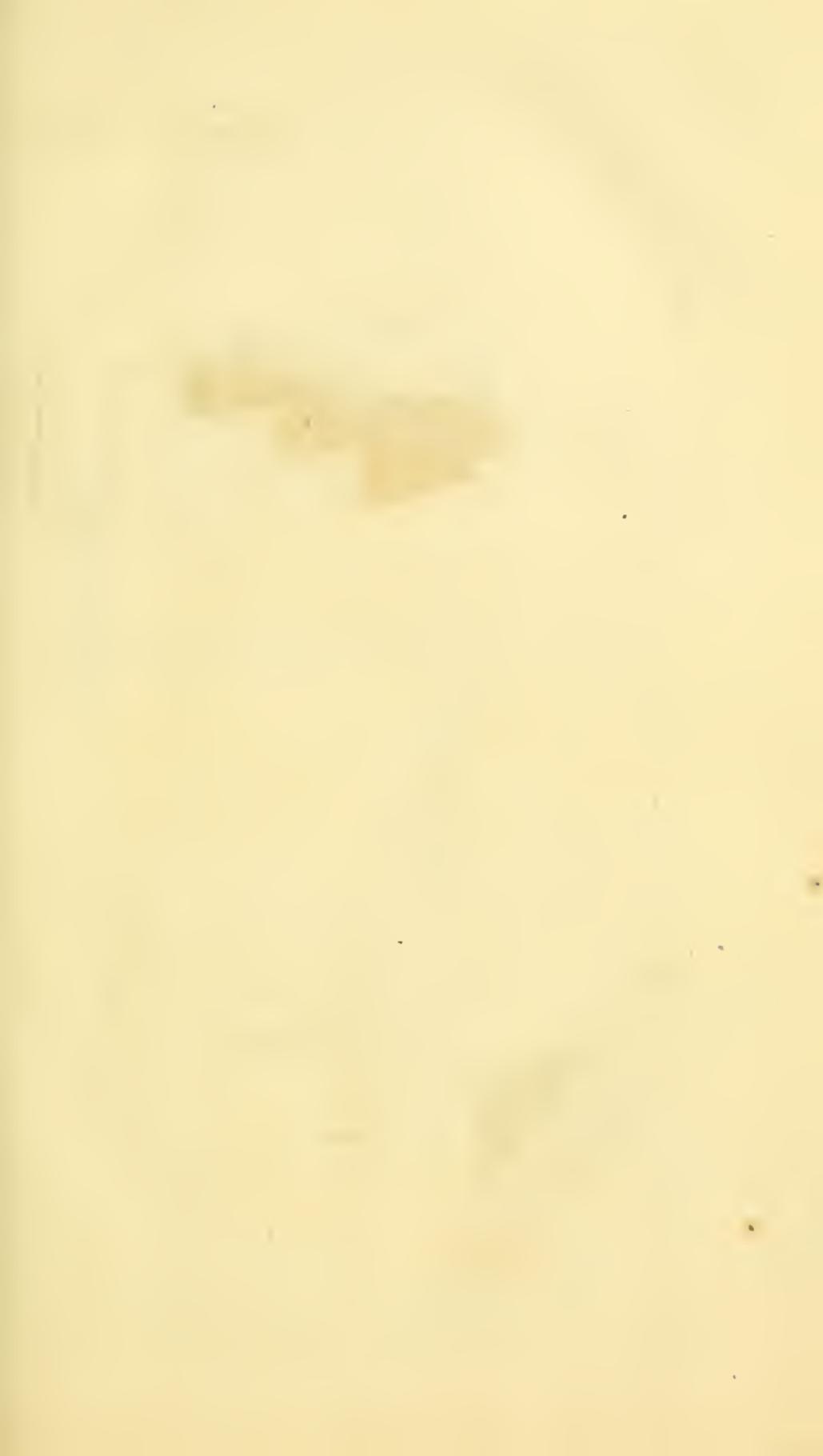


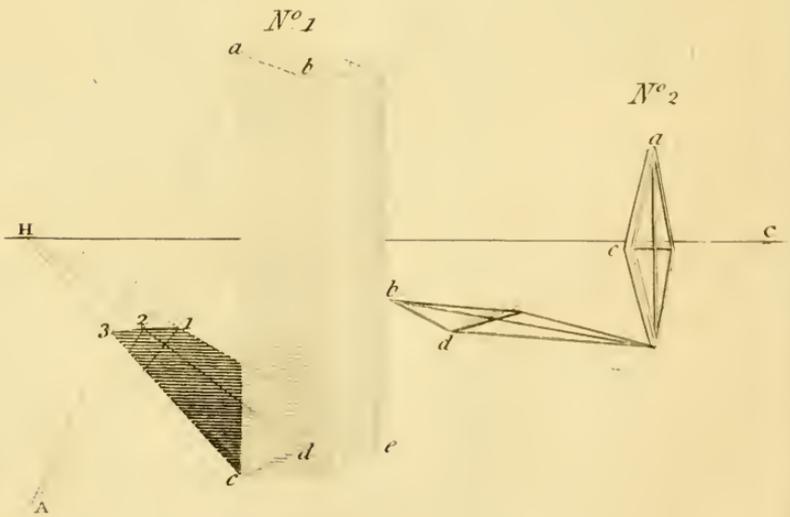
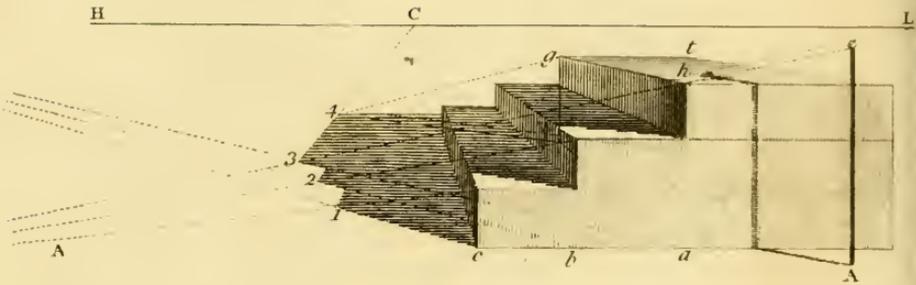
Fig. 2.

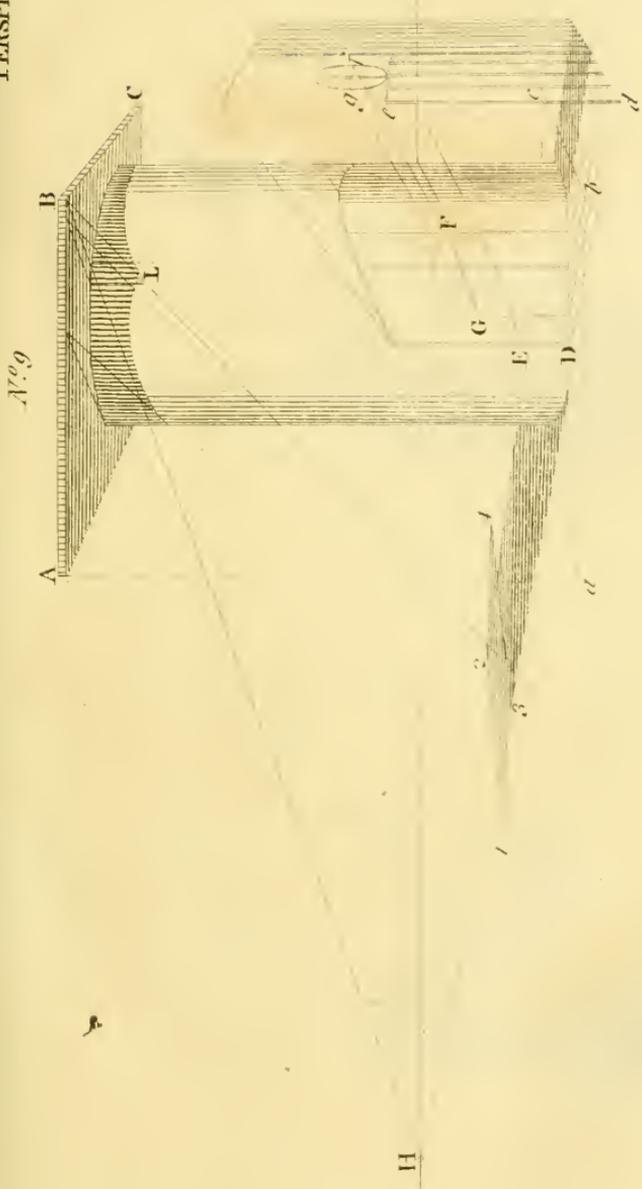








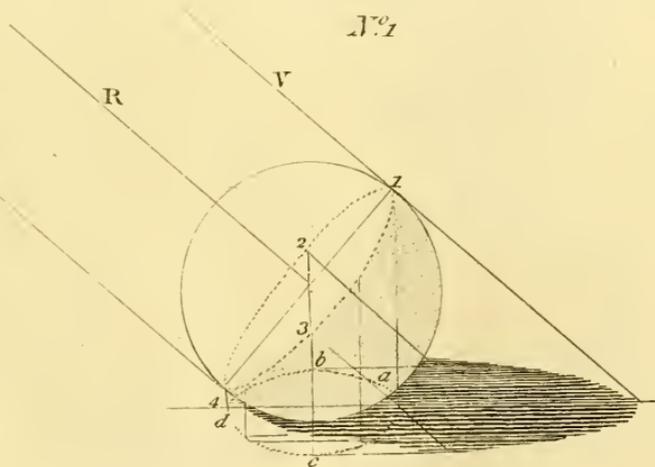
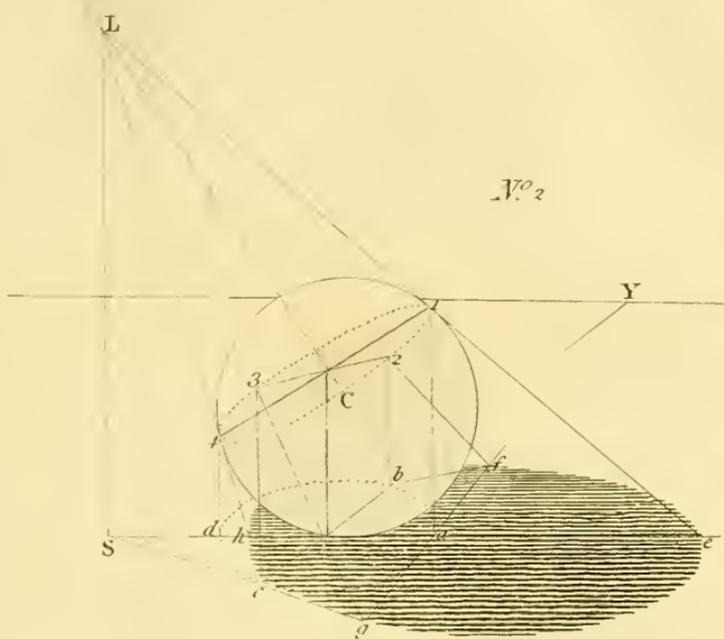




I.

R

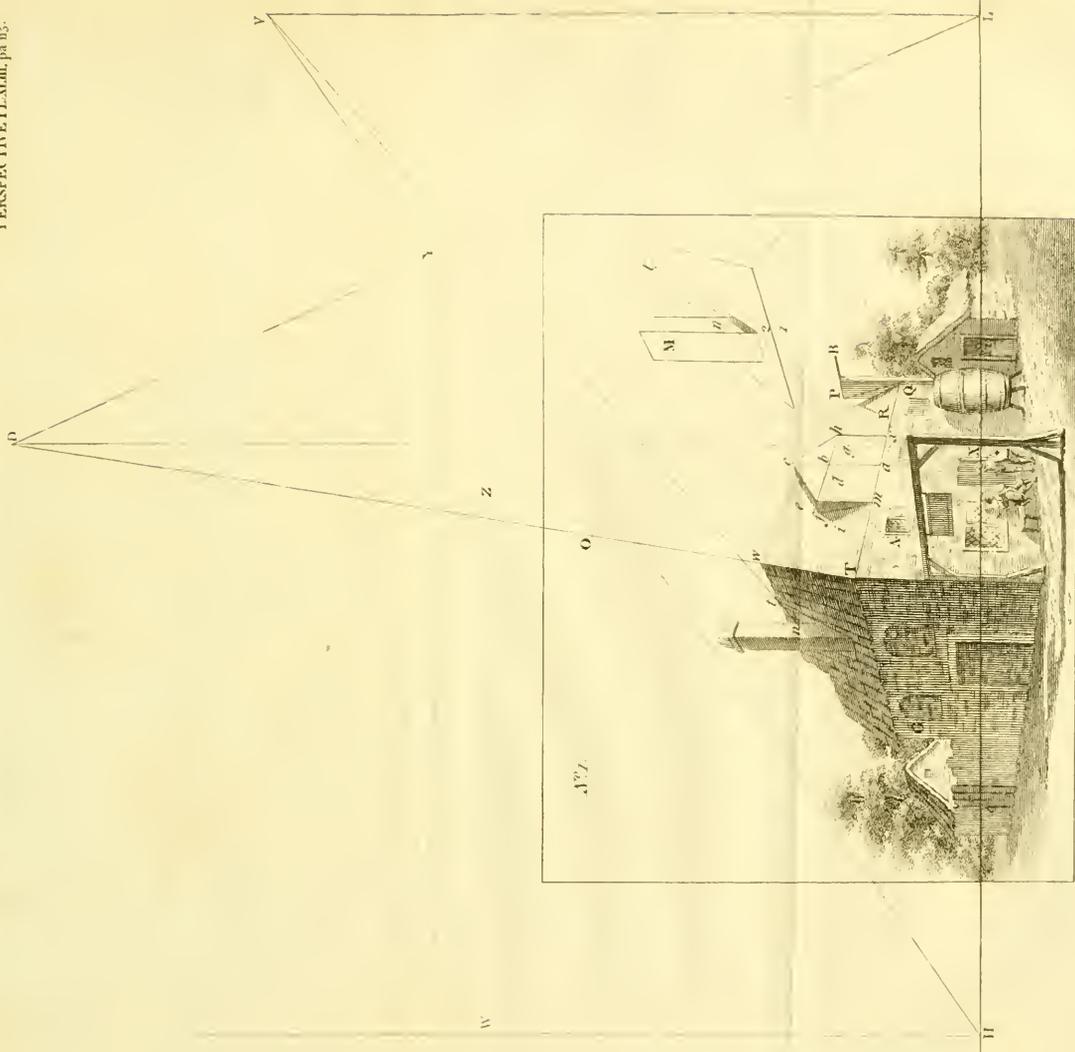




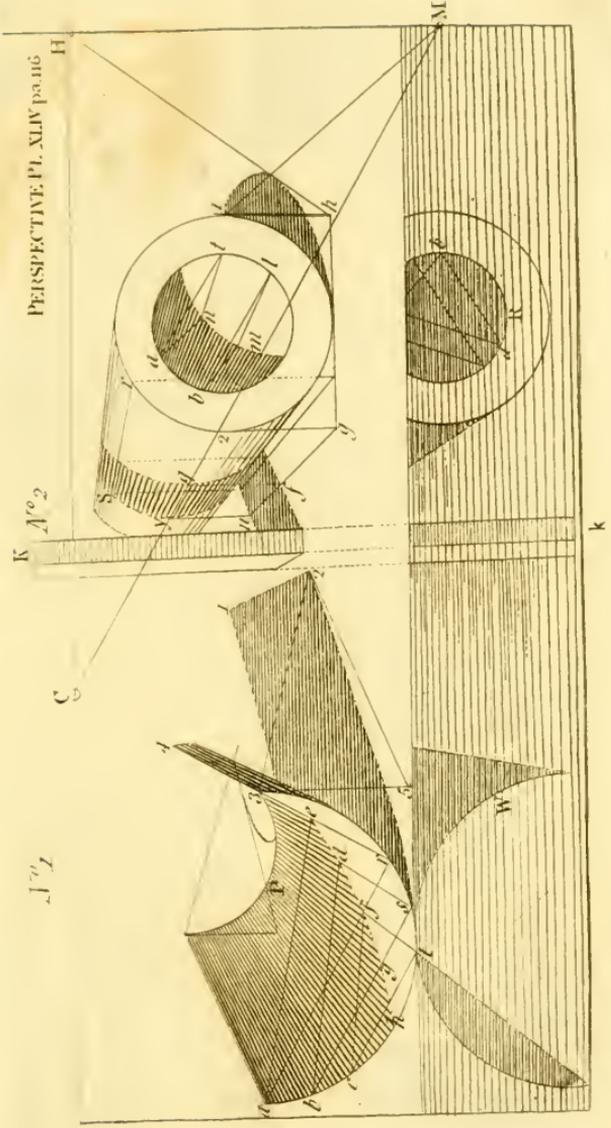




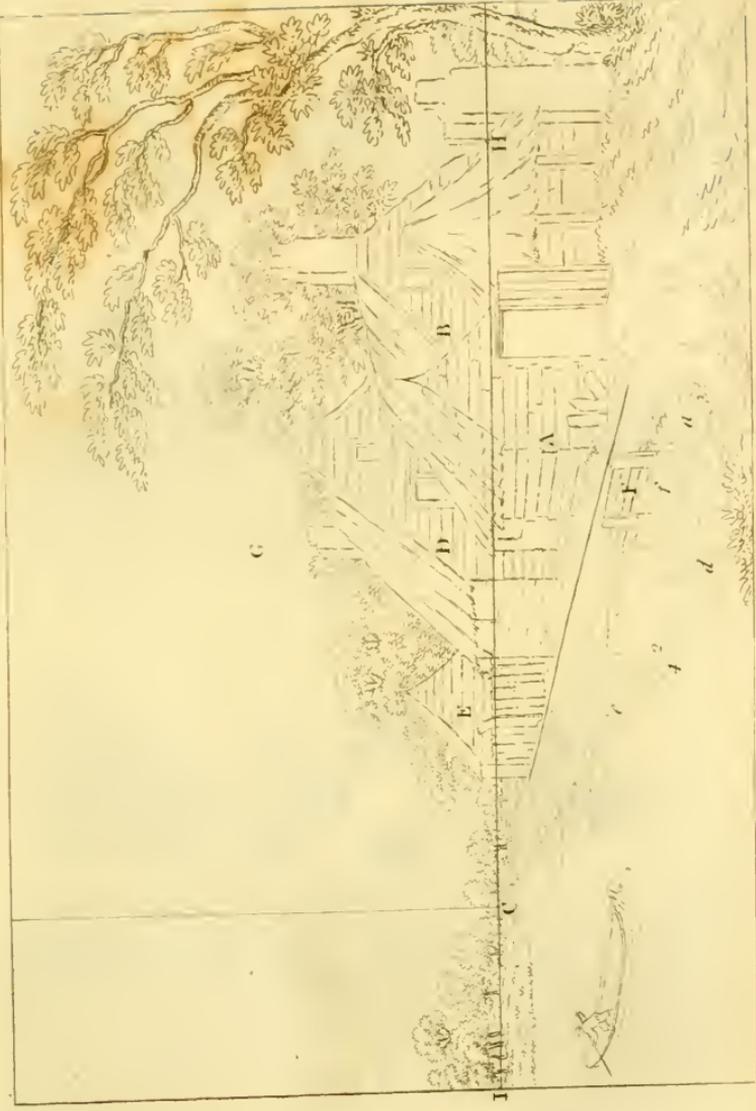








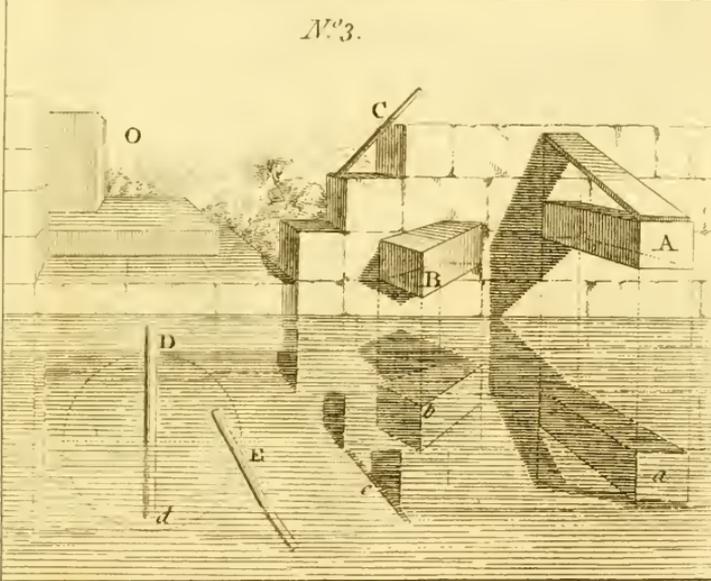
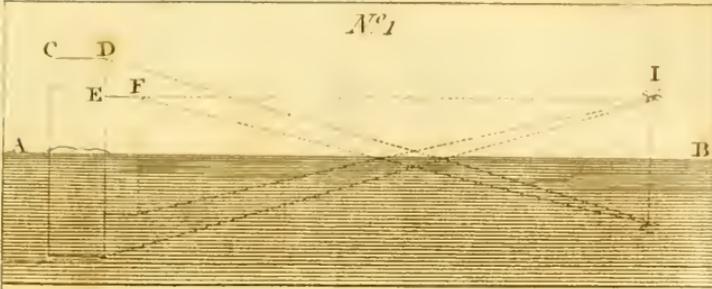




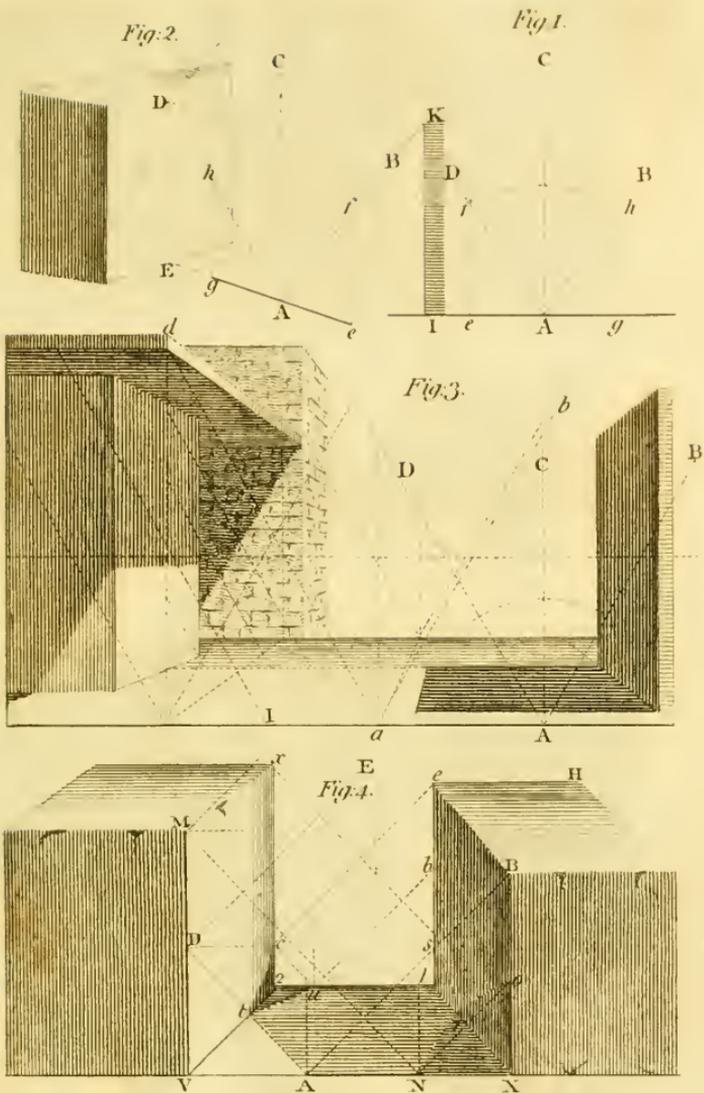
REFLECTION IN WATER.



PERSPECTIVE PL. XLVI pan 7.



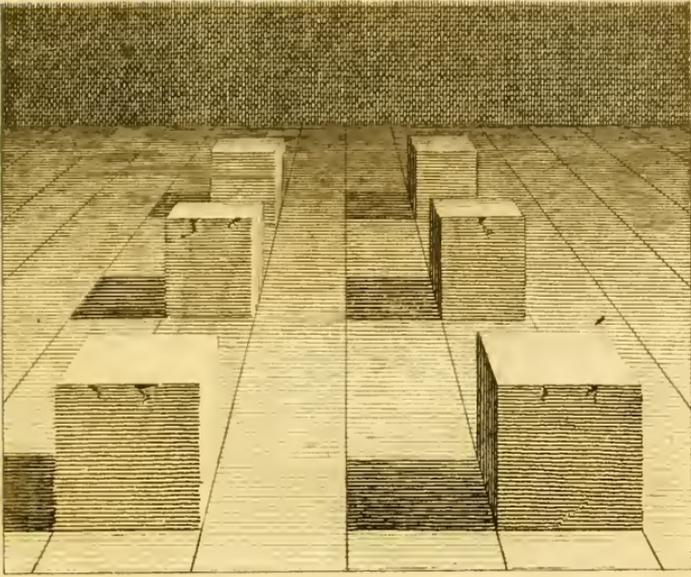




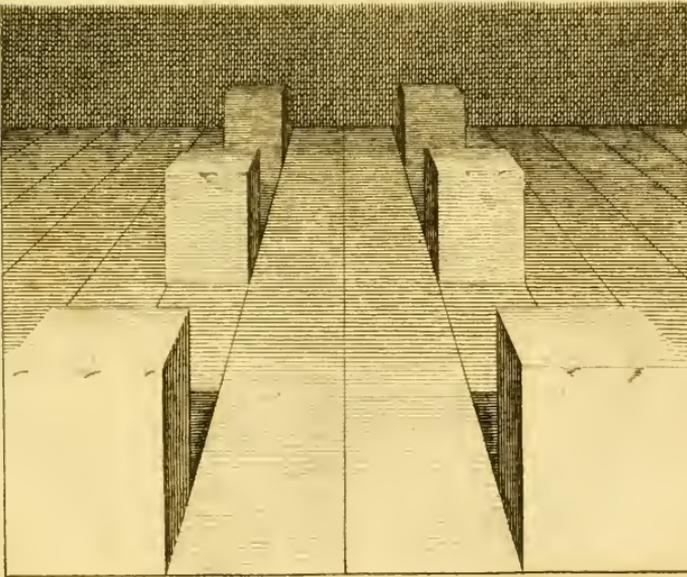
REFLECTION of LIGHT:



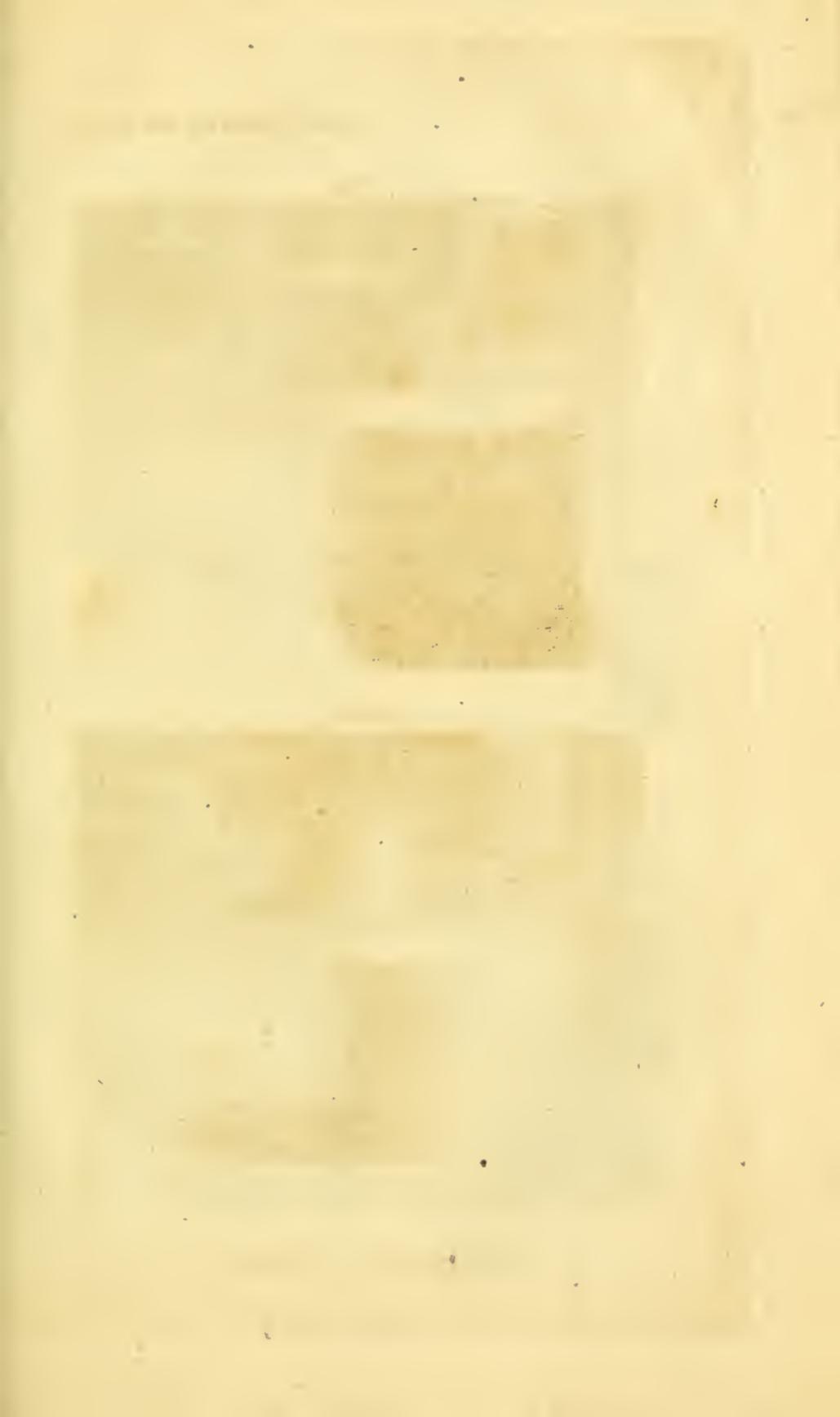
*Fig. 1.*



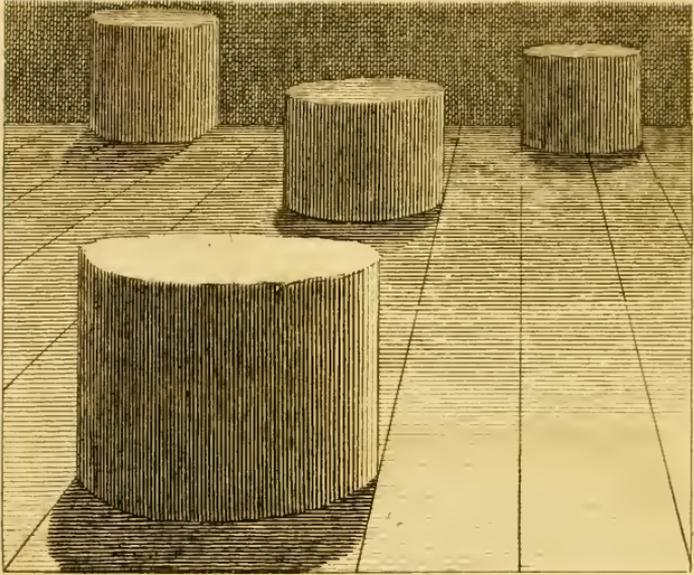
*Fig. 2.*



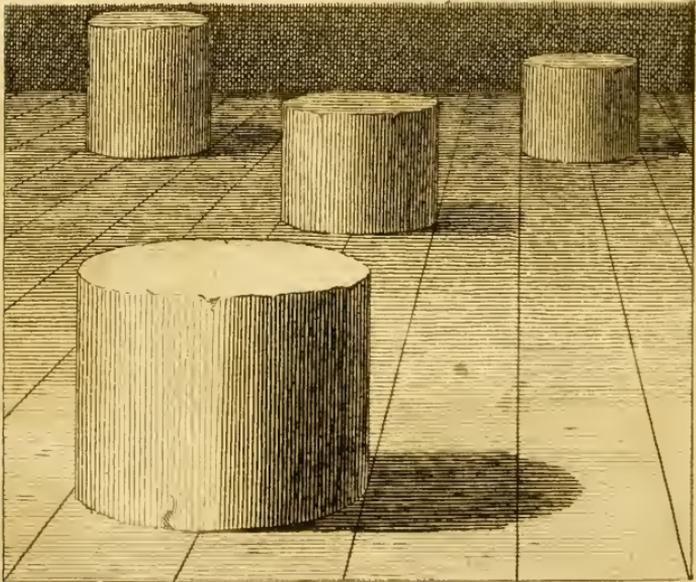




*Fig. 1.*



*Fig. 2.*



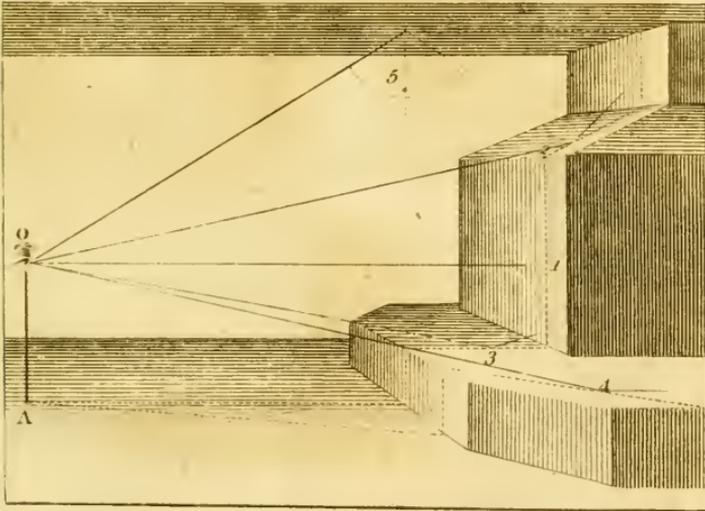
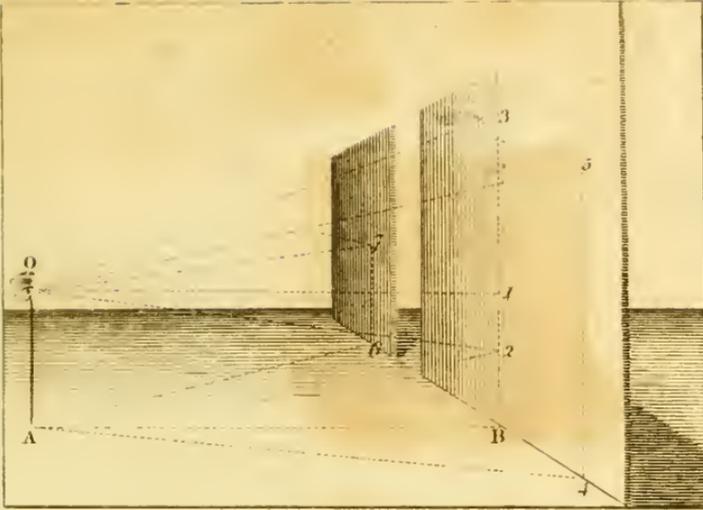
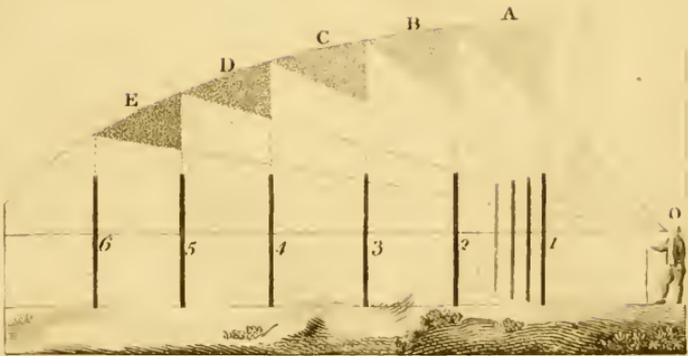




PLATE I





KEEPING. Plate IV.

PRINCIPLES  
OF  
ARCHITECTURE.

.....  
LECTURE I.  
.....

LADIES and GENTLEMEN.

IF “the proper study of mankind is man,” a very proper part of that study, is, to trace the efforts of human ingenuity, and the progress of human genius, and application. These qualities, are no where more apparent, than in man’s inventions to supply the necessities which continually surround him, and to secure himself against those evils to which his present condition exposes him. Time was, indeed, when he dreaded no evil, nor sought security, but safe in his lawful territories, there ruled and reigned; a paradise his palace! For the original dwelling of man is usually supposed to have been beneath the spreading shade, or under the verdant grove: or, if he sought other retirement, it was not in the gloomy cavern, or the melancholy cave; neither in antres vast, nor desarts wild; his bower was

Chosen by the Sovereign Planter, when he framed  
 All things to man's delightful use; the roof  
 Of thickest covert was in woven shade;  
 Laurel and Myrtle, and what higher grew  
 Of firm and fragrant leaf; on either side  
 Acanthus, and each odorous bushy shrub  
 Fenced up the verdant wall; each heauteous flower,  
 Iris all hues, Roses, and Jessamine,  
 Rear'd high their flourish'd heads between, and wrought  
 Mosaic; underfoot the Violet,  
 Crocus, and Hyacinth, with rich inlay  
 Broidered the ground, more coloured than with stone  
 Of costliest emblem:——

The traces of this "shady lodge" are not obliterated among his posterity; nor will be, while *hets* (a tree) bears any resemblance to *huts*, or its derivatives, in several languages spoken among the sons of men.

What might be the abode of ADAM after his expulsion from bliss, or, what kind of city CAIN might erect, we know not: possibly, the fortress of his security was but a composition of mud-walls, and reeds; rather exposing than concealing the trembling vagabond.

I confess, my reflections lead me to think, that the Antediluvians had little occasion for the study of ARCHITECTURE to any extent, as a science: for we must not conceive of certain natural things then, as we experience them to be now. It is likely, the earth was at that time, not only more fertile, but also more temperate; that the seasons were less rigorous, and the wants of human life less numerous. The Deluge, which changed considerably the  
face

face of the earth, most probably changed its temperature; and, perhaps, also, the Deluge was the first prolonged rain which had ever fallen; and not less astonishing to its beholders, than if it had been fire, instead of water. Is it asked, How then was the earth refreshed? By copious dews:—Those countries at present watered by dews, are not the least fertile parts of the earth; and, certainly, dews might afford moisture sufficient to the earth when in full vigour, and when the heat of the sun was moderate. To this hypothesis agrees the extreme length of human life; and, in my opinion, the phenomenon of the rainbow; for if there was originally no rain, then there were no clouds; if no clouds, no rainbow, the offspring of clouds: this pacific token originating after the waters of the flood had covered the earth with oceans, with vapours arising from those oceans, and after the earth was subjected to a fresh system of actions exerted on it.

It is not my intention to notice the almost infinite varieties of ARCHITECTURE which at present obtain among different nations; it is of small consequence to us, on this occasion, to know, that the Samoiedes dwell underground, and pass their long night of winter without wishing for a window; or, that in certain parts of America the natives build their houses up in the trees, to avoid the sweeping floods: or, that many are the towns in China, which are constructed on the watery element, and cover the surface of rivers. That ornamental species of ARCHITECTURE which we have adopted, is more interesting to us, and is to be traced much

nearer to our own climate, amid the power and superstition of Egypt, the science and the application of Greece.

I am aware, that it has been supposed, divine instruction imparted architectural knowledge, and that among the favoured nation we are to look for its institution, or, at least, for its advancement, and its regularity: but, with all due respect to whatever seems to support this opinion, I beg leave to engage our thoughts to another, and a more probable, system.

Before science of any kind can make a considerable progress, civilized life must be advanced some degrees at least toward perfection; for, not till after a community possesses members sufficient for a distinct profession to be assigned to each, is much improvement in any profession to be expected. Alone, or nearly alone, a man must concenter every talent in himself, or at least in his family around him; must himself supply the necessities of life, one after another; and these necessities are too numerous, and too urgent, to permit him to acquire a dextrous management in the treatment of one, before his attention is required by its successor. If this reasoning be just, and if the necessities of life are supplied in haste, perhaps, too, imperfectly, surely, when articles of secondary moment are in question, they shall be dismissed with little regard, insomuch, that after every supposable allowance as to the acquisition of conveniences, the elegancies of life must be relinquished: for what shall impell the already wearied person, to seek after any  
thing

thing not essential to his comfort, when the acquisition of indispensibles has been sufficiently fatiguing?

But beside the additional security, and strength, naturally arising from numbers, in a state of society, population is one source of wealth: and unquestionably, it is also a parent of emulation. A splendid dress, equipage, or habitation, are useless in a desert; but in a city, where they may be seen and admired, they are marks of distinction, they are supposed (how truly is not our question) to confer dignity, and, in their degree, to separate between the ranks of life.

When a profession is sufficiently honourable, or lucrative, to engage the attention of several practitioners, then we hope for improvements and advances in that profession: one practitioner will study and improve its theory, and its principles; another will improve its practice; and the desire of fame, or of fortune, will animate the endeavours of each to surpass the other, and to render himself conspicuous, by manifesting superior abilities.

I wish I was not obliged to add, as another occasion of improvement in the arts, that Superstition has greatly contributed to their advances. While men entertained ideas of paying to the deity superior worship, or of superior acceptance by devotions of superior expence, it is not wonderful they should endeavour to honour the objects of such worship by extravagant structures. These structures moreover, after a time, became the boast of city against city, and country against country: thereby involving national honour as well as local superstition.

We

We have hinted, that the primitive dwelling of man was, probably, beneath a tree, where, as he had enjoyed converse with his maker, he had undoubtedly passed his happiest moments. There is, then, little wonder, that afterwards, trees, especially such as were of venerable aspect, and of spreading foliage, should be chosen by mankind as places of devotion.

It is somewhat unhappy, that, in our translation of the scriptures, the passages which relate to Abraham's sojournings in the *plains* of Moreh, were not rendered by the *oaks* of Moreh, for such is the import of the original word: and many of the transactions recorded in the history of that patriarch would appear more intelligible, had this been attended to; however this may be, we find groves were, in ancient times, considered as necessary parts of devotional structures, and happy were the temples around which the oaks flourished. But, in no part of the world was the oak in higher honour than in Britain, where, for ages, every solemnity was performed beneath it, and every important consultation, and assembly, was held under its branches; and afterwards, when stones were erected into temples, oaks continued to be regarded as sacred accessories. The temples of the Druids were not, like those of Egypt and Greece, properly buildings; but rather, they were arrangements of stones in the nature of an avenue, leading to other arrangements of the same material, which surrounded the altar; for, they held it impious, to interpose any impediment between themselves and the object of their supplications.

The only occasion, on which, as I recollect, they even

even admitted stones on each other, was in those surrounding the altar; where they placed on every two, a third, laid from top to top, and thereby uniting them: but, these stones were not hewn into form, or wrought into elegance, they possessed neither ornament, nor polish, but, rough as they were found, they were deposited with infinite labour in the places assigned them. Much debate has been maintained concerning the learning of the Druids; I shall only say, that, while they could contrive to remove, and to adjust, such enormous masses as would embarrass the most expert of our modern architects, even in this age of science, their works demonstrate their abilities; and, the very remains of them, in part, supply the absence of recording volumes, which the Druids never used.

Druidical erections were so generally uniform, and similar, that, having noticed one, we have little more to add; whereas, the temples of the more Eastern nations, after their principles were once adopted, continued increasing in dimensions, and in magnificence. Having composed, and adjusted, one row of columns, a second was added. The frontispiece of the building too, became an object of attention, and, much decoration was bestowed upon this part of the structure; first, by pilasters, or pillars, partly inserted in its walls; then by a range of columns somewhat advanced from the sacred edifice; afterwards a second and a third range of columns were introduced, further to ornament and complete the entrance.

By similar degrees were equal honours bestowed

on the sides of the building, and ranges of pillars, forming walks for the contemplative, were constructed on its wings; for, since it was not possible in all places where temples were situated, to surround them with groves, their architects planted, as it were, columns in their stead; thereby, endeavouring to supply that deficiency, and manifesting their own abilities in decoration, in contrivance, and in magnificence.

The internal structure of the temples of antiquity deserves attention; for the holy and the most holy were not equally accessible. It was after the general splendour of the building, and especially after the magnificence of the portico, had struck the mind with solemnity, that the worshipper entered the sacred enclosure; and that not on every occasion; for, most of the offerings made on the altar, were presented on that *before* the temple; not on any within the temple; and here terminated many, if not most, of the sacred ceremonies. But, when the worshipper had entered the edifice, properly called the temple, beyond the first apartment into which he entered, was the adytum, or the most profound recess, understood to be the residence of the tutelary Deity. Now, as these apartments had no window, whatever were the rites performed within them (in imitation of the venerable gloom of the consecrated grove) they were performed in obscurity; or, torches and lamps, added their dim lustre to the mystic ceremonies. Nevertheless temples dedicated to a variety of Deities, were constantly open at the top; whether, supposing such an assembly to resemble that of  
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the Gods on Olympus, or whether to provide against errors in their votaries, who might, by mistake, worship a wrong God of the *assortment*, I will not determine.

I could wish to communicate to my auditors some idea of the extreme magnitude of that scale on which some places of worship among the ancients were composed: and therefore shall select a few instances of the most famous and the most remarkable.

The general distribution of the Egyptian temples we learn from STRABO, who thus describes it.

“ This is the disposition of the building of their temples. At the entrance of the sacred place is a pavement of stone, its breadth an hundred feet, or perhaps something less, but its length three or four hundred, and in some places more: this is called the *court*, or approach.

“ Along the whole length from thence, on each side of its breadth, are placed stone sphinxes, twenty cubits, or somewhat more, distant from each other, so that there is one row of sphinxes on the right, and another on the left. After the sphinxes there is a great *vestibule*; as you advance farther there is another *vestibule*, and likewise a third, for the number is not limited, either of the *vestibules* or of the sphinxes, but is various in different temples, according to the lengths and breadth of the courts. After the vestibules is the temple, having a great anti-temple, or *nave*, worthy of admiration.

“ The sanctuary was of a moderate size; there was no carved images of the human form, but only of

some brute animal. On each side of the anti-temple are what they call wings; these are two walls of equal height with the temple, at first distant from each other a little more than the breadth of the foundation of the temple; afterwards, as you advance farther, they incline towards each other fifty or sixty cubits. These walls have sculptures of great images resembling extremely the Tuscan and ancient works among the Grecians." STRABO, page 805.

But, as some specific instance may impart yet clearer ideas of the extent of these buildings; I shall select from HERODOTUS his description of the temple of *Bubastis* in Egypt.

The approach to it was by a road, which separating two canals, had the appearance of an island; each canal being one hundred feet wide, and reaching from the Nile to the front of the edifice. The gates which formed the first entry were sixty feet high, and the size of their ornamental figures six cubits. The inclosure contained a wood of sacred trees, very high, planted around the body of the temple, wherein was the statue of the Goddess; each side of the inclosure being a furlong in length. Near the entry was a high road, paved, conducting to the public square, and bordered on each side by lofty trees, aspiring to the sky.

The magnificence of the temple of SOLOMON, I need not repeat, because it is a subject with which we all are familiar; but when we consider the happy coincidence of riches, skill, and devotional resolution, which distinguished its erector, we need not doubt of the extreme magnificence of SOLOMON'S sacred edifice.

The temple of SOLOMON has long since ceased; the ploughshare of desolation has uprooted its foundations: of other most superb instances of human abilities, scarce any traces remain; the pyramids alone, firm by their erection, and permanent by their form, continue to demonstrate the veracity of those accounts which describe contemporary, or posterior, erections.

A few temples in Greece, indeed, just serve to excite our melancholy reflections over fallen grandeur, and to relate the ravages of barbarism and ignorance; if beside, the laborious and venturefome architect can trace from pillar to pillar, and from arch to arch, those proportions which once infused solemnity into the spectator, or elegance into the building, it is all the age of PERICLES can boast.

And what further can we say of the ruins of Rome? the immense thermæ of voluptuous luxury; the noble temples of magnificent superstition; whatever was costly, or sumptuous; whatever was splendid, and exquisite, were associated in Rome: In Rome, where we now meet with—here and there a temple—remaining, but changed; here and there—an obelisk—but broken; here and there—a portico—a pillar—a frontispiece—but mutilated and imperfect. Triumphal arches, designed to perpetuate to eternity the actions of Emperors, and of warriors, are decayed; and consecrated Apotheosi (attributes of Deity) are mouldered into dust; yet enough remains to render credible the writings of the historian, which describe these in their splendour, and to excite admiration at the abilities of the artists who composed, and constructed them,

Mark how the dread PANTHEON stands;  
 Amid the domes of modern hands,  
 Amid the toys of modern state,  
 How nobly, how severely great!

These the northern ravagers destroyed: But, the Northern ravagers had their taste, and their style, and their skill too, and let us do them the justice to acknowledge, that it was not deficient in expression: like their poetry, which abounded in animated imagery, and bold phraseology, wild and irregular, yet often pathetic and lofty, void of conduct and plan, yet vigorous and affecting; so their architecture was peculiar and barbarous; dissimilar in its parts, multifarious, and injudicious, in its ornaments; confused, and perplexed, in its distribution. But, if the ages of ignorance wanted gloom, the Gothic architecture was gloomy; it was correspondent to the hood, the cowl, the beads, the superstition of the times, and, even now, has great effect in producing solemnity and reverence, and striking with awe the man of observation. Nor were the mechanical parts of architecture unknown; nor would many of our present architects be able to surpass the bold projection, and the lofty roof, which Gothic magnificence has left, as monuments of its abilities and emulation.

Gothic architecture is a striking instance of the necessity of order; for, if the architects of the times alluded to, had studied uniformity and symmetry, I think it not impossible they might have discarded, by degrees, those labyrinthine ornaments, with which they endeavoured to conceal  
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disproportion; and, by reducing the effect of their productions to the scientific principles of regularity and plan, they might have shewn, that their manner was susceptible of effects, peculiar and restricted, no doubt, yet, effects not always disgusting, or even despicable.

Let me here, be permitted to consider the peculiarities of national style, as no insuperable hindrances to merit: according to the opportunities of persons, so should we estimate their productions. That which would be very inferior from an Artist of these enlightened nations, would deserve our applause from an Indian of America. As the pictures of **QUINTIN MATSYS**, if not equal to **RAFFAELLE**, are yet highly laudable from the blacksmith of Antwerp; so the carvings of the Islanders in the South Sea, though not comparable to the living marbles of **PHIDIAS**, and **CLEOMENES**, yet are instances of much patience and skill. And, for my own part, I would even praise some labours of the Chinese, if in return their vanity would but allow that Europeans also possess the gift of sight, and are not totally void of understanding.

Be it always remembered, that the natural and moral, situations of mankind, occasion a diversity both of sentiments and of necessities: consequently, a diversity of inventions, to satisfy the principles of the first, and to prevent the inconveniencies of the latter. Thus, in Egypt, where they have no rain, but excessive heats, the roofs of the temples were almost flat; for what need had they of a water-course?—but, to guard against the sultry climate,  
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the edifices were low, in proportion to their extent, and every method was adopted to procure a stream of temperate air, or a breadth of cooling shade. To accomplish this, a forest of pillars supported an enormous superstructure, and the colonade almost forbad the light of the sun, that it might shut out his beams.

In Attica they had rain, and therefore raised their roofs to throw it off: in Attica they had the cooling breeze, and therefore might venture to elevate the column from four, or five, diameters, to eight or ten: in Attica the people were addicted to mirth and festivity, and the character of their buildings was correspondent to their cheerfulness. Elegant proportion, therefore, was studied here; and to adorn their edifices with splendor, was agreeable to the disposition of a people so "merry as the Greeks:" while the voluptuous Roman expended his riches on decoration; covered with ornament every part of his structure, in defiance of expence; and lavished in wanton effusions of magnificence, real or imaginary, the ill-gotten revenues of conquered provinces.

There remains yet to notice an order of religious buildings, different in many respects from any of the former; for, Christianity, though at first obliged by persecution to perform in obscurity much of its congregational devotion, yet desires not obscurity as agreeable to its genius. On the contrary, when well understood, it is cheerfull and animating:— what has, it then, to do with the darkness of the oracular cave, or the madness of midnight orgies?

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it has no mysteries forbidden to be divulged on pain of death; no (*aporetta mysteria*) things too sacred—no, says the Apostle—using the same term, things too vile to be disclosed. The devotional structures of Christianity, therefore, may desire windows; like him, who, when promised by his architect, that his house should be so constructed, as not to be inspected;—“rather,” said he, “let what passes there be open to all beholders:” or like him, who wished for an opening in his breast, that the integrity of his heart might be visible to all. Yet, with cheerfulness combining solemnity, the religious edifices of the Christian dispensation are happily calculated, in their principal requisitions, to afford ample scope for the abilities of an architect.

We have in our own country abundant instances in proof of this assertion; but one may be sufficient to mention: for, whoever has examined the cathedral of St. PAUL at London, has seen magnificence in proportion, and regularity in distribution, united to a remarkable lightness in construction: strong, not heavy; elegant, not gaudy; and perhaps as happy an instance as exists of the *simplex munditiis*; neither penurious, nor extravagant.

It is natural to suppose, that peculiarities correspondent to those which distinguish the religious edifices of any period, should also characterize the civil erections of the same time. When superstition enveloped the mind in gloom, no wonder the mansion was rather a castle than a house: the contracted window just admitted light enough to exchange darkness for obscurity; and to permit that  
hospitality

hospitality, which, in some degree, corrected the ferocity of ignorance. But, as learning dissipated the clouds of barbarism, the advantages of a just taste became more conspicuous, and gradually displayed themselves in the superiority they imparted to domestic residences. Hence, in towns, splendid palaces, magnificent offices, comfortable dwellings, and spacious streets; in the country, noble seats, and decorated retirements; the elegant pleasures of a gentleman's villa, or the salubrious enjoyments of the ornamented farm.

With regret we omit to instance correspondent improvement in the public buildings of the British nation: our national palace, our senate houses, and most of our public offices, are, and till lately *all* were, totally unworthy of this great people; but we have made a beginning, and it is to be hoped the case may hereafter be changed; and that, following our example, posterity may be induced to complete the undertaking.

At present, I apprehend, the science of Architecture is no where more cultivated, or better understood, than in England; many of the seats of our nobility, and gentry, attest this truth: and, though in most of our towns, our brick edifices are not equal in appearance to the stone buildings of certain cities abroad; yet in finishing, in convenience, in distribution, and in neatness, we very much excel them, and, while the real enjoyments of life continue to be of more intrinsic value and consequence than the tinsel of external finery, may this distinction ever be characteristic of the British Nation!

OBSERVA-

OBSERVATIONS

ON THE

PLATES BELONGING TO

LECTURE I.

ARCHITECTURE.

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PLATE I.

No. I. **P**LAN of a simple cabin, or primitive dwelling : and may be conceived as representing also a primitive structure for worship ; supposed among the Egyptians, Phœnicians, or other early people.

No. II. A similar cabin ; but surrounded by an inclosure, and defended by a hedge, a wall, or some other simple defence, which indicates sacredness.

No. III. An edifice, whose ruins still exist at Syenna, in Egypt : by the simplicity of its structure, it seems allied to the former.

The body of the building is preceded by a portico much larger than itself, having only *one* row of columns. This edifice has been thought to be an observatory ; but that does not prevent its having been a temple also. The inclosure is to be conceived as correspondent to the enlarged proportions of the edifice : this article must evidently be regulated by circumstances of convenience, or ability, and is therefore omitted.

No. IV. A temple, whose ruins are at Esfinay in Egypt. This porch had *two* rows of columns; and the temple itself is divided into more apartments than the others, probably to accommodate a family.

No. V. A temple whose porch had *four* rows of columns; and which had in front a large area, with a colonade on the sides. By the space of the building, from wall to wall, this edifice is conjectured to have been open at the top. The ruins are in Egypt, at Etfou.

No. VI. Exhibits the immense additions made to temples in process of time: here we have (1) (at bottom of the plan) prodigious obelisks, or other decorations of that nature, for the door-way. Having entered the building, we have (2) an extensive and multiplied colonade; in fact, a forest of pillars. Having passed another door-way, we have (3) another colonade (of single columns), and probably open at top, in the center at least; which leads into an open square (A) in front of the temple itself, colonnaded on the sides, with double ranges of pillars (5). A very magnificent portico of columns, &c. precedes (6) the entrance into (B) the sacred edifice; in the interior of which (C) was probably the adytum, also the statue of the Deity, with a vestibule (D) behind it. It is evident that many apartments, &c. might easily be constructed around, and within, this temple, for the accommodation of numerous attendants. Around the whole may be supposed approaches through avenues of trees, and sacred groves; or public roads, canals, &c. The ruins are still visible at Luxxor in Egypt.

## PLATE II.

No. I. It has been thought very probable, that the Israelitish tabernacle in the wilderness resembled in its plan that of the temples of the times, especially those of Egypt: as appears in this figure, where the sacred edifice itself is situated in the center of the inclosure, which is a kind of colonnade.

No. II. May impart an idea of the front of the tabernacle; which seems little different from those of other temples, except in the temporary nature of its materials.

No. III. Plan of the temple of the Serpent Knuphis in Egypt; a sacred edifice, surrounded by an area; the inclosure not wholly a continued wall, but in part composed of columns.

No. IV. Elevation of the same structure: the pillar in the middle of the *door-way*, was more probably the result of necessity, than of choice, and seems to indicate the great antiquity of this structure.

No. V. Another Egyptian temple; in composing which, the architect has endeavoured to add to its dignity by a very large area, colonnaded, (*a b c d*) having a portico. The temple (*A*) is much like some preceding. Vide No. V. Plate I.

No. VI. Is an idea of the temple of SOLOMON, surrounded by an inclosure; having on each of three sides a magnificent entrance (*ABC*); and on one side two entrances (*DE*). These buildings (as *A*) were fifty cubits long; from them to the porch of the temple was 100 cubits; the porch itself fifty cubits; and the court of the temple (*R*) 100 cubits broad. *S* is the holy place. *T* the most holy place. *x x* chambers of the priests, constructed all round the temple; not adjoining to it, but separated from it by the little interval *u u*.

## PLATE III.

No I. Plan of a temple, explaining the supposition of the necessity for propping the roof by a row of supports *throughout the middle of the building*, as hinted in the LECTURE, and partly exemplified in the *door-way* of the temple dedicated to the Serpent Knuphis; Plate II. Nos. III. and IV.

No. II. Frontispiece of a temple slightly ornamented: *i. e.* with two pillars at the door-way, and a pilaster at each corner of the projecting walls which form the portico: called by the Greeks the ANTES.

No. III. Plan of such a temple.

No. IV. Shews further progress in ornament, the front portico being formed and decorated by an *advanced* row of columns, making in effect a double colonnade: it has also a row of columns at the back front. This kind of temple was called PROSTYLE.

No. V. Plan of such a temple.

No. VI. Shews the addition of a detached range of columns *all round* the temple; also of several steps for elevation and additional grandeur. This kind of temple was called PERIPTERAL, in allusion to the kind of *wing*, which the columns form to the temple.

No. VII. Plan of such a temple.

No. VIII. This temple has *two rows* of columns, in its portico, and all round; with a flight of many steps in front and behind: and frequently all round. This kind was called DIPTERAL, or *double-winged*.

No. IX. Plan of such a temple.

No. X. A temple in the center of a colonnaded inclosure. The ruins of one like this are thought to exist at Athens: It differs from the Egyptian, in having a colonnade in front of the inclosure; also in the proportions of the temple, &c.

## PLATE IV.

No. I. TOWER OF THE WINDS at Athens: an octagon temple, of which hereafter. *Vide* Plate VIII.

No. II. Plan of the temple of JUPITER OLYMPIUS at Athens: according to Pausanius, the area was a furlong in length on each side. The temple itself is dipteral; and, according to the general mode of the Greeks, is in length more than double its breadth.

No. III. A Roman dipteral temple: in length just double its breadth.

No. IV. Elevation of the PANTHEON at Rome: a circular temple, of which hereafter.

No. V. Plan of the PANTHEON.

No. VI. Plan of a temple at Baalbec: in which we notice, besides an immense flight of steps, a colonnaded portico and vestibule: the first court (A); the second court (B), very large; the portico (C); the body of the temple (D). The temple is DECASTYLE, *i. e.* has ten columns in its front portico.

No. VII. Elevation of its portico.

## PLATE V.

No. I. An idea of the subterranean catacombs, or burial-places; wherein, during persecution, the early Christians are said to have assembled for worship. These were of different forms, as accident or contrivance regulated their construction or excavation. They are found in Rome, Naples, Egypt, &c.

No. II. An ancient church; the plan from PALLADIO.

No. III. Plan of the ancient St. PETER's at Rome.

No. IV. Plan of the famous SANCTA SOPHIA, at Constantinople; now a Turkish mosque.

No. VI: Plan of St. MARK's church at Venice.

No. VII. Section of the church of St. MARY of *Flowers* at Florence.

These churches shew, especially, the progress in construction of domes, and cupolas: *i. e.* of circular coverings, resting on quadrangular foundations; which form of sacred edifices is peculiar to Christian structures for worship: not having been practised by the ancient architects. *Vide* the HISTORY OF ART.

## PLATE. VI.

No. I. Section of the AUGUSTIN's church at Rome.

No. II. Plan of the AUGUSTIN's church.

No. III. Section of the present St. PETER's at Rome.

No. IV. Plan of St. PETER's at Rome ; with the colonnaded area, &c. which forms the approach.

No. V. Exhibits the usual construction of churches in catholic countries ; with chapels round the sides. This is the plan of the chapel at VERSAILLES.

These six plates are intended to impart some idea of the progress of architectural decoration and construction ; the designs are mostly drawn to the same scale, except the very small ones, (especially the small *elevations*) which are *enlarged*, to render them somewhat more intelligible. We observe, on the whole, that the attempts of succeeding ages at sublimity or magnificence, were constantly directed to surpass their predecessors in the magnitude of their structures, and in the consequence of the approaches to them. Whether so much attention bestowed on approaches, has not often injured the effect of the principal building, is doubtful.

*N. B. These plates trace the progress of sacred edifices in various countries, as*

*In Egypt, Plate I. II.*

*In Greece and Rome, Plate III. IV.*

*Of Christian churches, Plate V. VI.*

PLATE

## PLATE VII.

No. I. Front elevation of a temple of that kind with *ANTES*, *i. e.* ornamented only by a pillar on each side of the entrance; and the projecting wall of the temple with a pilaster (properly the *Antes*). The order is *DORIC*.

No. II. The portico *advanced*, decorated with four pillars (correspondent in situation to those of the *Antes*), the rest of the building plain. This kind was called *PROSTYLAR*, or *PROSTYLE*. The *AMPHI-PROSTYLE* had a similar portico in the back-front. The order is *IONIC*.

No. III. Beside the advanced portico, now containing six columns in front, the roof is projected on both sides of the building, forming a walk between the body of the temple and the colonnade. This kind was called *PERIPTERAL*. The order is *CORINTHIAN*.

No. IV. A frontispiece, having eight columns in front; also two rows of pillars, *advanced* from the body of the temple, on both sides, forming two walks. This kind was called *DIPTERAL*.

No. V. A *PSEUDO-DIPTERAL*; which, seen in front only, has the appearance of a dipteral: but it differs, by the absence of the *interior* row of columns, the space between the body of the temple and the external row of columns, being vacant; and making only one walk, of double the usual width.

No. VI. Has ten pillars in front, but only two side walks; the body of the temple comprising an extent equal to six pillars. This kind was called *HYPÆTHRAL*, *i. e.* open to the air: forming a kind of cloisters internally, and generally containing many deities.

## PLATE VIII.

Hitherto we have attended only to temples whose forms were square, or allied to square, as parallelograms, &c. This temple, THE TOWER OF THE WINDS, at Athens, is octagon.

This plate also shews the nature of a *Section*, *i. e.* the *inside* of a building, seen geometrically, as if the front wall was supposed to be absent: also, of a *Plan*, *i. e.* the *foundation* of a building supposed level with the ground. The peculiar construction of this roof, occasioned by the form of the building, is seen in the section, and also in the plan of the roof; to which we have added the names of the eight winds, whose figures with their attributes are sculptured on the outside of the edifice.

This building is still existing tolerably entire at Athens: and is used by the Turks, as a kind of mosque, or place of worship. The worship maintained in it, is of a peculiar nature, and consists of a perpetual whirling motion, performed by the devotees, to a melancholy music; having turned round swiftly, till their heads are giddy, they kiss the ground and retire.

On each face of this edifice on the outside, are remaining the lines of the sun-dials which formerly occupied them: these are among the most ancient of the kind remaining.

## PLATE IX.

## CIRCULAR TEMPLES.

No. I. Monument to the honour of **LYSICRATES**, a victor in the public games, at Athens; called by the modern Greeks, (but without authority), the **Lantern of DEMOSTHENES**. This is one of the most elegant little buildings existing; the peculiar richness of the roof, and of the entablature, merits notice. It is supposed, the tripod won by **LYSICRATES**, stood on the top of the ornament on the roof.

No. II. Section of the monument of **LYSICRATES**.

No. III. Elevation of a temple at Tivoli, commonly called the **SIBYL'S temple**; but rather dedicated to **VESTA**.

No. IV. A **MONOPTERAL** temple, *i. e.* having but one row of pillars, which support the roof, and being open, without any wall to form the body or cell of the temple.

Circular temples have a very pretty effect, in gardens, pleasure grounds, and parks: and they are much used in such decoration.

## PLATE X.

No. I. A circular PERIPTERAL temple, *i. e.* having one row of pillars, advanced from the body, or cell of the temple.

No. II. Its plan: wherein the walk between the body of the temple and the colonnade, is very evident; the altar (when inside the temple) or statue of the Deity, is placed in the center: but in total darkness.

No. III. The circular temple at Baalbec: wherein we observe the columns advanced from the body of the temple, as in the *peripteral*; but affording no space for a walk around it, because connected to the temple by the circular sweeps of their pedestals, entablatures, &c.

In these four plates we have attempted to convey to our readers a more distinct idea of the nature and variety of temples, &c. than was possible on the small scale of the preceding plates, where our object was, by comparison with each other, to shew the general progress of this branch of art; and, indeed, as only by *comparison* can distinct ideas of their differences be obtained, we have been solicitous to arrange these in a manner favourable to that intent. We have not thought it necessary to give *plans* of all these buildings, as most (*i. e.* the square) may readily be understood from plans already given; and that given of a round structure requires little variation to render it applicable to all of that form; and is further assisted by the plan of the Pantheon, and some others, introduced on a larger scale, at the close of the following discourse.

*End of the Plates belonging to LECTURE I.*

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## LECTURE II.

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LADIES and GENTLEMEN,

**T**HE difference between the works of Omnipotence and those of such feeble beings as ourselves, is never more apparent, than when we consider the principles, and the progress, of our attempts at magnificence, or sublimity. What extensive preparations! what unremitted labour! what accumulated toil! what united efforts! are necessary to erect a pile, which shall impress a spectator as somewhat above the common; whereas, with what ease does the Majesty of Heaven will, and it is done, command, and it is accomplished; and this on a scale infinitely beyond the competition or conception of puny mortals! If we seek sublime in terror; vast rocks, awful precipices, immense mountains, strike us into trembling: if in serenity, the celestial expanse is sublimely serene. If we seek an instance capable of both; observe the smooth surface of the liquid plain; the immense pool is motionless: or if, obedient to the wanton zephyrs, gentle undulations creep over the transparent ocean, its languid murmurs die along the shore. Sublimely beautiful! placid, benign! the canal of industrious commerce! the liberal distributor of abundant wealth!

wealth! the friendly union of distant nations!—is this that element, which anon shall rouse its resistless fury, in tempestuous billows foaming against the heavens? shall roll its circling eddies in restless agitation, and open its profound recesses! deep as the grave! obscure as the shadow of darkness!

The works of Omnipotence are simple principles, applied to a variety, an infinite variety of purposes; distributed into effects apparently distant from their causes; into divisions whose origin seems scarcely related to its offspring: not so are human productions: these, are an assemblage of various smaller articles, combined to form one whole; they are collections from distant quarters, composed, compounded, arranged and regulated, with much patience, contrivance, and ingenuity. To procure them is the province of labour: the sinewy arm must exert its strength to separate, or to secure, the wanted materials; and vigorous efforts of united force, must be well plied, and well directed, to move and to adjust the cumbrous mass: but, to place this mass to the best advantage, to correct it into symmetry, to decorate it with delicacy and effect, is the province of genius; of genius, happily assisted by knowledge and skill.

The company I have the honour at present to address, will readily forego a relation of the labours of the quarry, or the toil of the brick-kiln: our attention, will be, I hope, more agreeably engaged, on that part of architectural science which regards rather principles, than practice.

We attempted to illustrate a former subject (*vide* LECTURE III. of the first series), by a reference  
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to some of the principles of this science; in which we considered UNIFORMITY, or SYMMETRY, as appearing with great effect in the labours of the architect; and indeed, the presence, or the absence, of this principle, is among our first observations, whatever be the instance we inspect. Its absence is notorious in many gothic erections, and is a principal cause of that discontent, perhaps disgust, with which we survey those erections. Every composition of art requires that some part should be more conspicuous than the rest; that some distinguished portion should more immediately impress itself on the mind of the spectator, which he may, without hesitation, fix on at once as the direct object of his attention. In composition of architecture, this is a requisite altogether indispensable: but, if all parts of an edifice are alike, we distinguish no principal portion; or if all parts of an edifice are unlike, we experience, at least, equal perplexity, in guessing at what should be the principal portion. Moreover, the impressive effect of composition, is not proportionate to its details, and its *minutia*, since these require time to be examined, and understood; but the effect is proportionate to the quantity of parts which are calculated to strike the spectator, at once:—*This* may be pretty, and *that* be delicate; but, unless the aspect of an edifice has previously raised an expectation of delicacy, and a conception that the subject deserves such attention, the finishing, though exquisite, will appear frivolous, or misplaced: and therefore, instead of applause, may possibly meet contempt.

There

There is nothing very sublime, I believe, in the firing of a musquet, or of a dozen, or a score, of musquets in succession; but the same quantity of report employed in a large cannon, by its united effect, and instantaneous explosion, produces much *greater* sensations. The sublime of a single voice, vociferating *huzza!* is very moderate, let the voice be prolonged, or the shout repeated as long, or as often as may be; whereas in the roaring of a multitude combined, there is something grand; now, if this roaring be regulated by happy modulation, and disposition, it becomes a chorus, and is unspeakably improved in effective grandeur, principally by the power of symmetrical arrangement. So, in architecture, that composition will be most successful, which brings the greatest quantity *to bear* on a spectator *at once*. Let me not be misunderstood; quantity, *i. e.* extent merely, is not my meaning; since the capacity and intelligence of a spectator to survey and comprehend them, do not increase with the increased dimensions of a fabric; but, I mean that happy arrangement, which, by symmetry and distribution, enables the eye to comprehend the composition, and its beauties, with the readiness of perception.

Thus, at a blow, are cut off the intricate multiplicity of projecting corners, closets, staircases, towers, and turrets, which abound in some structures: with all labyrinthine windings, and vermiculated decorations, which rather speckle, than adorn, the external of buildings: and, by reducing ornaments to those of facile comprehension, we forbid much useless labour which has often been injudiciously

ciously, perhaps injuriously, lavished. I think also, that this principle demonstrates the general superiority of Grecian architecture: ornaments are ornaments; their effect is, to produce diversity; those of one shape may please as well as those of another; but, in the larger and more important principles of art, in conception, and in composition, an error is more serious and far less retrievable. We place, therefore, a symmetrical distribution, which shall distinctly express the design of the edifice, and indicate its noblest parts, as a *sine qua non* in architectural composition.

But, by symmetry, do we exclude VARIETY? certainly not. We merely forbid licentiousness;—variety run mad. We commend a diversity of forms, provided those forms be regular; and we exclude no variation, but such as tends to weaken the general effect. In fact, variety is equally necessary as symmetry; and equally necessary as either variety or symmetry, is, that propriety, and FITNESS, which to insure success, must regulate every exertion of art.

No proof is required, I presume, that, according to the intended use of a building, it may vary in parts and dimensions. A parlour requires not the magnitude of a cathedral: nor am I of WILLIAM RUFUS's opinion, that Westminster-Hall is fit only for a bed-chamber. Propriety not only never need be separated from elegance, or magnificence; but, magnificence or elegance are peculiarly offensive unless accompanied and regulated by propriety.

In requiring, therefore, the most suitable proportions for an edifice, we must previously understand its destination; for, according to its use, must be its magnitude; and according to its magnitude, must be its proportions. Various instances prove the power attributed to this principle by the architects of antiquity: where a colossal building, for instance, required extraordinary altitude, they proportioned the members of the orders which composed it, not precisely, and exactly, as they would have done, had each been separate; but, allowing for the effect of perspective, and its influence in diminishing proportions, they determined their parts accordingly, adapting them to those stations from whence their effect was most likely to be estimated. Such variations of the parts of buildings imply correspondent variations in their general dimensions, to answer particular purposes.

Moreover, the destination of an edifice regulates, beside its proportions, all its decorations. I readily grant, that we may worship the Deity with equal sincerity, and with equal acceptance, beneath a roof of thatch, as beneath a splendid dome: yet, I cannot say, therefore, I would recommend a cottage for a cathedral; on the contrary, where multitudes assemble to worship, I would wish to render their worship commodious. Together with meanness, this concession prohibits whatever is gaudy, or glaring, since these contribute (often greatly contribute) to distract attention. In this respect, all comparisons between the rival churches of St. PETER's at Rome, and St. PAUL's at London, are greatly in favour of the latter.

I much

I much mistake, if splendid decorations be analogous to the design of a house of prayer, which is the simplest and most direct idea of an edifice for worship: Are they not rather, likely to excite that admiration of the artist's abilities, which is inconsistent with the intense humility of devotional supplication? Let us imagine ourselves entering a superb edifice, viewing on either hand fluted columns, and pilasters of exquisite workmanship, supporting highly ornamented arcades, surrounded by statues of great merit, and by pictures of most sublime composition;—we advance further into the building; we observe the wreathed pillars, and the angelic figures; we look up to the dome, look around to the aisles, look forward to the altar; the whole is enriched with scrolls, shells, foliage, and festoons; with every device of sculpture, and painting, with every ornament of human art: Is there nothing in all this to bewilder our attention, to dissipate our reflection, to amuse, rather than to augment the reverence which brings us to this sacred temple?—But St. PAUL'S has no such profusion of magnificence; the structure is indeed grand, but simple in its parts, and plain in its ornaments: no pictures, and little sculpture; nor do I wish to see its sculpture much augmented, except perhaps, by monumental erections to those great men, who may deserve of their country to have their memory so honourably transmitted to posterity; and these might be placed in the circumference beneath the dome, to great advantage.

I confess, I think the humbler parish church is

more happily adapted to its purposes than the gaudy St. PETER'S; but, I would not confound a parish church with the dwellings of the parochial inhabitants around it. It requires distinction, and variety, in its ornament, as in its construction; nor am I Puritan enough to suppose, that pillars at the porch, or pilasters within, would hinder the fervency, or the acceptance, of devotion.

We look elsewhere then for the seat of decoration, and magnificence; where the senate of a great nation, the representatives of a powerful and opulent people, meet to regulate their power and opulence; where royalty erects its throne, and the seat of government is apparent; where foreign visitants are received with due distinction, whatever be their rank; and where, if ever, pride, national pride is laudable, there introduce the rich entablature, the ornamented moulding, the polished shaft; there exhibit the flowing wreath, and the gracefully-pendant festoon: but beware even there, that dignity be not lost in decoration, or genuine elegance be enthralled by lavish profusion.

Or, if the nobles of the land wish to erect mansions suitable to their estates, we commend the intention; their patronage will encourage art; in return, art will supply conveniencies not otherwise to be procured, and elegancies not otherwise to be enjoyed; art will furnish personal accommodations adapted to their conspicuous situations, and splendid distinctions correspondent to their exalted dignity. By what powers, or means, art will succeed in this attempt, I proceed now briefly to notice.

There

There are certain principles in which every erection intended for habitation must of necessity agree; such as, that it should be a defence from the vicissitudes of the seasons; that it should be a commodious receptacle for property; that it should permit the necessary avocations of nature, and contribute to safety and satisfaction as well by night as by day, and so on. These are but a part, though a very important part of architectural study: indeed, it is not easy to notice the variety of which architecture is capable, much less to render it improving, or entertaining: nor is it my present design, to enter into a detail of carpentry, and perplex my auditory with the distinctions and applications of beams, timbers, girders, joists, and rafters; these we leave to whom they may professionally concern; but we shall attend somewhat to the leading and standard principles of building, and then turn our attention to those compositions which profess to impart peculiar elegance.

Having thus attended to the necessary properties of a building, let us now advert to the nature, and the application of its ornaments.

In a former discourse we remarked, that, to increase the magnificence of their temples, the ancient architects augmented the number of their columns; and, that whenever elegance was necessary, recourse was had to columns: What is there in columns which entitles them to this distinction? or, are they all equally elegant?

There seems, I think, little reason to doubt that trees were the first supports to buildings of considerable

siderable size; and were, most probably, inserted into the walls, to sustain, either an upper story, or, beams of considerable weight, on which the roof rested. The strength which they contributed, when by attentive genius rendered regular, brought them into use; and by progressive improvements, they increased in importance, and in ornament.

There remain in some early edifices, very remarkable indications; that ancient architects, in erecting stone buildings, did little more than substitute one material for another; they have imitated very closely the courses, and the appearances, of those beams of wood, which were necessary to be laid from part to part, for additional support. It is true, they ornamented these marbles, but without excluding the appearance we have mentioned; and had we now extant the original attempts at this substitution, probably the likeness might be yet more explicit. This is very apparent in certain parts of the orders: let us therefore now turn our attention to the orders; and to this circumstance, among others, belonging to them.

The orders are usually reckoned five: the Tuscan, the Doric, the Ionic, the Corinthian, the Composite: not that the difference is throughout considerable between these orders: for, between some of them the variation is rather in their ornamental parts than in their general principles, or their apparent conformation.

The DORIC order of columns is considered, I apprehend justly, as the most ancient: The earliest Doric specimens remaining, usually consist

sist of the following parts: (1) the shaft of the column, which goes strait into the ground, or which rests on a step, without ornament, or moulding of any kind at the bottom, to form a base; and, this absence of the base occurs, notwithstanding the shaft may be decorated with flutings, which indicates a progress in ornament. On the upper part of the shaft is (2) the capital; the form of whose members, in early instances, seems to convey an idea of pressure by supporting considerable weight; over the capital, is (3) the architrave, and (4) the frieze, which correspond exactly to so many pieces of timber, laid one over the other, and from column to column. (5) The cornice, by its projection, seems intended to protect the under parts from the injuries of the weather; and very probably, was originally designed for that service.

Some have said, that, the Doric column was proportioned to the form of a well-shaped man; and the Ionic was imitative of a delicate woman: It might be so; but I am not without suspicion, that this resemblance, and its application, was discovered *after* the invention of these orders: it seems to me an ingenious after-thought grafted upon them, arising, from observing their different decorations, and proportions. In fact, the manly Doric not suiting well the lighter kind of edifices, it was natural to think of lengthening the shaft, or tapering its diameter, which in effect is the same: nor was it difficult to enrich, or to elevate the entablature, when lightness and elegance were wanted to characterize the structure in which the order was to be employed.

The

The volute, which forms a very important part of the capital of the IONIC column, bears some resemblance to a ram's horn, supposed to be hung on a pillar (we know such ornaments were placed around altars); as the trygliphs of the Doric order are considered as having originated from the sacred lyre; and the heads of sheep, or of oxen, which adorn the Metopes, from those parts of animals slain for sacrifice. It is, indeed, likely that most ornamental appendages of the orders, originated from some accidental occurrence, or from some ceremonial custom: thus, the torus of the base is thought to have been suggested by the passage of cords, or bands, with which the pillar was bound to ensure its stability; or, of those cords which, having drawn up a canopy, were wound around a pillar to secure them. If, indeed, the priests (who were usually poets also) hung their lyres on the walls of their temples, they might suggest the idea of the trygliph; and, when once such an ornament is adopted, what prevents other implements from being esteemed ornamental, and appropriate also; as shields, &c. to the God of War, and foliages of the various sacred trees, to their respective divinities, around whose temples they grew.

Those persons who have doubted, whether architecture was capable of expression, seem never thoroughly to have considered the distinction of the various orders, or their natural progress. I think it evident, that, in early times, sacred edifices were decorated with the Doric order; and, thereby, it seems not unlikely, that an idea of sanctity became connected with it. It might be thought,  
perhaps

perhaps, too serious for places of pleasure, and diversion; and a lighter, more airy, and ornamented style, might be required for such gay erections.

To characterize the orders, I should say, the Doric is manly, and firm; the Ionic is beautiful, and delicate; the Corinthian is magnificent: but the magnificence of the Corinthian was perfected long after the others had been employed, and had become popular.

Concerning the capital of this order, is related, one of those accidental instances of good fortune, which usually occur to those only who by their merit deserve such favours, and are qualified to improve them. The history is to this effect: With that kind of regard which we shew to the memory of those we love, a nurse of Corinth, whose child was dead, brought out her play-things, and placed them in a basket before her tomb; the basket happened to stand on a root of Acanthus, which, springing up around it, formed by its leaves a decoration that perhaps had been frequently passed unnoticed by the eye of ignorance. But, the effect of knowledge is, to instigate the mind, and to direct its researches. Whatever is beautiful, whether common, or uncommon, is an object of attention to the well-informed, and this history is one proof of it: for, the sculptor CALLIMACHUS passing by the tomb, was pleased with the elegant appearance of the basket, thus decorated by the luxuriant Acanthus; and, having made a design from it, he afterwards used this new, and beautiful, ornament to embellish the capitals of columns. Correspondent to the

gaiety of this decoration, the proportions of the CORINTHIAN order are taller, and more superb, than those of its predecessors.

These three orders are, in fact, all that a just taste would think necessary, since one, or other, of them suits almost any kind of structure; but as it is usual to reckon the orders as five, we shall mention the TUSCAN, and the COMPOSITE.

The Tuscan order is, in its principles, nearly allied to the Doric, and is, either the Doric order injured, by want of skill in those who employed it, or, perhaps, a transcript, or imitation, of it, when in its early stages; which, by being carried into a remote country, never arrived at perfection. As to the Composite, that is an union of the Ionic, and the Corinthian orders, which, however it may succeed in some cases, in others it spoils both.

It is evident, if we trace the progress of columnar proportion, that it continued increasing in height, till the judgment of the architect was convinced he had sufficiently tapered, or lengthened, his column: and perhaps, it is not easy to determine, whether was deserving of most applause, that judgment, which, by perpetual improvements, advanced to a certain point; or that, which having reached this point, was convinced of the impropriety of passing beyond it, and forbore to force art beyond her abilities.

The proportional height of many very ancient, perhaps, the most ancient, Doric columns remaining, is but four, or five, of their diameters, next the base; by degrees, however, they were proportioned to six, and afterwards to seven, or eight, including

cluding bases and capitals, which latter (capitals) are but small in structures of remote antiquity. As to pedestals, it is clear, as they had no bases, the columns of this order could have no pedestals.

The Ionic column was elevated to nine diameters, including the base, and the capital, and thereby acquired a lightness which the Doric did not possess; the members of its entablature also were proportionally elevated; to correspond with the delicacy of the column: and now, pedestals were introduced, as imparting greater height to the order, without disturbing its parts.

Ten diameters were given to the Corinthian column; and its entablature was varied, of course. Beyond this, we have no rules for proportionate, or regular, architecture; and we find, that, (as in some Gothic buildings) where pillars of more slender dimensions are adopted, they must be placed in combinations of several together, one alone being weak, and insufficient for strength either real, or apparent.

The effect of an order is very much determined by the projections of its parts, (which constantly should preserve a certain ratio to their heights) and depends greatly on the shadows such parts will cast when in their proper places in the building. Therefore, it sometimes happens, that where a bold proportion is given to the members of an inferior order, it shall acquire a greater appearance of dignity, and produce a more forcible effect, than a richer composition, or more delicate workmanship.

Besides being susceptible of the highest decoration,

tion, the orders impart an appearance of strength to a building; they seem to contribute support, and stability, which evidently is of much importance in architecture. Now, as it is contrary to every idea of probability, that the weaker should support the stronger, the elegant support the robust, or the delicate the sturdy; therefore, in determining the situations of orders over each other, we must regard their respective characters, and proportions; and their fitnesses for the services required from them.

According to this view of the subject, the Tuscan order is fit only for places little exposed; and where gross strength is a principal recommendation; therefore, being the stoutest of the orders, it is used at the bottom of buildings, and in lowermost situations.

More noble than the Tuscan, though not so elegant as the Ionic, the Doric order is placed between them; and, like the direction of wise counsel, regulates the whole composition, though unnoticed by the perception of ignorance;—Upon the following principles,

It is clearly necessary, that columns, when above others, should stand immediately over the center of those beneath them, and not be removed on either side, which would be absurd. Still more absurd would it be, to place three columns as supports to four, and so on. It being, I say, necessary that the same perpendicular line should pass, centrally, through the superior and the inferior column, and the distance from column to column in the Doric order being regulated by the Metopes,  
(which

(which must be square) and by the Trygliphs, (which are half a diameter of the column, and which must be placed immediately over the column) it follows, that according to the Metopes and Trygliphs, must be situated the Doric column; and correspondent to the Doric, must be placed the Ionic directly over it, and the Corinthian directly over the Ionic. For, these orders being lighter, as they are more elevated, are unfit to support those beneath them, and therefore are regulated, not only in their situations, but also in their proportions, by the proportions of those below them. Observe likewise here, that there is a natural alliance between those orders whose proportions are most nearly alike. To employ the Tuscan order to support the Corinthian, though it is very well able for such employment, is to sustain a light weight, by a prop adapted to a heavy load, consequently, it is misplaced; not to mention the too great opposition between the magnificent richness of one, and the rustic plainness of the other: but, when the Corinthian order is supported by the Ionic, the affinity is pleasing; or, when Doric columns sustain Ionic columns, though apparently well calculated for this purpose, as being strong, yet their strength seems to be suitably employed, and not wasted.

For the proportions of the parts of the orders between themselves, and each other, I refer to the examples. I consider as very censurable those breaches of distinction, and appropriation, among the orders, which have sometimes been fashionable, through the influence of masters whose abilities  
might

might have been better employed. It seems to me idle to say, "I wanted embellishment in that instance, and therefore have decorated the Doric pillars, and entablature, equal to the Corinthian: I have given it a capital of leaves, roses in its abacus, and have embellished an ovolo in its cornice with eggs and darts." This confusion, I say, ought to be avoided; since, if all this richness, was proper, or necessary, why not use the Corinthian, or the Ionic, at once? If these orders were unknown, the excuse of necessary ornament might be pardonable; but, while character is allowed to be of importance, it should be adhered to: and even if urged by what is thought necessity to a deviation from it, which, I am persuaded, is not often the case, it should be deviated from as little as may be.

Propriety is, I think, the just director on all occasions; and very far am I from supposing, that general regulations are perpetually to be enforced. I would not ornament a mile-stone with a capital of Acanthus, because it was so many diameters high; it would be misemployed: nor do I think the worse of those great architects, who have chosen the Tuscan, though the least elegant order, for the pillars which perpetuate the memory of TRAJAN and of AURELIAN; because, these pillars being immense masses, standing alone, and being decorated with historical sculptures, are out of the usual applications of art. Moreover, we have but to consider the effect of perspective on the lengthened shaft of a taller pillar, to perceive that the uppermost ranges of figures in such erections, must have been

been rendered, if not nearly invisible, yet greatly confused and indistinct: and, I doubt not, that if Sir CHRISTOPHER WREN had been engaged to erect, as a monument of the fire of London, a pillar whose shaft was to have been historically ornamented, he would have preferred, for that reason, the Tuscan order to the Doric.

As to the variety of minor ornaments which may be introduced in architecture, it is too extensive (I might say almost infinite) to be now repeated: character, and appropriation, is all I shall insist on as necessary to be observed in this article. For, who would approve of ornamenting the residence of a general officer with lyres, and myrtle foliage? or, a lady's bedchamber with trophies of the stern God of war? But, when Blenheim is building to commemorate a victory, let not trophies be absent from thence; or, when a senate-house is erecting, forget not the symbol of eloquence (a Caduceus), or the Civic crown.

Architects have debated, whether human figures were, or werenot admissible, as external terminations of the upper parts of structures. It is said on one side, that figures are the most elegant terminations, that they may be symbolical also, and, that all the world knows they are stone: which reasons are urged in answer to those who remark, that they are placed where nobody would choose to stand, or, indeed, could stand long with safety; and they are exposed to all weathers, which neither Gods, or Goddesses, if they represent such subjects, nor human beings, if they are meant for mere mortals.

mortals, would be able to endure; that other symbols, if symbols are necessary, might be equally expressive; and that, beside what elegance may be found in other kinds of terminations, true elegance is inconsistent with absurdity. These reasons are so strong, in my opinion, that I survey without pleasure those unhappy figures, which are condemned to a situation whereat humanity shudders: and very rarely may such ornaments be adopted without trespassing against propriety.

Nearly allied to the foregoing article, is, the order of CARYATIDES, which is, a substitution of figures, generally female, (for when male figures are used, it is then commonly termed PERSIAN) instead of pillars. Its origin, we are told, was this: when the Persians invaded Greece, the town of Caryata, instead of combining with the rest of the Grecian cities, in defence of their common liberties, made a truce with the invaders, and thereby weakened the hands of their countrymen. In resentment of this behaviour, after the defeat of the Persians, the the Greeks attacked, and took, the town of Caryata; they condemned the inhabitants to slavery, and dispersed them among the cities of Greece; also, to render them instances of greater severity, they forbade them from wearing any other dresses than what they had already adopted, and by which they were ever after distinguished, go where they might. And further, in order to perpetuate their disgrace, the architects, and the sculptors, of those times, composed an order of figures, to which they gave the name of Caryatides; and these they represented in slavish, and disgraceful, attitudes.

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It is not necessary for us to take up these ideas on the Caryatic order; but, whether it be applicable to purposes of ornament in present circumstances, is all we have to consider. I think, for reasons already alledged, this order is little adapted to external decoration: it is true, they are now chiefly composed of allegorical figures, such as deities, virtues, nymphs, &c. but, methinks, to expose the virtues to all risques, and to every injury, on the outside of a building, seems in some degree to indicate their little influence on the master within; at least, they furnish the sarcastic with such reflections. An instance, not dissimilar, was the equestrian statue of *LOUIS XV.* in the place *Louis quinze* at Paris, by *BOUCHARDON*; the pedestal being supported by the four cardinal virtues, gave rise to a pasquinade, to this effect:

What a comical fellow is this *BOUCHARDON*!  
 His work we complain of as grievously wrong;  
 His *VICE* here on horseback he ventures to seat,  
 While the cardinal *VIRTUES* are under his feet.

There is yet another reason, which I think insuperable, wherefore figures should not be used in external decoration of buildings; which is, that be their dimensions what they may, the eye will never judge them to be so much larger than life, as they really are; and therefore, being unable to augment its estimation of them proportionately to the magnitude of the building, it will diminish the building by an estimate correspondent to its ideas of these figures. It is easy to conceive from hence, how

greatly a structure may lose of its just importance by this diminution; and perhaps we have an instance of it in that particular of St. PETER'S, which I formerly noticed, (LECTURE I.): for, if the perspective effect is so far deceptive to those who examine the great altar, as to induce them to estimate the figures at only half their true size; where is the wonder that a similar error should regard the whole dimensions of this building as less than they are, since it is crowded with abundant objects, each of which may contribute to such deception? It is a fact, that at the first survey of this church, strangers always judge it to be less than they find it, after they become better acquainted with its various parts. I know this has been accounted for, by supposing its arcades are too high; perhaps, however, both reasons may unite.

After having disapproved of too much ornament on the outside of buildings, I shall indicate where, in my opinion, ornament may be suitably employed; and that too, without fear its delicacy should be overlooked: I mean in those apartments which, in most, I might say, in every, capacious structure, are appropriated to festivity, and hilarity. Here let the composition, the effect, and the ornaments also be festive, and hilarious; whatever may attract or delight the eye, whatever may diversify and embellish the scene, shall here reign uncontrolled. For, though a visitant would appear sufficiently awkward if employed in examining the exterior ornaments of a structure, while its owner waited for him at the entrance; yet in the drawing-room, or in  
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the cabinet, what forbids his enjoying the satisfaction of the artist's design, the delicacy of his workmanship, the finishing, and the propriety, of his embellishment, or the striking effect of his composition? Here also the lighter orders apply, and their magnificence is better within our view; here, too, if symbols are introduced, a spectator may have that time in which to ascertain their nature, and their application, which he could scarce bestow conveniently on the outside of the edifice.

There will always be a diversity of opinions on the effects of many parts, especially the ornamental parts, of every composition, (otherwise taste would constantly be alike, and variety would be excluded); yet, the primary and leading ideas of sciences which have been the constant study of mankind, are not now to be quitted, or exchanged. The innumerable occasions, and circumstances, which arise, and which require particular adaptation, afford ample opportunity for the exertions of architectural skill; and where, by happy contrivance, or foresight, or by judicious remedy of defects, and impediments, from whatever cause arising, an artist overcomes difficulties, or improves capabilities, let him have his just, his full share of praise. Natural genius is not confined to any spot, or to any people; and, in my mind, the constructor of Pont-y-prid bridge, in Wales, though a mere mason, or a mere country carpenter, may vie, as a man of genius, with the author of the Rialto.

The science of architecture is of great extent; it has produced many huge folios; many more it will

produce; and it may justly claim the character of "making many books, to which there is no end." It will not, therefore, be expected from me, (however desirous of imparting information) that I should be able to comprise within the limits of an evening's discourse, the whole of a study so multifarious, and extensive.

But, notwithstanding our attention to those principles of architectural decoration, upon which this science may be said to value itself, has been somewhat lengthened, I cannot exclude from this lecture a few remarks on those humble, but not less happy structures, which without pomp, and parade, contribute to the enjoyments of human life; they raise no envy in the spectator, by their grandeur, or their ornaments, but, if acquainted with their inhabitants, he admires, and esteems, the benevolence, philanthropy, and decorum, which inhabit them, virtues which are not symbolical, but actual, and active. Our sea-girt isle has many such; where every comfort of life, and whatever is really valuable abounds, where genuine ornament, both of mind and person, is liberally acquired, and where human life rolls on with pleasure and delight.

Who would not wish in such an habitation to pass his days! not indeed that the habitation, merely, insures this felicity, though certainly it may promote it. If, therefore, any of my auditory should have occasion to erect such a fabric, let them first consider well the situation of their proposed dwelling:—not in a bottom, where an amphitheatre of surrounding hills forbids every opening prospect; where

where rushing waters melancholy roar, and the winter's torrent sweeps all before it; where rushes are the only ornament of the mire, and vegetation is suffocated by mud:—not on a steep hill, whose rapid acclivities are of long-winded measurement, and laborious ascent, on which the rude blasts of the bleak north wind beat full, and whose hollow howl is the melancholy music of the cold-confined inhabitant. But, where the easy descent affords an enlivening view, a view which excites exercise, repeatedly to enjoy it, and which amply repays the gentle exertion; where the promenade may be diversified by variety, and prolonged by novelty, there seat your dwelling, especially if vegetation flourishes; and if the waters are plentiful, and salubrious.

Shall I describe a dwelling for such a situation? let it be, without, simple and plain, but uniform and symmetrical; decorous, yet varied; void of frippery, but not of taste: the entrance, advanced to meet a friend, offers pillars of the modest Doric only, graced, perhaps, with a basso relievo; this conducts to the entry, adorned with simple pilasters; but in the dining room, and the parlour, the order changes, and with it changes the style of decoration. The garden front, is perhaps embellished with Ionic pilasters, raised a step, or two, above the gravel walk: here display “flowers of all hue, and every fragrant scent:” a little further, evergreens may compensate in winter for the room they occupy in summer. If, on either hand, clumps of lofty trees, or plantations of shady groves adorn the sides, they complete the scene, without interrupt-  
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ing the prospect. What enjoyments are distant, we must enjoy at a distance; nor wish the river diverted from its channel, to conduct it through our garden canal: No, let it be a public benefit; it shall add to the pleasure of the prospect, and perfect the view by its traffic, its meanderings, and its resplendence. Here, health and serenity, here peace and tranquillity shall fix their residence; here shall life glide on imperceptibly; here shall body and mind, acquire strength and improvement: here will we exercise our important prerogatives as rational, and immortal, beings, whose views extend beyond the narrow compass of this limited globe, and, who await above the skies, not merely habitations, but MANSIONS, of felicity.

OBSER-

OBSERVATIONS  
ON THE  
PLATES BELONGING TO  
LECTURE II.

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**T**HE series of plates to the former discourse, exhibited the progressive additions which were made in succeeding times to the edifices intended for sacred services: the present series of plates will explain, first, the principles, the constructions, and, the parts, of structures; and afterwards, will offer examples of several of those buildings, and other erections, which are esteemed the most important and perfect of their kind.

PLATE XI.  
CONSTRUCTION OF HUTS.

This plate attempts to shew the progress of mankind in the construction of their dwellings.

The CENTER compartment, by the rock opening into a cave, in front, suggests the idea of those times when the situation of the first settlers was such as to force them into dwellings of this nature. Shelter they might afford, but not convenience; also being fixed to a place, they were not calculated for men of roving dispositions; who more probably, would construct huts, resembling those seen further off. The flatter kind of hut, might serve in dry countries;

countries; but in countries exposed to rain, the taller and conical form would be most useful. This continues to be the form of the buildings (the churches) in Abyssinia to this day, because of its utility in throwing off the very great rains.

The other design shews a frame work, constructed pretty much on the principles of the Doric order. This attempts to account for the *Trygliphs* by the effect of the principal rafters seen in front, as in the frieze (the architrave being one plain timber) while the mutules appear to originate from cross rafters forming the cornice. It is likely these two ideas should be kept separate; as no building requiring so heavy a roof, as this quantity of raftering implies, should be supposed as yet erected.

The LOWER design shews the manner in which the Hottentots construct their huts; viz. by a framework, rising into a top, which they cover with skins, the fire-place being in the middle. The inconveniencies attending this kind of architecture need not be enlarged on, as certainly, it shall not be recommended.

The UPPER division represents a Hottentot town; and is a proof that those people are not destitute of ingenuity; as they drive their flocks, &c. into the center, and by blocking up the entrance, render access to them very difficult.

These constructions seem to indicate the earliest stages of art: and something like these was probably the inventions of most wandering settlers.

## PLATE XII.

## PROGRESS OF THE DORIC ORDER.

IN No. 1. we observe, the uprights are merely trees, placed as supports to the impending timbers; the interstices between them being filled up with mud (or clay) walls. The Architrave is a solid beam, laid on the walls from end to end: and the Trygliphs are in this instance accounted for, by supposing them the ends of the cross-beams which support the roof. The Cornice is merely thick boards projecting to cover the whole.

In fact, this is little more than the center figure of the former plate filled up, with mud walls.

No. 2. In this example this composition begins to assume an air of regularity; the trees are not only stripped of their bark, but smoothed and rounded; they have also a base, (perhaps somewhat too early) and a kind of trencher Capital. The Trygliphs here seem to originate from the insertions of the cross timbers to the frieze-beam on this side; and the mutules immediately over them, from the ascending beams which support the roof. The Cornice is formed by the projection of the covering of the roof; which is composed of thick boards, and plastered over with clay.

The transition from these rude essays to more regulated proportions, may be easily imagined, or gathered from what has been already delivered.

## PLATE XIII.

## EGYPTIAN TEMPLES.

No. 1.—Shews an Egyptian temple: that of the **HAWKS** in the island of *Philæ*, in the Nile; which is entirely open at the top; and indeed, though it may be called enclosed at the bottom, yet as that enclosure reaches only part of the height of the pillars, if not too high to be overlooked, it might permit spectators to view what was passing within the sacred precinct.—This idea is well known to have been adopted in the temple at Jerusalem. From **NORDEN's** *Designs in Egypt*.

No. 2.—Is its plan.

No. 3.—Is a temple directly the reverse of the other; being entirely under-ground: so that whatever services were performed in it, must have been performed altogether by torch-light. Whether it was (as is probable) dedicated to the infernal gods, or whether it was principally the sepulchre of three great persons, to whose memory their posterity maintained great attention, and to whose honor they might perform certain solemnities, or rather whether it might not unite both of these purposes, is wholly unknown.

By its plan No. 4. it appears to consist of a large chamber in the center, with three tombs in it, regularly placed in recesses: the fourth recess being occupied by the door-way. Probably these tombs are placed according to the four cardinal points of the heavens. The whole is of good workmanship; and cut in the rock; it is at Necropolis, probably, the City of the dead: near the old port of Alexandria in Egypt. From **NORDEN**.

PLATE

## PLATE. XIV.

## PROGRESS OF EGYPTIAN TEMPLES.

THIS plate endeavours to illustrate the progress of architecture, especially in regard to the number and position of columns in temples. To effect this,

No. 1. Is a real view of the cabin of an Arab family as constructed in Upper Egypt: from the rudeness and simplicity of this erection, it may justly pass for a close imitation of the original dwellings of the inhabitants in the earliest ages. We remark upon it (1) that it totally excludes the sun; shade being of all things most desirable in this part of the world; (2) that it is enclosed on three sides; (4) that it is partly enclosed on each side of the front, leaving only the center open; (3) that it has a prop on each side of the door-way; also (5) a prop almost in the middle. Certainly when Mr. NORDEN drew this cabin from nature, he was not aware of its relation to the temples of Egypt; yet to me it seems so truly primitive, that I think the ideas connected with it admit of little doubt.

No. 2.—Is an elevation of the same cabin as supposed to be seen directly in front..

No. 4.—Is an elevation of the temple of the *Serpent* KNUPHIS on the island of Elephantine in Upper Egypt, in which most of the peculiarities we have noticed in the cabin occur; not indeed that it is wholly closed up on the sides, though nearly; but the closure of the front on each side of the door-way, and the position of the pillar in the middle of the door-way, are strong features of similitude.

No. 3.—Is the same cabin with its door-way, supposed to be so far extended as to require two props instead of one: these props also are not of one single stem, but a number of lighter materials (as canes or reeds) united for strength, and bound round by cords, or other materials.

No. 5.—Is a view of the temple at *Taetfa* in Upper Egypt: wherein we see the adoption of the mode of placing two columns in the door-way; we see also that this temple being entirely covered, not only receives light from the door-way (which is usual) but also on the sides, from the vacancies (resembling windows) left in the upper part of the wall. The position of these vacancies is such as might admit light but not heat.

No. 6.—Is the temple at *Komombu* in Upper Egypt: this offers a frontispiece of three pillars in the door-way; these pillars also nearly resemble a number of canes, or reeds, tied together for strength; notwithstanding they have handsome capitals, &c.

No. 7.—A view of the temple at *Deboude* in Upper Egypt; having four pillars in front; and being pretty much closed up, yet preserving a door-way, with windows on its sides.

Thus we have selected authentic instances of temples, having one, two, three, and four pillars in front: the addition of more may easily be imagined after these specimens.

## PLATE XV.

## EGYPTIAN TEMPLES.

No. 1.—Is a view of two chapels, cut in the rock, at *Tshibel Esselsele* in Upper Egypt: they shew the prodigious labour taken by the patient inhabitants; their workmanship is excellent; they are internally covered with hieroglyphics; there is a separation for the holy, and the most holy place; the latter being most ornamented. The pillars on the sides of the entrance, deserve notice, as well for their symmetry, and handsome arrangement, as for the peculiarity of their bases; which, though whimsical are ornamental. As these are undoubtedly more ancient than any instance of Doric pillars, yet have bases, they prove that ignorance was not the cause of the omission of the base in the Doric order: whose proportions these pillars somewhat resemble. Their capitals were in part imitated in Greece.

No. 2.—Is the temple of the serpent *Knuphis*. The front entrance to it has the great inconveniency of only a single pillar, and that standing in the middle of the door-way: but this temple differs from others, in having a kind of cloistered space around it; wherein perhaps the priests walked, and conversed. It is probable this cloister might answer to the holy place, and the enclosed edifice to the most holy. The most holy place seems to have had no light but from the door-way; and that by reason of various obstructions could be so little, as barely to afford liberty of worship in it. Shall we suggest that the junior priests were admitted into the cloister only, and the elder alone into the central inclosure?

No. 3.—Is its plan.

PLATE

## PLATE XVI.

## EGYPTIAN TEMPLES.

No. I.—Is the temple in the middle of the city of *Essenay* in Egypt. This has six pillars in front; of that kind united and bound together: they have handsome capitals; and each capital supports a block, forming a kind of architrave, which runs the whole depth of the temple. The front is partly enclosed on the sides, notwithstanding the number of pillars, and the great space they occupy; the center seems to have had a handsome entrance between the two central pillars; whence, it is probable, the other pillars were united by a low wall: the present wall seen between them is merely an erection of the Arabs, for the purpose of confining their cattle; but it may indicate where the former wall stood: and perhaps the low wall yet exists, as this building is evidently greatly buried in the sand of the country. This must have been a capital building in its primitive state: the number of pillars, their beauty, their being bestowed on the interior of the temple, as well as on the front, the extent of the roof, the hieroglyphics, the handsome ornament running round the cornice, and the capital winged globe over the entrance, justify this idea.

No. II. Is its plan.

PLATE

## PLATE XVII.

## SUGGESTED PARTS OF COLUMNS.

BECAUSE of the curiosity of the subject, in connexion with its relation to architecture, as being a constant ornament on the temples of Egypt, we have introduced a distinct representation of what is usually termed the winged globe.

It consists of three parts; a globe in the center, a kind of dragon (but altogether an ideal kind, as I believe) and a prodigious pair of wings: the wings, I conceive, to be the symbol of protection, defence, and swiftness; the dragons of perpetuity and watchfulness (from the circumstances of the serpent tribe seeming to be renewed by changing their skins, and their sleeping with their eyes open.) The globe, either of the land, (principally) of Egypt, or of the earth at large. *q. d.* "To the deity who perpetually protects the land—of Egypt." Some persons think the idea is relative to the course of the earth, as a planet, round the sun. The handsome effect of this ornament has been already seen.

No. II.—The capital of a column of the gallery of the principal court of the temple of Isis on the isle of *Phile* in Upper Egypt. The ornaments of it are evidently borrowed from nature; being the leaves of an Egyptian water-plant common on the Nile.

No. III.—A capital from a fragment of a column found on the isle of *Phile*: which appears to me, to be a hint borrowed from the palm; and capable of very great elegance. The upper row of leaves, resemble full grown leaves; under them is a row of young shoots; the lower are a kind of squamose projections, which are changed at the bottom. I think a judicious application of a hint from this capital, would make a noble gallery of columns.

PLATE

## PLATE XVIII.

## SUGGESTED PARTS OF COLUMNS.

No. I.—The story of the Acanthus basket: which has been already given: shewing how the elegant capital of the Corinthian order might originate.

No. II.—An enlarged view of that kind of united (or reeded) column which we have already seen: it is surmounted by two rows of water-lily flowers, whose simple and elegant cups greatly enrich it, without the appearance of much labor: the head of Isis above it, is singularly introduced; but perhaps not more so, than the author of this would have thought of some of the cherubim heads which adorn our churches, &c. It is the capital of the columns of the interior court of the temple of Isis on the isle of *Phila*.

This No. also shews the nature, and effect, of an Egyptian entablature: its differences from the more refined productions of Greece are easily remarkable.

No. III.—Is another design considerably like the former; but differing, in the shaft of the column being smooth, and the divisions (or reedings) restricted to ornament the top of the column: whereby they become part of the capital. The leaves of this capital seem to be fluted; and are by no means so simple as the former. It is a capital of a column of the temple of Isis in the isle of *Phila*.

The plans of the columns shew by their lines the projections of the leaves of the capitals: the shadowed part being the shaft,

PLATE

## PLATE XIX.

## EGYPTIAN PILLARS.

FROM noticing parts of columns, we proceed now to notice the column at length; and therefore have selected two instances, both of which shew that the design of the bases we noticed in Plate XV. must not be considered as general in Egypt; but, that however they might be adopted when to ornament a rock, yet when support was requisite, a firmer base was employed; In fact, the simplicity of these bases seems to date at a very early period, and before that part of the column was much considered in respect of ornament. As to the shaft of the column; in one it is quite plain; the other recalls the idea of those we have already seen, composed of several small pillars united into one; whereby the general resemblance of this pillar is not very distant from some in later ages, denominated GOTHIC: for if each of these smaller pillars had a capital, the composition would be almost exactly like some in our ancient churches.

As to the capitals of these pillars, they are greatly alike; the first is indeed very plain; the second is more ornamented, but by no means equal to some we have seen. The idea of the numerous fillets in the neck of the pillar, seems closely allied to that of a number of cords whose office it is to bind the composition together; at least, to secure the steadiness of the shaft. The first is one of the columns of the portico of the great temple, the other is one of the columns of the vestibule of the great temple, at *Luxor*, the ancient Thebes, in Egypt.

## PLATE XX.

## EGYPTIAN OBELISKS.

IT is fortunate for the reputation of Egyptian Art, that although most of its surprising productions live only in the reports of those foreigners who were admitted to see them, when standing in their places, as designed by their authors, yet enough remains of some of its works to justify those accounts which describe others as yet superior.

When we can trace a building a mile in extent, and this has been mentioned as not the largest, we are induced to receive, as true, the accounts of the largest, although *that* may have perished in the revolutions of ages. On this principle, when we view, with surprize, the great obelisks at Rome, which we know to be Egyptian; we can credit relations which represent others as of yet larger dimensions. Especially, as we know that the highest we have, has been originally higher. Be that as it may, as the obelisks are among the greatest of the Egyptian works come down to us; we have selected three for the inspection of our readers.

The obelisk in the middle of the plate, is that in the *Piazza del Popolo* at Rome. *Pliny* reports, that it was procured from the quarry by *Sennefertus* king of Egypt, about the time *Pythagoras* travelled in that country, 522 years before A. D. It was brought to Rome, as appears by an inscription on the base, by *Augustus*; and from thence was called 'the obelisk of *Augustus*;' that prince placed it as a principal ornament in the great Circus, where no doubt it was very conspicuous, being one hundred and twenty-five feet high in a single stone, without the base. In the time of the emperor *Constance* it was only eighty-eight feet long, lying then thrown down in the great Circus; from whence *Sixtus V.* retrieved it, under the management of Cavalier *Fontana*. At present it is about 79 feet high, it is of a single stone, of beautiful granite, ornamented on all sides with hieroglyphics. What these hieroglyphics

phics really mean is not known: We are told that in the time of *Julian the Apostate*, *Hermapion* (an Egyptian probably) endeavoured to explain those on this monument, which he read thus, "The sun, the God, the Lord of heaven, has given to **RAMESSES** the empire of the earth! **RAMESSES** son of the God, founder of the universe, whose strength and valor has subjected the whole earth to his sovereign sway, immortal son of the sun, the embellisher of the city of the sun." *Kirker* the Jesuit rejected this explication, but did not give a better.

As I conceive that it is likely this may be one of **SESOSTRIS**'s famous works, consequently, older than *Pliny's* date, I think it just worth while to suggest that I would read the inscription thus :

" To the sun, God :

To the Lord of the Heaven ;

Who gave to **RAMESSES** the empire of the earth :

**RAMESSES**

Son of the God—foundator of the universe,

After having by strength and valor subjected the whole earth to his dominion

(Immortal offspring of the sun !)

Erected this

To ornament the city of the sun."

*i. e.* *Heliopolis*, the ancient **ON**. This seems to be probable ; and in the instance of **SESOSTRIS** we know to be pretty nearly fact.

The obelisk to the right is now erected in the *Piazza Navona* at Rome. It was found broken in many pieces, lying in the circus of *Caracalla*, about two miles from Rome. This obelisk is small ; is covered with hieroglyphics ; and was erected by *Innocent XII.* to ornament the superb fountain of the *Piazza de Navona*, which flows around it.

The obelisk to the left, is that in the *Piazza della Rotonda*, at Rome ; though small, yet it is ornamental. Being desirous to shew the use of these immense masses as ornaments, we have introduced it, with the fountain, &c. which it embellishes.

N. B. The steps are an addition.

## PLATE XXI.

## BASES.

THESE Designs exhibit the Bases of the various orders together; whereby their differences and distinctions are rendered more striking: and the progress of their enrichment by additional members may be clearly seen, from the simple Tuscan, to the replete Composite.

## PLATE XXII.

## MOULDINGS.

THIS plate is given in order to shew at large the true forms of these parts, and the centers from which they are struck by the compasses. It is of importance to commit their names accurately to memory: as one, or other, occurs in every piece of Architecture, that can be inspected, or described.

## PLATES XXIII. XXIV.

## PARTS OF AN ORDER.

THESE plates are explained by the writing upon them: they shew the members of the Doric and Composite Orders, whose names and situations being similar in the other orders, render further illustration unnecessary.

PLATE

## PLATE XXV.

PROPORTIONS OF THE ORDERS ON THE SAME HEIGHT.

AS Plate XXVI. represents the Orders on the same module, shewing their increase in height, this Plate shews their increase in slenderness; and is designed to fix the general appearance of each Order more firmly in the reader's memory: and especially, the appearance and proportions of the column, when separate from its base and pedestal.

## PLATE XXVI.

PROPORTIONS OF THE ORDERS ON THE SAME MODULE.

THIS plate shews the proportions of the orders to each other on the same module; the progressive elevation and tapering of the shaft, and the advances of richness and ornament, is apparent.

The difference of the Orders may be gathered by the eye from these subjects; as they are placed together for the sake of comparison: but their peculiarities will appear more distinctly in the larger examples.

PLATE

## PLATE XXVII.

## PRINCIPLES OF DRAWING THE ORDERS.

THE Orders are generally measured by the diameter of their column at the bottom of its shaft, or by the semi-diameter: this diameter, or semi-diameter, is usually divided into sixty minutes; and by these measures the whole proportions of the columns are adjusted.

The TUSCAN column is in height 7 diameters

The DORIC - - - - - 8

The IONIC - - - - - 9

The CORINTHIAN - - - - 10

The COMPOSITE - - - - 10

The perpendicular proportions of the columns being fixed, the other parts of the orders are adjusted to them.

The ENTABLATURES of the Tuscan, and Doric, are in height one-fourth of the column: of the Ionic, Corinthian, and Composite orders, one-fifth. Which by the diameter of their columns is in this proportion.

The TUSCAN entablature is in height  $1\frac{3}{4}$  diameters:

The DORIC - - - - - 2

The IONIC - - - - -  $1\frac{1}{2}$

The CORINTHIAN - - - - 2

The COMPOSITE - - - - 2

The PEDESTAL is comparatively a modern addition to the Orders, and is that on which the base of the column rests: its general height is one-fourth the

the height of the column and entablature taken together. It is sometimes made lower, but never higher.

The PEDESTAL is divided into—the base (at bottom); the die, or square part (in the middle); and the surbase, or cap, (at the higher part).

The COLUMN is divided into—the base, the shaft, the capital.

The ENTABLATURE is divided into—the architrave, the frieze, and the cornice.

IN drawing the DORIC order, erect a line of the just height required; one-fifth (as A B,) is the height of the pedestal. Divide the remainder into five parts; four to the column (as 1, 2, 3, 4, or B C) one to the entablature (as 4, 5, or C D). The column divided into eight parts (as 1, 2, 3, 4, 5, 6, 7, 8) one-eighth is the diameter. The base is half a diameter (as from B,  $\frac{1}{2}$ ); and the capital half a diameter (as from  $\frac{1}{2}$ , C). The base of the column projects on each side one-third of a semi-diameter (as 1, 2, 3, 4): Exactly of equal projection to the base (constantly) is the die of the pedestal. The column diminishes at the top one-sixth of its diameter; beginning at one-third of its height, (as at *a*, *b*,) which ought to be divided into six parts; of which one is gradually diminishing as it ascends. The capital projects one-fourth of the smaller diameter (*i. e.* at top) of the column. The entablature is divided into eight parts (as between C and D); two to the architrave; three to the frieze, and three to the cornice. The architrave projects one-sixth of its height; the cornice projects one half

half of the height of the whole entablature; as shewn by the circular dotted sweep.

N. B. *The projection of the members of the Orders are reckoned from a line supposed to be erected in the centre of the column, (unless notice be given to the contrary) when modules and their parts are used.*

In drawing the IONIC order, divide the original perpendicular line into five parts, (as a, b, c, d, e); one-fifth is the pedestal, as a: the remainder divided into six parts, (1, 2, 3, 4, 5, 6); one-sixth is the height of the entablature, (as 5, 6). The column being divided into nine parts, (1, 2, 3, 4, 5, 6, 7, 8, 9) one-ninth is the diameter; the base and capital are each one-half diameter in height, (as  $a \frac{1}{2}$ ). The column diminishes one-sixth of its upper diameter; the capital projects one-half of the semi-diameter of the column; the projection of the base is one-third of the semi-diameter. The entablature is divided into five parts; one part and half to the architrave, the same to the frieze, and two parts to the cornice. The architrave projects one-fourth of its height; the cornice projects equal to its height.

In drawing the CORINTHIAN order, divide the original height into five parts (as a, b, c, d, e); one of which is the height of the pedestal. Divide the remainder into six parts, (1, 2, 3, 4, 5, 6); five to the column, one to the entablature. The column divided into ten parts, (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), one is the diameter; the height of the capital is one diameter and a quarter. The other dimensions agree with the Ionic order.

For

For the pedestal, divide it into four parts, (1, 2, 3, 4); the first is the height of the plinth: one-third of a part is the height of the lower base; one-half of a part is the height of the upper base.

N. B. The COMPOSITE is similar to the Corinthian in its proportions.

In drawing the TUSCAN order, divide the original height into five parts; one is the pedestal: divide the remainder into five parts; four to the column, one to the entablature: the base and capital are each one semi-diameter. The entablature divides into seven parts; two to the architrave, two to the frieze, three to the cornice. The column diminishes one-fifth of its diameter; the capital projects one-fourth of the smallest semi-diameter; the architrave projects one-sixth of its height; the height and projection of the cornice are equal.

Pedestals in general follow the proportion of their order; but this part is varied according to circumstances. The pedestal of the Tuscan order is divided into four parts; one is the height of the plinth; one-half is the height of the sur-base; one-third is the height of the lower-base. The projection of the base is equal to its height; and the projection of the upper base, or cap, is equal to that of the lower base.

These rules are very general, and are the nearest approach to regularity; but as the members of the different orders are not precisely alike in every composition, but vary according to the effect required, the proportions of the smaller members change of course. And, indeed, there are great variations in the general proportions of the orders among those

remains of ancient art which are regarded as models of this study: thus, we have instances of the Cornice being in height half the entablature; of many members of the entablature being suppressed, and even of an omission of the whole architrave and frieze; the columns supporting only the cornice. These instances, however, must be considered as licentious, unless we knew the motives which actuated the architect in his departure from general and established principles.

The proportions of columns, also, are not always the same; but even in many justly admired buildings they are not so tall as the moderns make them.

FLUTING of columns is supposed to render their superficies more sensible, and, in consequence, to increase the apparent diameter of the column; so that a plain shaft seems thinner than one fluted.

Flutings should never exceed twenty-four in number, to the lighter orders; but twenty is sufficient for the Doric: In some instances the ancients made only sixteen.

The flutings of the Ionic, &c. are separated from each other by a fillet of about one-third of the flute in width; but Doric flutings terminate *sharp* in the superficies of the pillar, without any fillet between them.

Sometimes the flutings are filled up one-third of their height with ornament; which, when well cut, has a rich effect: Sometimes they reach only one-third of the height of the shaft, the upper part being plain; and sometimes they commence at one-third of the height, and proceed to the top of the shaft, the under part being plain.

PLATE

## PLATE XXVIII.

## INTERCOLUMNIATIONS.

SHEWS the various distances of the intercolumniations, and their names, as given by the ancients: These examples shew at the same time the manner of representing plans of columns, with their bases and pedestals. The general effects of these various distances may easily be imagined.

The **PYCNOSTYLE** intercolumniations are distant from column to column, one diameter and a half of the column, measured at bottom. This is the nearest approach of columns to each other, except when they are coupled; in which case, the bases of the two columns may almost touch each other.

In the **SYSTYLE** intercolumniation the space between the columns is two diameters.

In the **DIASTYLE** three diameters,

In the **AREOSTYLE** four diameters.

The **EUSTYLE** is two diameters and a quarter, and was by the ancients reckoned the most perfect; as being a happy medium between the thronged Pycnostyle and the scattered Arcostyle; and as permitting also sufficient space for persons who had occasion to pass between the pillars.

When columns are coupled, as the increase of strength is proportionally augmented, the couples may be separated by a wider interval than single columns, without injuring the general effect. But four diameters is usually thought quite sufficient.

PLATE. XXIX.

TUSCAN ORDER;

THE noblest instance we have of this order is *Trajan's Pillar*; but that is not a perfect specimen: neither, in fact, is any perfect specimen known, as a regular order, (notwithstanding some fragments united by PIRANESI in his temple of *Corá*). This plate we have taken from PALLADIO; who assures us he had seen it among the ancient buildings extant in his time, though now destroyed.

PLATE XXX.

DORIC ORDER.

THIS Plate exhibits an example of the DORIC order, taken from the Theatre of MARCELLUS, at Rome: which is usually regarded as the most correct specimen of this order. It is, however, contrary to the precepts of VITRUVIUS, (who says, the dentils, as ornaments, are peculiar to the IONIC order) the cornice of this composition being decorated with dentils. The drops also beneath the corona, instead of being horizontal, are somewhat inclined.

PLATE

## PLATE XXXI.

## DORIC ORDER.

AS this order has great merit, and beauty, and is much encouraged in present architecture, especially in lesser erections, where the strictness of its rules produces less confinement than in extensive buildings, we have added two plates of it, after Greek specimens, both being taken from ancient structures remaining at Athens. The first is very simple, the architrave being a single uniform member; the frieze having a decoration of olive crowns placed at regular distances: but the symmetry of the whole is very neat and pleasing; as also the projection of its members and their distinctness.

## PLATE XXXII.

THE SECOND specimen is from the famous temple of Minerva at Athens: the pillar is fluted; the architrave plain; but the frieze is decorated with tryglyphs, and the metopes are filled with figures. It is evident that this part of the order has been the favourite of the architect, who probably was the sculptor also (*Phidias*) and who depended much on the effect of the excellent decorations which he proposed to insert. The whole of this fabric has a stately and venerable appearance, and an imposing air of grandeur.

PLATE

## PLATE XXXIII.

## IONIC ORDER.

THIS plate, and the following, offer specimens of the Ionic order, taken from such Greek examples as are now remaining. This of Plate XXXIII. has been thought to be the first building erected of the order (the temple at *Teos*); it must be admitted to be a very handsome composition throughout.

## PLATE XXXIV.

THIS SECOND instance is from the temple of *Erectheus* at Athens; the enrichments of this specimen distinguish it; those of the upper torus, and of the capital, especially; and peculiarly the conformation of the volute, whose spiral differs from all others known. It must be admitted that the architrave and frieze are excessively large, and thereby the cornice is deprived of its due proportion, and reduced to a mere covering of the lower parts: which need not be adhered to in any imitations of this order.

N. B. The effect of this order may be seen by the pillars, &c. of the inner door of the chapel in Greenwich hospital: where they were adopted by Mr. STUART, who studied them at Athens.

PLATE

## PLATE XXXV.

THIS IONIC example is taken from the Temple of FORTUNA VIRILIS, at Rome: which is usually supposed to be the most elegant instance of this order.

## PLATE XXXVI.

## THE IONIC VOLUTE.

AS this is the member which distinguishes the Ionic order at first sight, we wish to impress it on the memory of our readers: and the formation of it being a curious piece of geometry, we have given its principles, in the eye of the Volute at large, A. To obtain this, first strike the surrounding circle: within this, form a square (points upright) and prolong lines through these points to the extent required: the sweep from line to line will then include one quarter of a circle. Each side of the square bisected, gives the points for an inner square, and the place of one foot of the compasses to strike the first spiral, for the first quarter of a circle; beginning at 1, and sweeping the outermost quarter of a circle; then moving the compasses to 2, for a second quarter, and so on to 3, and to 4. The diagonal lines of the inner square divided into third parts, give the points for striking the other spirals; always going in a circular order, as 5, 6, 7, 8, for the first, or outer, divisions of thirds; and  
9, 10,

9, 10, 11, 12, for the inner division of thirds, which completes the figure.

The capital of this order being very peculiar in its construction, has given rise to more than one manner of composing it. The ancients usually adopted that which appears in Fig. C. which, on one front had an ornament originating near the top of the capital, and continued spirally to a center. On the other front (or more properly the side-front) this ornament was omitted, and the correspondent parts were embellished with leaves, fillets, &c. as in our figure.

B. Represents a more modern capital, whose volute is the same on both its sides; and which being set angle-wise, has the same effect all round the capital. This volute originates from an ornament composed of eggs and darts, called the Echinus; between the originations of the volute is a flower.

PLATE

## P L A T E XXXVII.

## CORINTHIAN ORDER.

AN example of the CORINTHIAN order, from the PANTHEON at Rome: the richness of this capital deserves notice. The ornament marked with a star, is a side view of the Modilion: of which those on the same line with it are front views. The base of this order has a greater number of mouldings than the Ionic, to increase its richness.

## P L A T E XXXVIII.

## COMPOSITE ORDER.

THIS example of the COMPOSITE or ROMAN order, is from the Arch of TITUS at Rome. The Base nearly resembles the foregoing Corinthian: the Capital is composed of the Corinthian acanthus, &c. but instead of the caulicoli, has superadded the echinus and volutes of the Ionic order. The cornice also (which in this instance is of great height) has the Ionic dentils, as well as the Corinthian modillions. There is always danger, lest these ornaments should too nearly resemble each other; the dentils, therefore, should be smaller in proportion than in their proper order, and the modillions larger. The ornamental frieze of this example shews of what decoration that part is capable. The whole of this order is richly ornamented.

## PLATE XXXIX.

FRONT ELEVATION OF THE  
 TEMPLE OF FORTUNA VIRILIS,  
 AT ROME:

ALSO,

SIDE ELEVATION OF THE SAME TEMPLE.

## PLATE XL.

PLAN OF THE SAME TEMPLE.

THIS is given as an instance, not only of the general and customary construction, and distribution, of Heathen temples, but also, of a square temple, exhibited on a larger scale than any yet introduced.

We are to conceive of temples in ancient times as standing in a considerable area, wherein was the altar: there was also, usually, an ascent to the edifice by a flight of steps, (A) which led to the portico (B); after which was the entrance, and the first apartment of the temple, properly speaking, (C); beyond which was the second apartment (D): wherein was the statue, or symbol of the divinity. This apartment was accessible only to the priests, it being considered as the most sacred *adytum*—chamber, of the whole structure.

PLATE

## PLATE XLI.

FRONT ELEVATION OF THE  
PANTHEON,  
AT ROME.

## PLATE XLII.

SIDE ELEVATION OF THE SAME PANTHEON.

THESE plates exhibit a circular temple, on a larger scale than any already given.

This temple was not dedicated to one deity only, but, as its name imports, several divinities had their altars in it, at the same time: these altars were placed within it, in convenient niches around the wall; they were dedicated to the principal deities of the Romans. The large niche opposite the door contained a colossal statue of Jupiter: Colossal statues of AGRIPPA, and of AUGUSTUS, were also placed in the great niches in the portico.

This temple was not only an edifice of great estimation among the ancients, and considered by them as a capital fabric, but it receives additional value, at present, by having escaped, in a great measure, the ravages of barbarians, and of time; so that it is supposed to be the most perfect Heathen temple now existing. It is not, however, at present, in its original splendour; its ornaments, which were mostly of bronze (and some of silver), being taken away from the inside; as are also its bronze gates, the ornaments of the portico, &c. Neither is the upper part of the portico as at first composed, having undergone modern repairs and alterations.

The portico is supposed to be an addition to the original circular edifice; by MARCUS AGRIPPA, whose name it bears.

## PLATE XLIII.

SECTION OF THE  
P A N T H E O N,  
*A T R O M E.*  
SEEN IN FRONT.

## PLATE XLIV.

SECTION OF THE  
P A N T H E O N  
SEEN ON THE FLANK.

THESE sections exhibit the internal construction of this building: shewing the places for the altars, and the decoration of the tabernacles wherein they stood (A, A) the effect of the supporting columns around the interior, &c. They shew also, the opening in the center of the roof, by which light was admitted: as was indispensable in a pantheon. The same opening which admitted light, admitted also rain, &c. but, beside, that this did not spread far from the center of the pavement where it fell, the pavement was gently inclined toward a drain, by which it was carried out of the temple.

PLATE

## PLATE XLV.

ELEVATION OF THE FRONT OF THE  
BANQUETTING-HOUSE,  
AT WHITEHALL.

THIS very elegant building was erected by INIGO JONES, as a specimen of part of an intended royal palace: a plan, which, if it had been completed, would have raised the British reputation in architecture above that of any other nation. The Banqueting-House is justly reckoned the most correct, as well as most elegant, structure we have: In this series it not only claims a place for its merit, but also as being an example of super-columniation, or order over order: the inferior order being Ionic, the superior Corinthian.

## PLATE XLVI.

THE FRONT OF ST. PETER'S AT ROME,

Is given for the purpose of comparison with the portico of St. Paul's at London. The observations usually made on this front, are, that the attic with which it is crowned, is much too high for the order beneath it; being more than one-third (which is the usual proportion) of the supporting order. Moreover, the pediment in the center is, for so large a front, very ill supported by four pillars, and should have had six at least: To which may be justly added, that the whole front being apparently of equal projection, the parts are not distinctly marked, nor is there any great effect produced by such trifling shadows as the parts can cast.

PLATE

## PLATE XLVII.

ELEVATION OF THE WEST-FRONT OF  
ST. PAUL'S,  
AT LONDON.

## PLATE XLVIII.

SIDE-ELEVATION OF ST. PAUL'S.

THIS Plate, and the former, shew the composition of this noble building, and its distribution: the motion of the parts (*i. e.* their variety and situation) is very happy, and the magnitude of the center is grand. It must be observed, that in so large a building the perspective adds to the variety of the design.

The front is not like St. Peter's, *evidently* on an equal line, but by the recesses behind the pillars supporting the pediment, (which answer to what the Italians call a *loggia*) it acquires a shadow and depth. The projections of the parts on the sides, are more distinct and compact than the same parts in St. Peter's. The situation of the stair-cases adjoining the body of the church, is at the same time commodious, adds to the importance of the center, and breaks the otherwise too sudden lines of the building.

The height of the dome is said to have exceeded what Sir CHRISTOPHER WREN could have wished; but was necessary to satisfy the public. The decorations of the inside were never executed according to the proposed plan. The dome is double; the inside dome being a cone of brick-work, the outside supported by timbers, &c.

PLATE

## P L A T E XLIX.

P L A N  
 O F  
 S T. P A U L ' s,  
 A T L O N D O N.

## P L A T E L.

P L A N  
 O F  
 S T. P E T E R ' s,  
 A T R O M E.

THESE Plans shew the distribution of these rival buildings. It must be owned the English architect appears to have had most difficulties to struggle with; being confined to narrow limits of breadth, in proportion to length, &c.

The line traced on the Plan of St. Peter's, denotes the length of St. Paul's; and shews the proportions of the two churches to each other: St. Peter's being about 725 feet in length; St. Paul's being about 525 feet.

From

From this, and the preceding, series of plates, our readers have formed a general idea, not only of the progress of the science of ARCHITECTURE (which, from an insignificant beginning, has attained both utility and magnificence) but also of its leading principles in those parts which are usually objects of design. It is not to be expected, that every part of this so very extensive and multifarious science should even be mentioned, much less discussed in the contracted space allowed to these Lectures. Many folio volumes have been written on the subject, and every year adds to the number, as well at home as abroad.

It is, perhaps, much to be wished, that representations of the capital productions of Architecture were more easily to be procured: it is true, many may be found scattered throughout the volumes of authors on the subject; but a well-chosen collection is wanting. Such a work ought to exhibit, not only the erections of modern times, but also the remains of the most important antiquities, which thereby might not only become lessons and studies for artists, but also might contribute to a comparison between ancient and modern art. We assume some merit, in having attended to this principle: we hope, added to the utility of this collection, it will yield to our readers both pleasure and advantage.

## OF PRACTICAL BUILDING.

IN *Building* three things are chiefly to be studied: Convenience, Firmness, and Pleasure. To attain these, we may consider this subject under (1) the *situation*, and (2) the *structure*.

*For the SITUATION of a building*, regard should be had to the quality, temperature, and salubrity of the air; the convenience of water, fuel, carriage, &c. and the beauty of the prospect.

For the distribution of the parts of a building, the observation is, that the chief rooms, studies, libraries, &c. should lie toward the east: offices that require heat, as kitchens, distillatories, brew-houses, &c. toward the south: those that require a fresh cool air, as cellars, pantries, granaries, &c. toward the north, also galleries for paintings, museums, &c. which require a steady light. Nevertheless, the ancient Greeks and Romans generally placed the front of their houses to the south; but the modern Italians vary from this rule.—Indeed, in this matter, regard must be had to the general properties of a country; all places being obliged to provide against their respective inconveniencies; so that a good parlour in Egypt might make a good cellar in England.

*The STRUCTURE of a building*, may be considered as composed of, first, the *principal* parts; then the *necessaries*, or ornaments. To the principals belong, the materials, and the form.

*The MATERIALS of a building* are either stone, marble, brick, or wood, as fir, oak, &c.

The *FORM* of a building is either *simple*, or *mixed*. The simple forms are either *circular*, or *angular*: the mixed are compounded of both.

The circular form is commodious, of great capacity; strong, durable, and beautiful; but the most expensive; loses much room when divided; and has an ill distribution of light, except from the center: the ancients therefore, used the circular form only in temples and amphitheatres, which needed no compartition. Oval forms have the same inconveniencies, without the same conveniencies, being of less capacity.

Sir HENRY WOTTON observes, that *building* loves neither many nor few angles: the triangle, *e. gr.* is condemned, wanting capacity and firmness; also, because incapable of being gracéfully resolved into any other regular figure in the partitions, besides its own. Figures of five, six, seven, or more angles, are fitter for fortifications, than for civil *buildings*. Rectangles are preferred, as being a just medium between extremes. Of these an oblong, provided the length does not exceed the breadth by above one third, is usually most esteemed.

Mixed figures, partly circular, partly angular, may be judged by the rules which regulate the simple ones; but they offend against uniformity, though they admit most variety; and however uniformity and variety may seem to be contrary to each other: yet they are both necessary to a happily composed building.

The *PARTS* of a building, have been comprised under five heads, the *foundation*, the *walls*, the *apertures*, the *distribution*, and the *coverings*.

For

For the Foundation, *Vitruvius* orders the ground to be dug up to examine its firmness; and its apparent solidity not to be trusted to, unless the whole mould cut through be found solid. The depth of the digging, *Palladio* limits to a sixth part of the height of the building, for structures of great magnitude and weight.

This Sir *H. Wotton* calls the *natural foundation*; whereon are to stand the walls, which he calls the *artificial foundation*: this then is to be the level; its lowest ledge, or row, being of stone, close laid with mortar, and the broader the better; at least twice as broad as the wall. Some add, that the materials below should be laid just as they grow in the quarry, supposing them to have the greatest strength in their natural position. *De Lorme* enforces this, by observing, that the breaking of a stone in this part of the fabric, though but the breadth of the back of a knife, will make a cleft of above half a foot in the superstructure.

The great laws of walling are, that all walls stand perpendicular to the ground-work; the right angle being the cause of stability: that the massiest and heaviest materials be lowest, as fitter to bear than to be borne: that the work diminish in thickness as it rises: that certain courses of superior strength be occasionally inserted to sustain the fabric, if the under parts chance to decay: and lastly, that the angles be firmly bound, and united; these being the nerves of the whole, and commonly fortified, by the *Italians*, at the corners, (*coins*, or *quoins*) even in brick *buildings*, with squared stones; which add both beauty and strength.

The APERTURES, are either doors, windows, staircases, chimnies, drains, &c. with regard to the last, Art should imitate Nature in these ignoble conveyances, and seclude them from sight, with the utmost possible address.

In Distribution there are two general views, *gracefulness* and *usefulness*: gracefulness consists in a double analogy or correspondence; first, between the parts and the whole; a large fabric should have large partitions, entrances, doors, columns, and, in general, all the members large. The second analogy is between the parts themselves, with regard to length, breadth, and height. The ancients determined the length of their rooms, that were oblongs, by double their breadth; their height by half their breadth and length, added together. When the room was square, they made the height half as much more as the breadth; these rules the moderns dispense with; sometimes squaring the breadth, and making the diagonal thereof the measure of the height; and sometimes more: according to circumstances, which require adaptation and management.

USEFULNESS, consists in having a sufficient number of rooms of each kind, with proper communications, and without interference. The chief difficulty lies in the lights and stair-cases. The ancients were pretty easy on these heads, having generally two cloistered open courts, one for the women's side, the other for the men's: thus the reception of light into the body of the *building* was easy; which, among us, must be supplied either  
by

by the open form of the building, or by graceful refuges or breaks, by sky-lights, &c. As to placing the offices, they should be neither so near as to be offensive, or intrusive on the company, nor so distant as that too much time should be consumed in passing to, or from them.

In distribution, an Architect will have occasion for frequent shifts; through which his own sagacity, more than any rules, must conduct him. For instance, he will be frequently put to struggle with scarcity of ground; sometimes to ruin the appearance of one room for the benefit of others; in general, his aim should be to make those the most beautiful which are most in sight; and to leave the rest, as it were, in shadow, &c.

In the covering, or roof, two extremes are to be avoided, the making it too heavy, or too light: the first will press too much on the supports; the latter has no less inconvenience; for the cover is not only a defence, but, a band or ligature to the whole *building*; and requires a reasonable weight. Care should be taken, that the pressure be equal on each side; nor should the whole burden be laid on the outward walls, but the inner walls should likewise bear their share. The *Italians* are curious in the proportion of the slope of the roof; dividing the whole breadth into nine parts, whereof two serve for the height of the highest ridge to the lowest: but in this, regard must be had to the climate, for those climates which fear the falling of snow, rain, &c. ought to have sharper roofs than others, that the snow which can lodge upon them, may be less in quantity and weight.

The

The *accessories*, or *ornaments* of *buildings*, are derived from painting and sculpture. The chief rules to be regarded in embellishment with pictures are, that no room have too much, (this does not include galleries, or the like :) that the best pieces be placed in the most advantageous lights: rooms with several windows, are enemies to pictures, nor can any picture be seen in perfection, unless illumined like Nature, with a single light. Also, in their disposition, regard must be had to what side the light comes from, to their height from the eye, which is the most natural for the spectator; and their subjects must be accommodated to the intention of the room they are used in. Ornaments of sculpture, must not be too abundant; especially at the approach of a *building*, or at the entrance; where *Doric* ornaments are preferable to *Corinthian*; fine sculptures, should always have the advantage of nearness to the eye, and coarser performances of distance from it.

To judge of a *building*, Sir *H. Wotton* lays down the following rules.—That, before giving any judgement, a person be informed of its age; since, if apparent decays exceed the due proportion of time, it may be concluded, that the situation, the materials, or the workmanship, is bad. If it be found to bear its years well, let him advert, from the ornaments and things which strike the eye first, to the more essential members; having determined on these, he may pronounce whether, or not, the work be commodious, firm, and delightful; the three conditions in a good *building*, first laid down and agreed on by all Authors.

In

In this judgement should be included the consideration, whether the walls stand upright, upon a clean footing and foundation; whether the *building* be of a beautiful stature; whether the principal entrance and others be well placed; as also the windows, offices, &c.

*Vitruvius* gives another method of judging: summing up the whole art under these six heads: *Ordination*, or settling the model and scale of the work; *Disposition*, the just expression of the design thereof; *Eurythmy*, the harmony between the length, breadth, and height of the several rooms, &c. *Symmetry*, or the agreement between the parts and the whole; *Decor*, the due relation between the *building* and the inhabitant: and *Distribution*, the useful allotment of the several rooms for office, entertainment, or pleasure. These last four are ever to be strictly attended to: and these are sufficient to condemn or acquit any *building* whatever.

Dr. *Fuller* gives us two or three good aphorisms in *building*; as,—1. Let not the common rooms be private, nor the private rooms be common.—2. A house had better be too little for a day, than too big for a year.—3. Country houses must be substantives, able to stand of themselves: not like city *buildings*, supported and sheltered on each side by their neighbours.—4. Let not the front look askint on a stranger: but accost him right at his entrance.—5. Let the offices keep their due distance from the Mansion-house; those are too familiar, which are of the same pile with it.

The

The design of an edifice is commonly laid down on three several draughts.

First, a *Plan*, which exhibits the extent, divisions, and distribution of the ground, into the various apartments, and other conveniencies. Plans are often made for the several stories: as their distribution may differ occasionally.

A second drawing represents externally the stories, their heights, and the general appearance of the whole building: this is termed an *Elevation*.

The third drawing is the *Section*, and shews the internal parts of the fabric; the front wall being supposed absent.

By means of the Plan, the Elevation and the Section, an estimate may be made of the expence, time, &c. a building may require, according to its measurement. And the most accurate estimates are necessary in this art, because some things always occur that could not be foreseen; but for which in good estimates allowance is regularly made.

END OF THE LECTURES ON

ARCHITECTURE.

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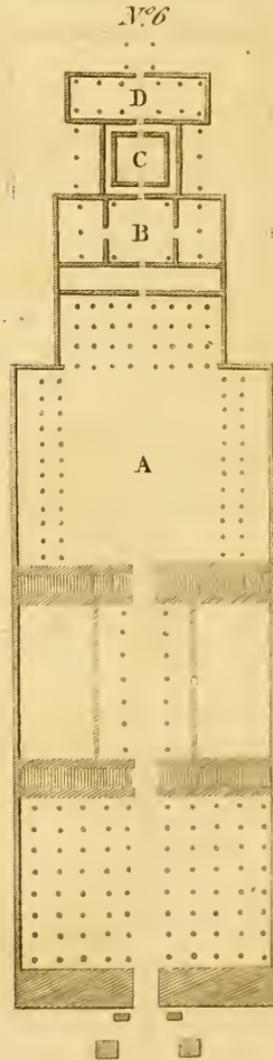
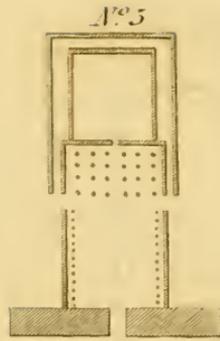


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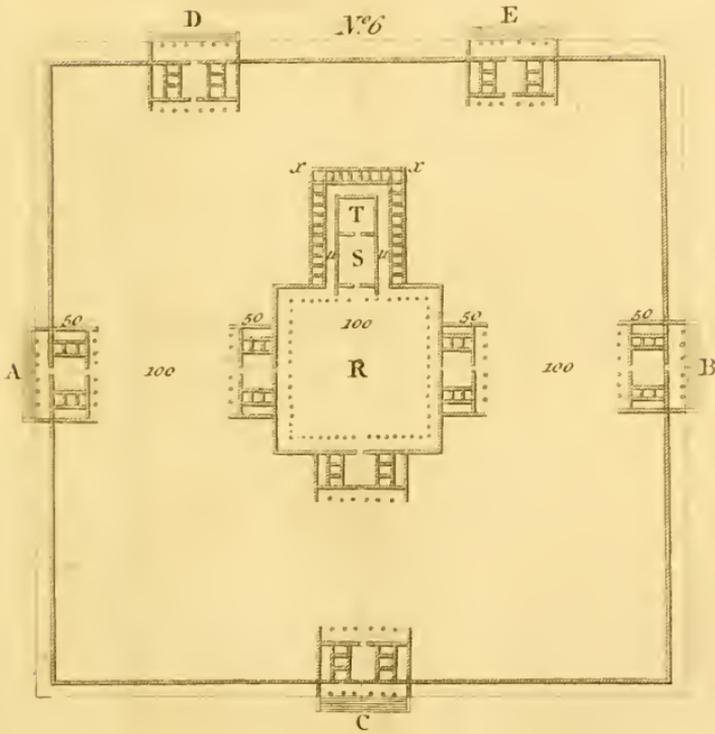
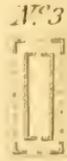
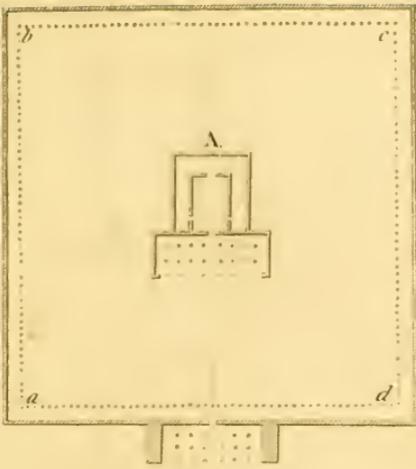
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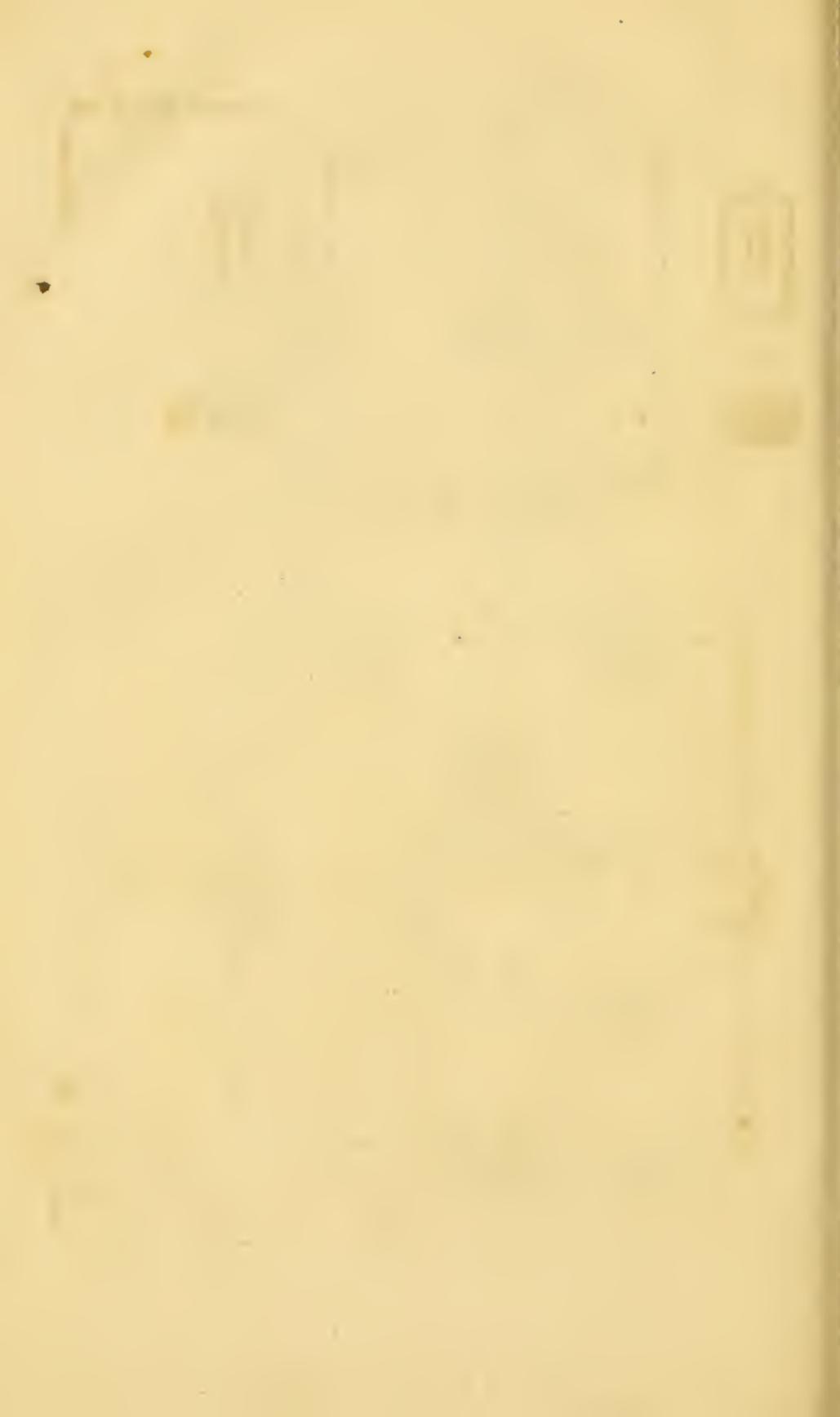
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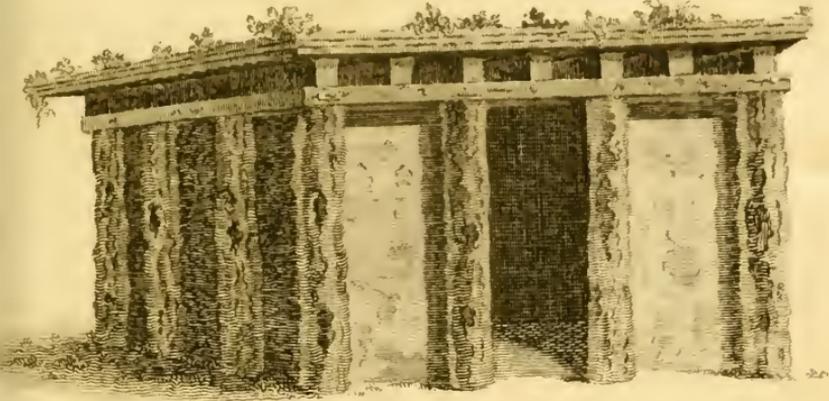




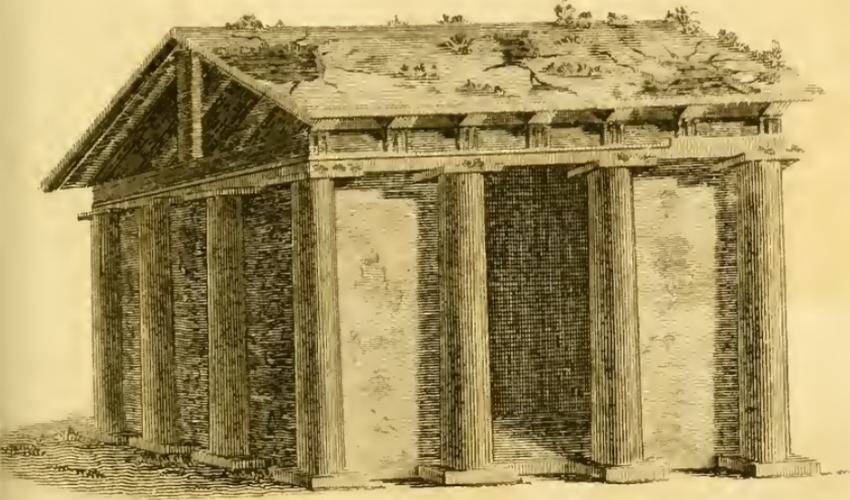


Construction of HUTS.

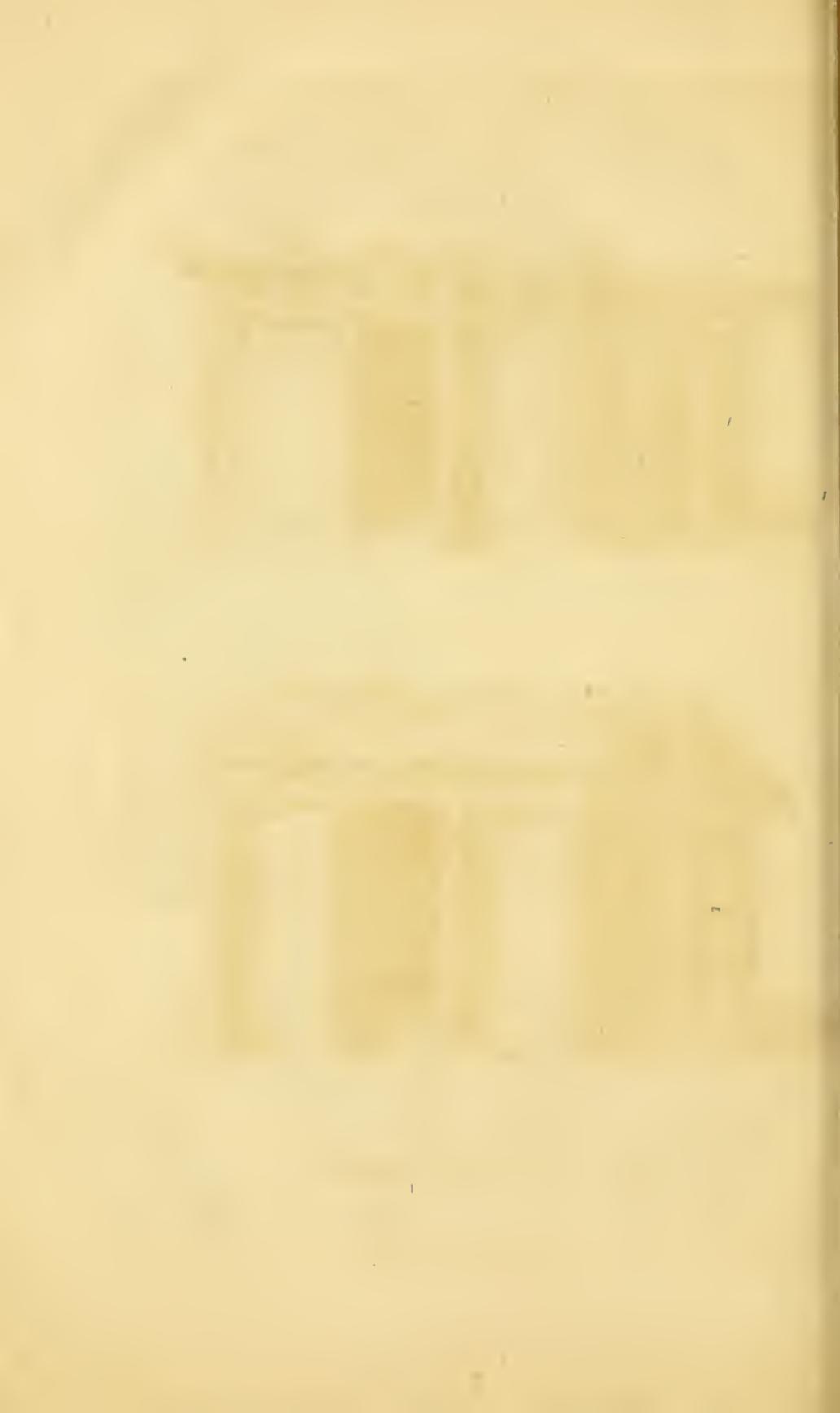
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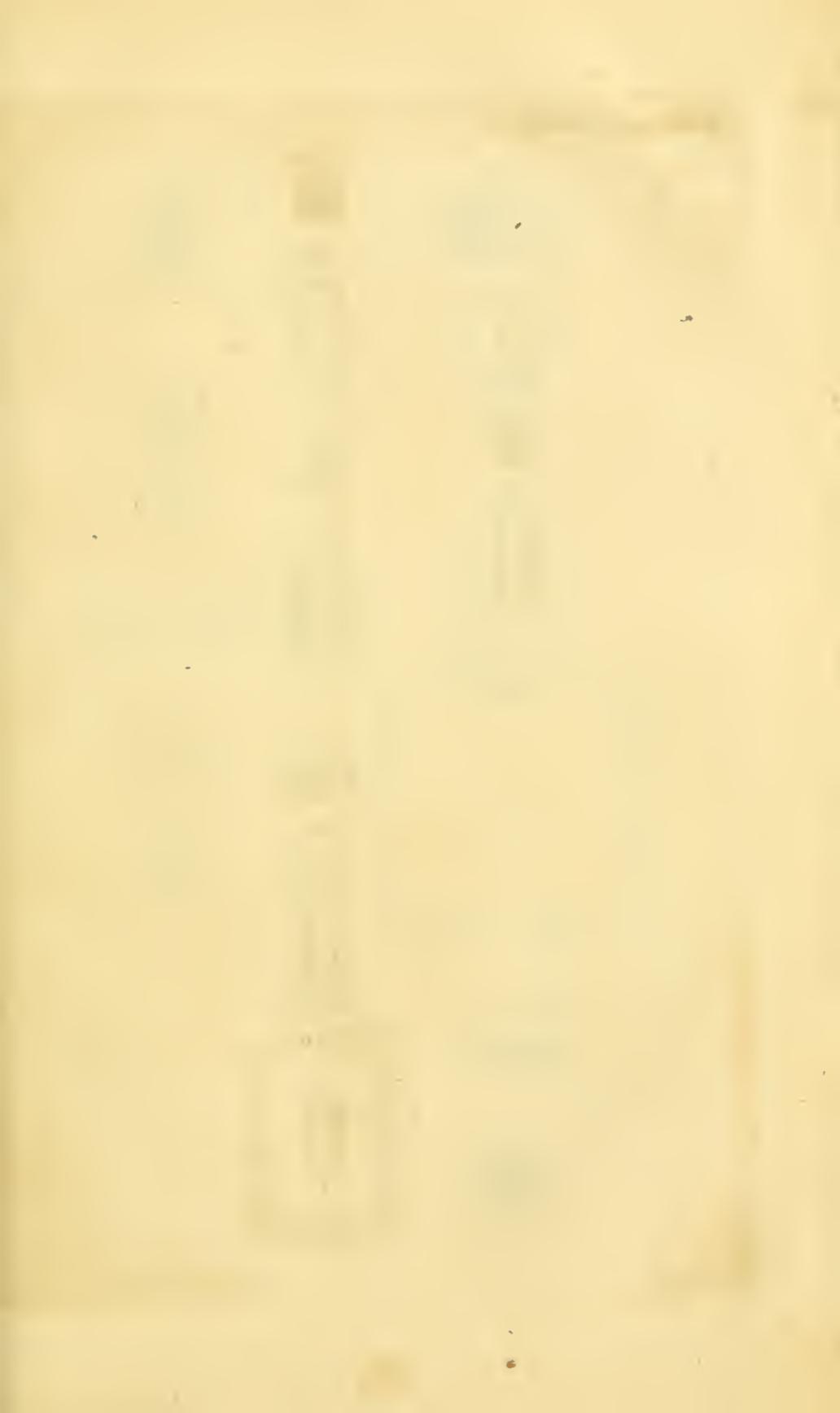


*N<sup>o</sup> 2.*



*Progress of the DORIC ORDER*





N<sup>o</sup> 1.



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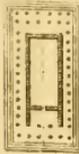
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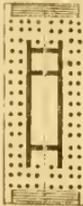
N<sup>o</sup> 7.



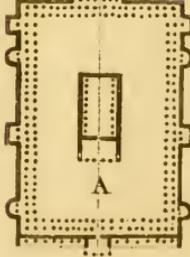
N<sup>o</sup> 8.



N<sup>o</sup> 9.



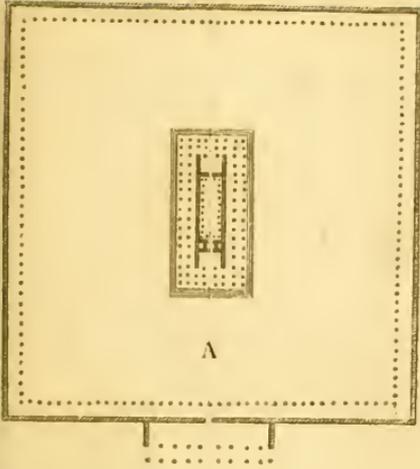
N<sup>o</sup> 10.



N<sup>o</sup> 1

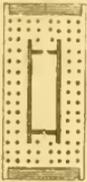


N<sup>o</sup> 2



A

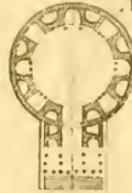
N<sup>o</sup> 3



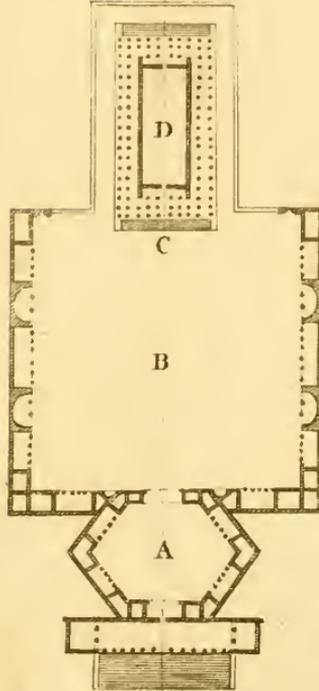
N<sup>o</sup> 4



N<sup>o</sup> 5



N<sup>o</sup> 6



D

C

B

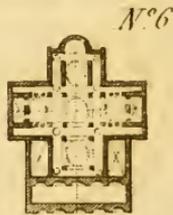
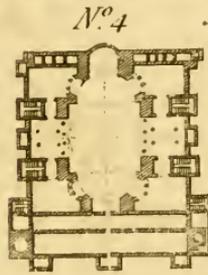
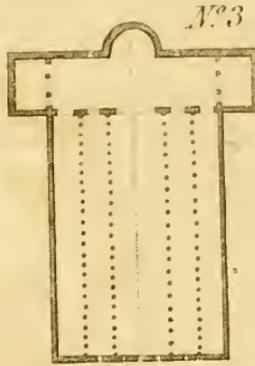
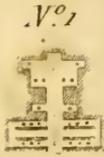
A

N<sup>o</sup> 7





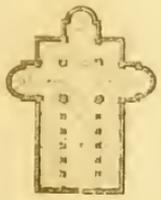




N<sup>o</sup> 1



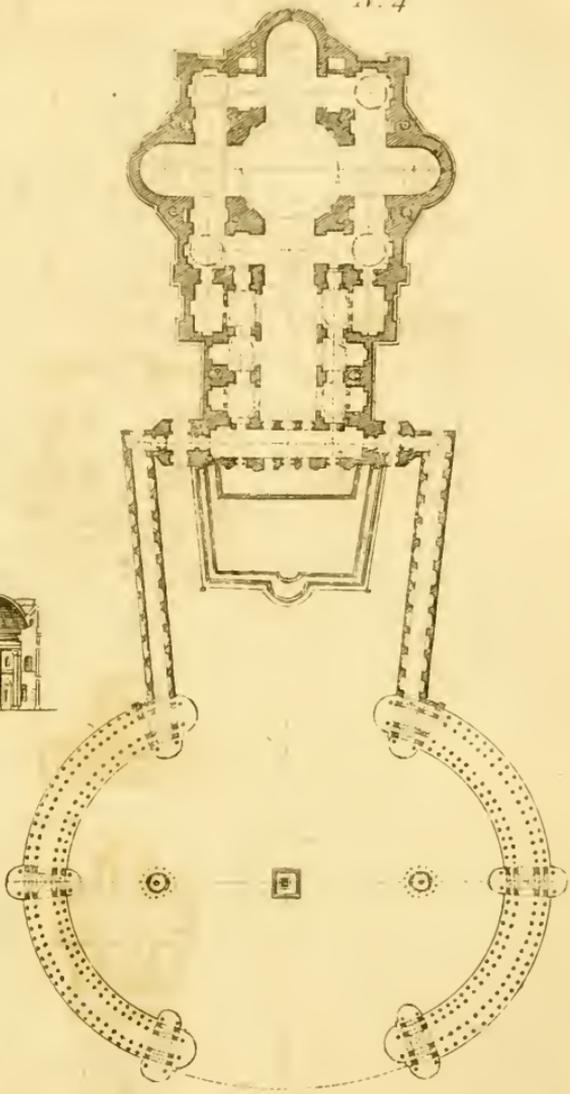
N<sup>o</sup> 2



N<sup>o</sup> 3



N<sup>o</sup> 4



N<sup>o</sup> 5







N<sup>o</sup> 1.



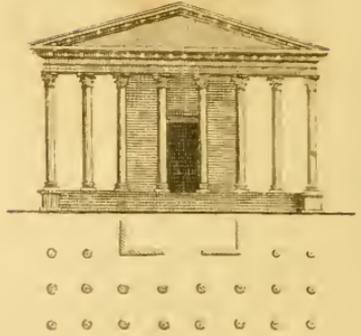
N<sup>o</sup> 2



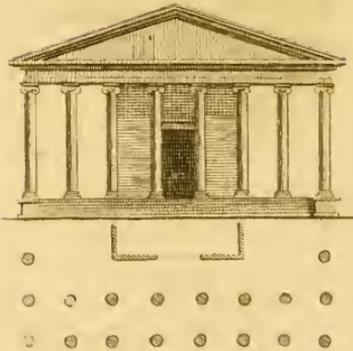
N<sup>o</sup> 3.



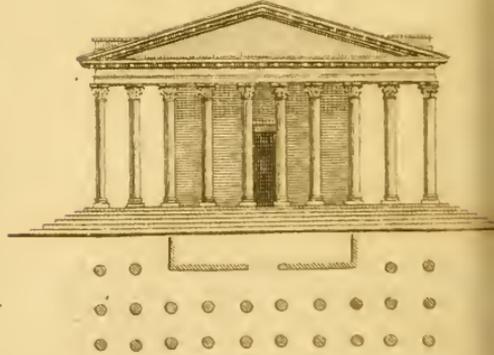
N<sup>o</sup> 4



N<sup>o</sup> 5



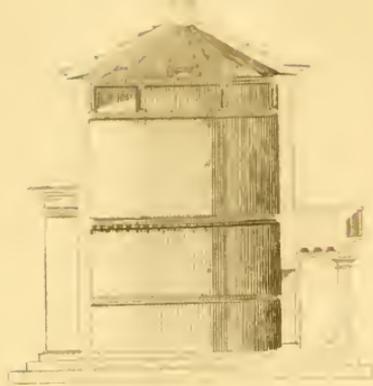
N<sup>o</sup> 6



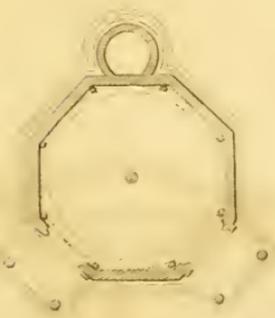
*Elevation*



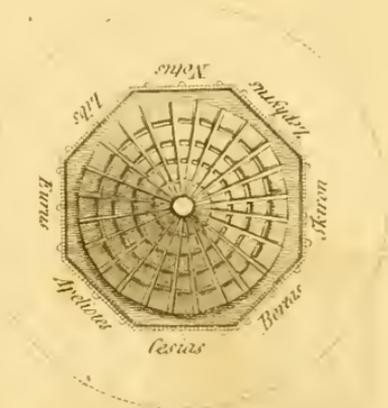
*Section*



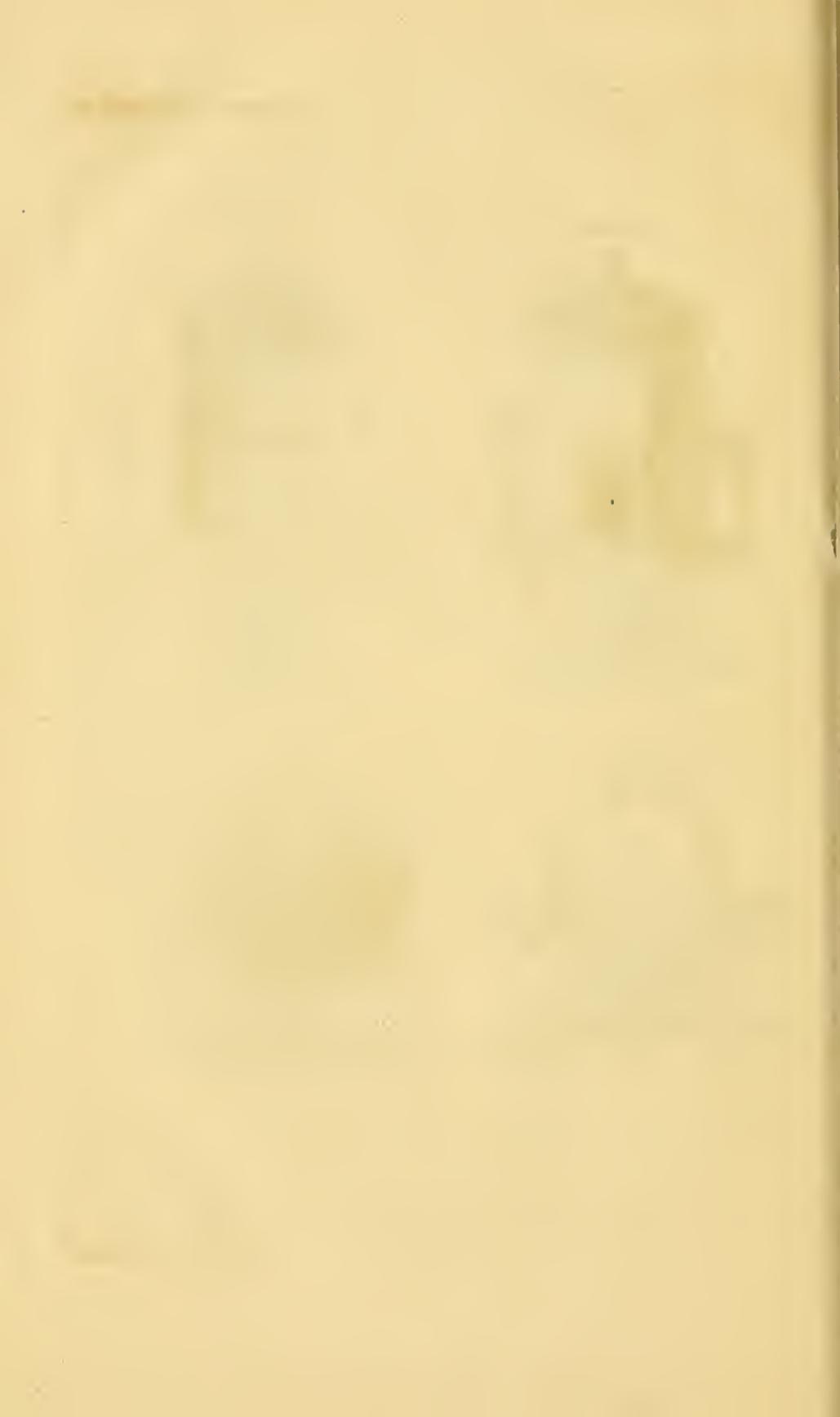
*Tower of the Winds  
at Athens.*



*Plan of the Building*



*Plan of the Roof*





*Monument to the  
honour of Lysicrates  
at Athens.*

N<sup>o</sup>. 1



*Elevation*

N<sup>o</sup>. 2



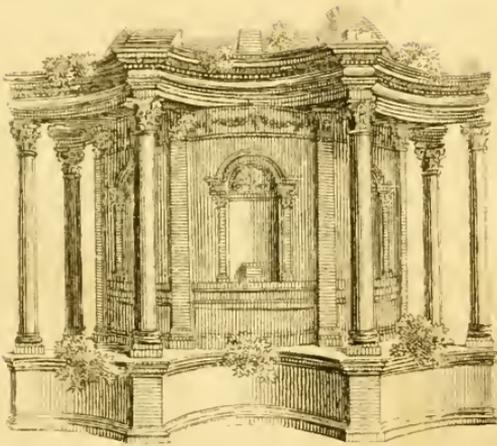
*Section*



*N<sup>o</sup> 1.*



*N<sup>o</sup> 2.*

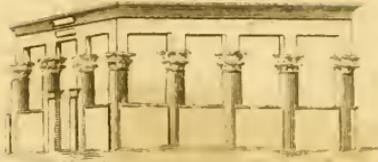


*A circular Temple at Baalbec.*

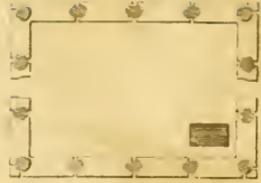




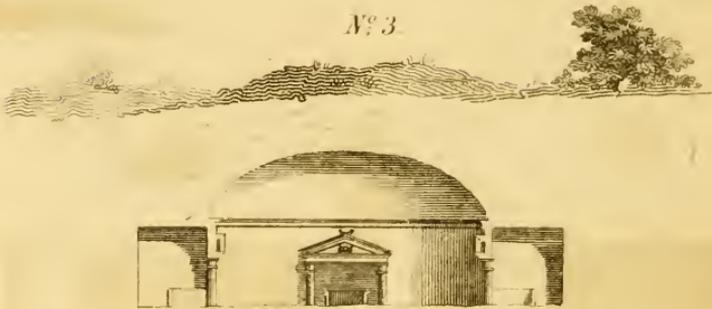
N<sup>o</sup> 1.



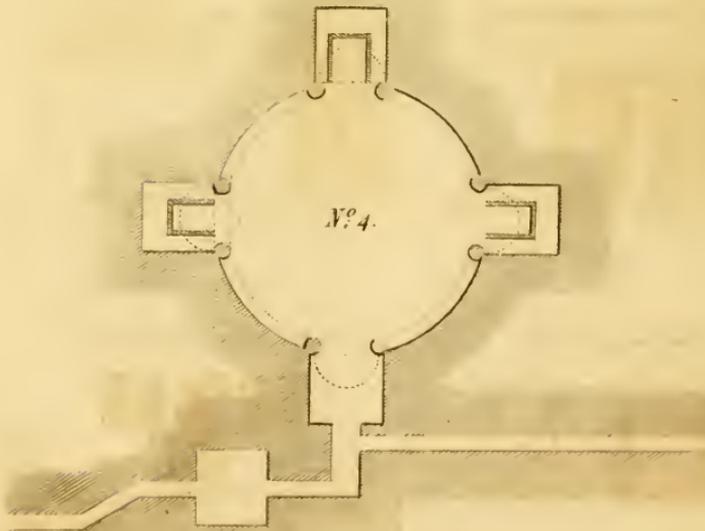
N<sup>o</sup> 2.



N<sup>o</sup> 3.



N<sup>o</sup> 4.



N<sup>o</sup> 1.



N<sup>o</sup> 2.



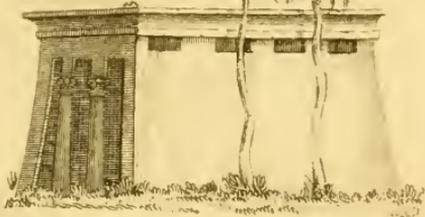
N<sup>o</sup> 3.



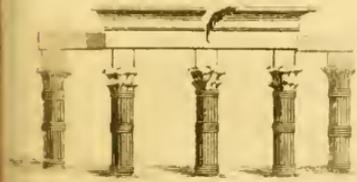
N<sup>o</sup> 4.



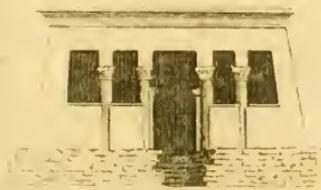
N<sup>o</sup> 5.



N<sup>o</sup> 6.



N<sup>o</sup> 7.

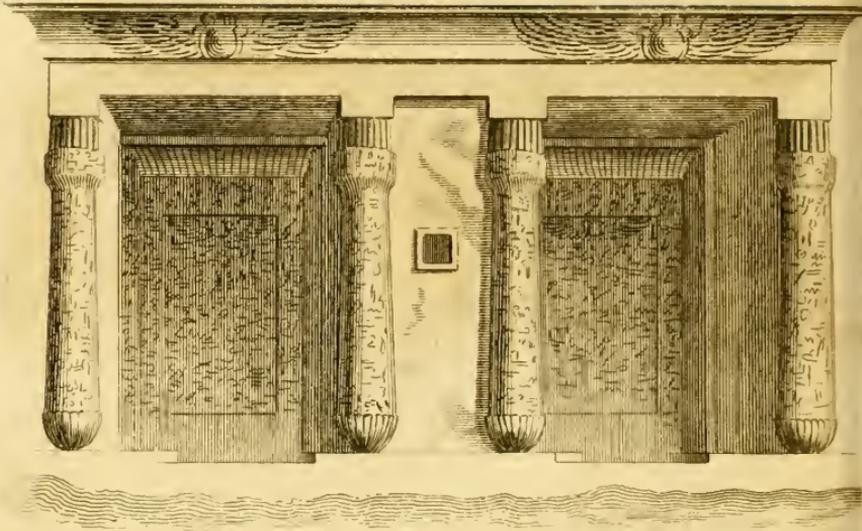


Progress of EGYPTIAN TEMPLES.

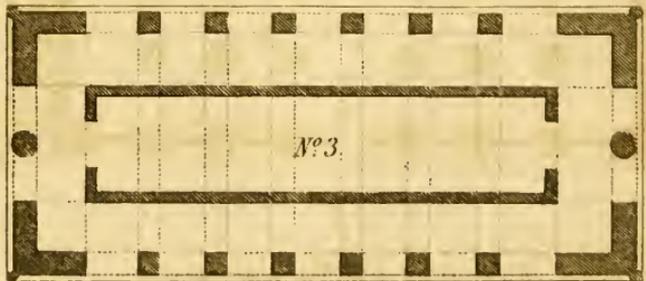
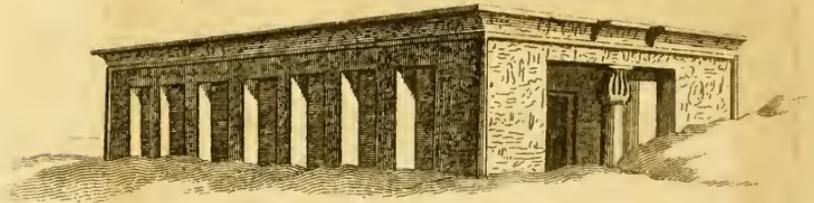




N<sup>o</sup> 1.



N<sup>o</sup> 2.

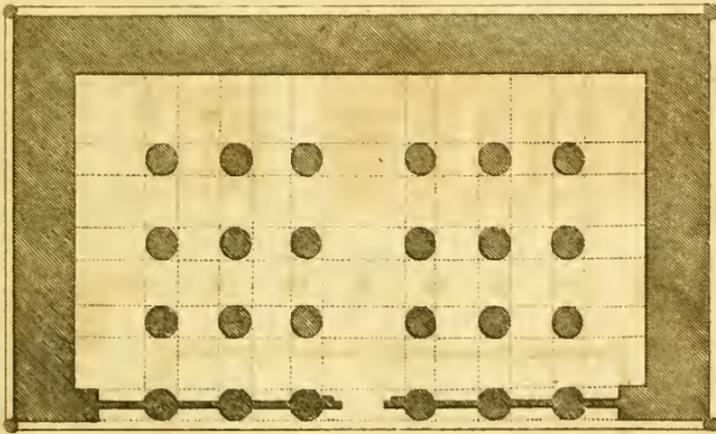


EGYPTIAN TEMPLES.

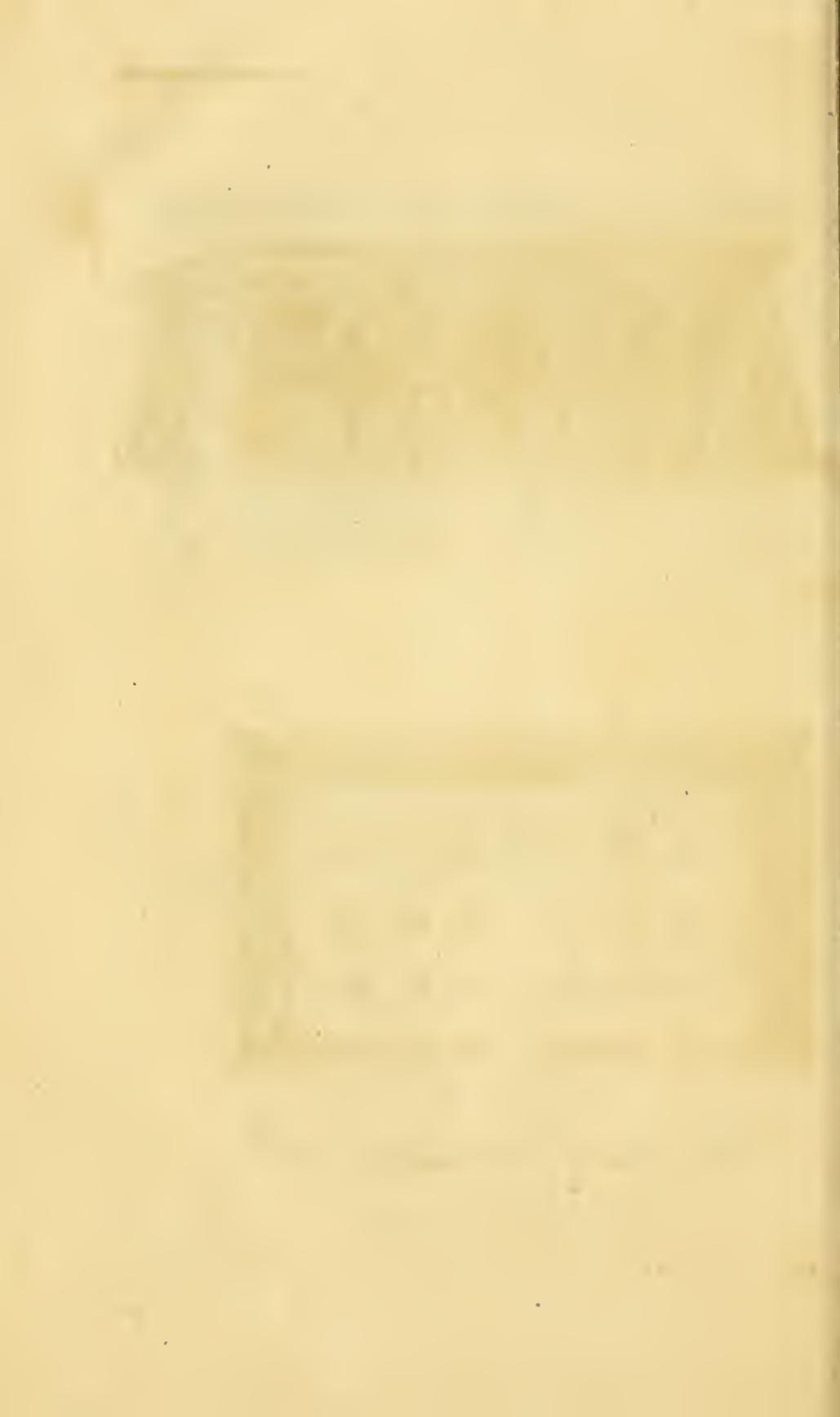
N<sup>o</sup> 1.



N<sup>o</sup> 2.

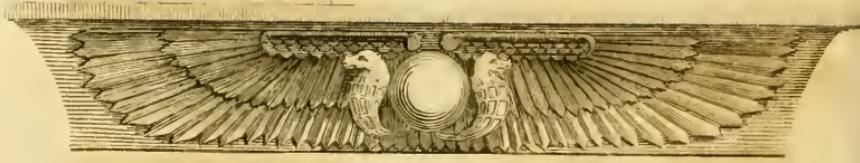


EGYPTIAN TEMPLES.

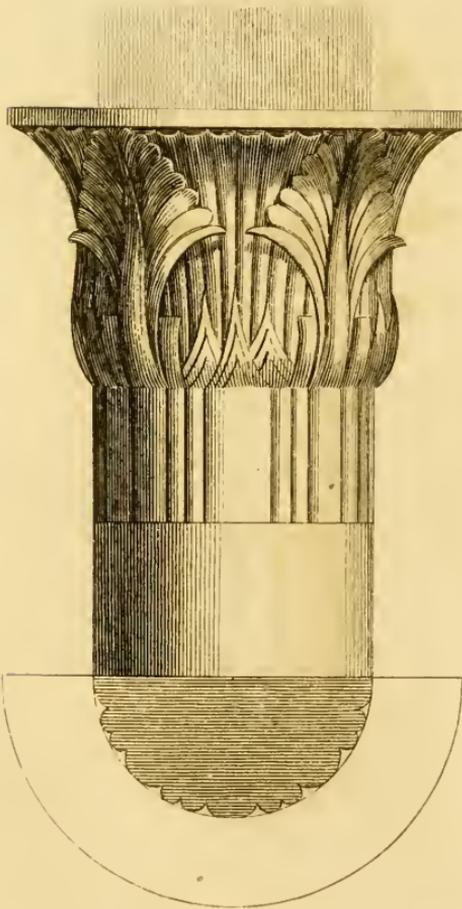




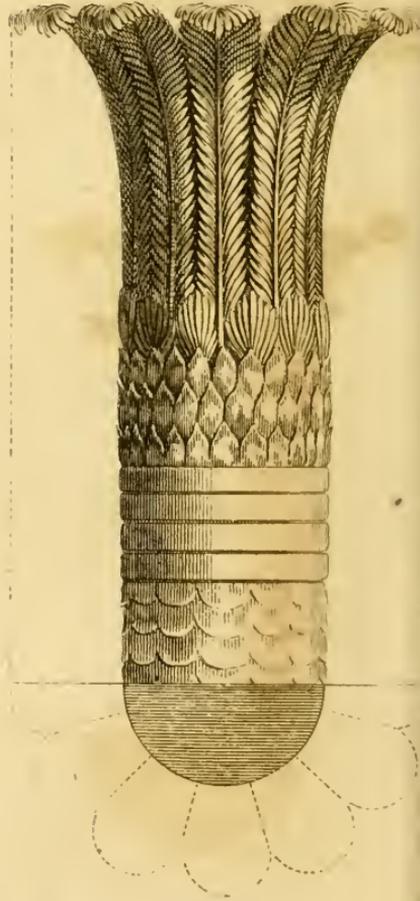
N<sup>o</sup> 1.



N<sup>o</sup> 2.



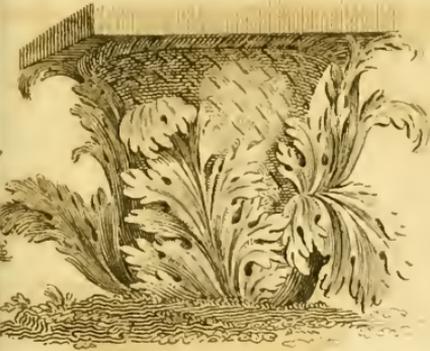
N<sup>o</sup> 3.



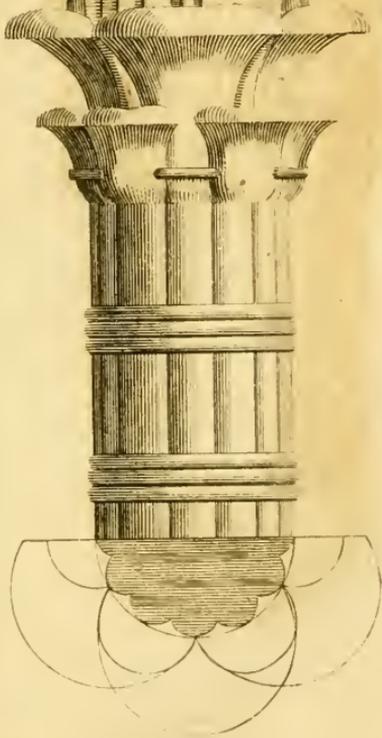
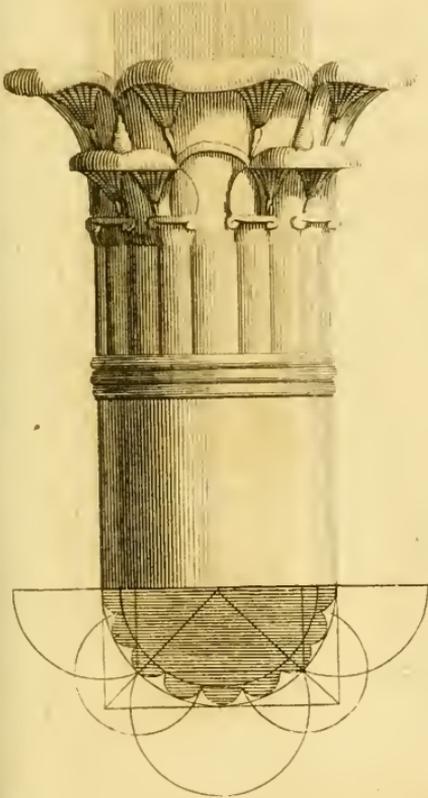
*Suggested PARTS of Columns.*

N<sup>o</sup> 2

N<sup>o</sup> 1.



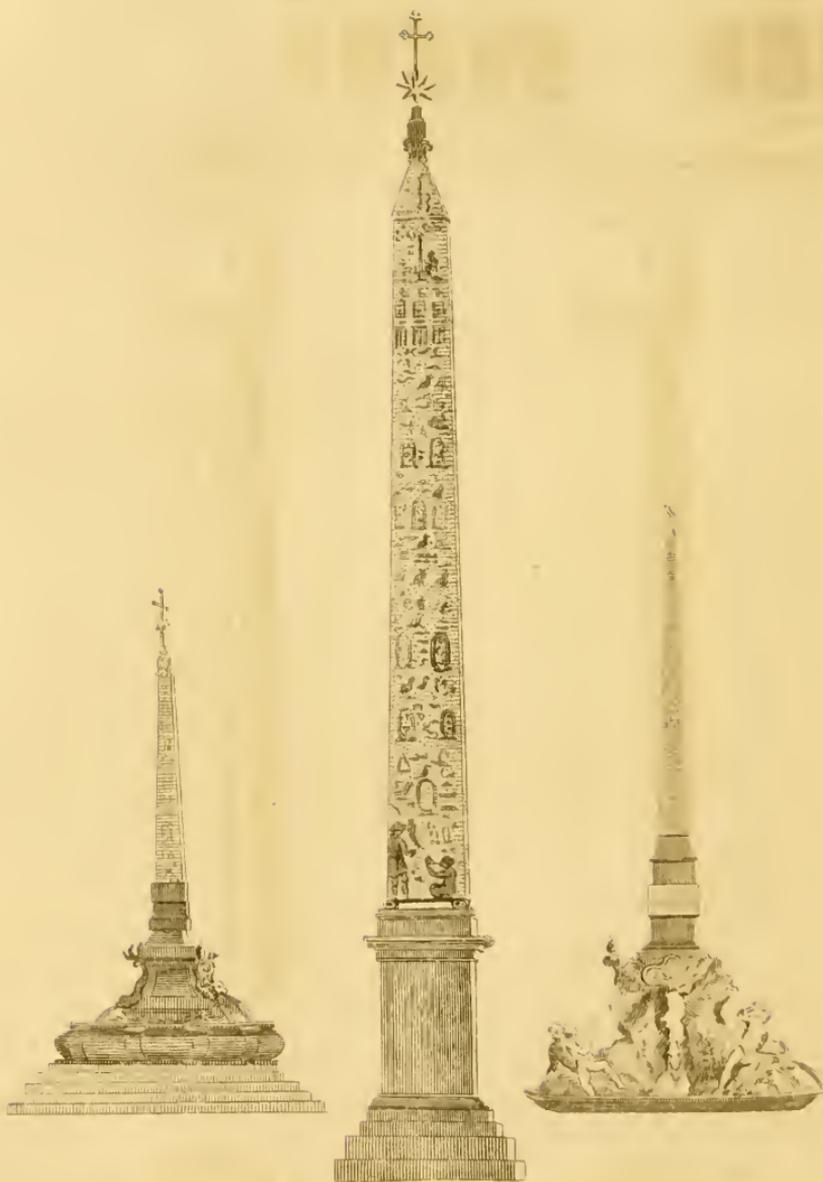
N<sup>o</sup> 3.



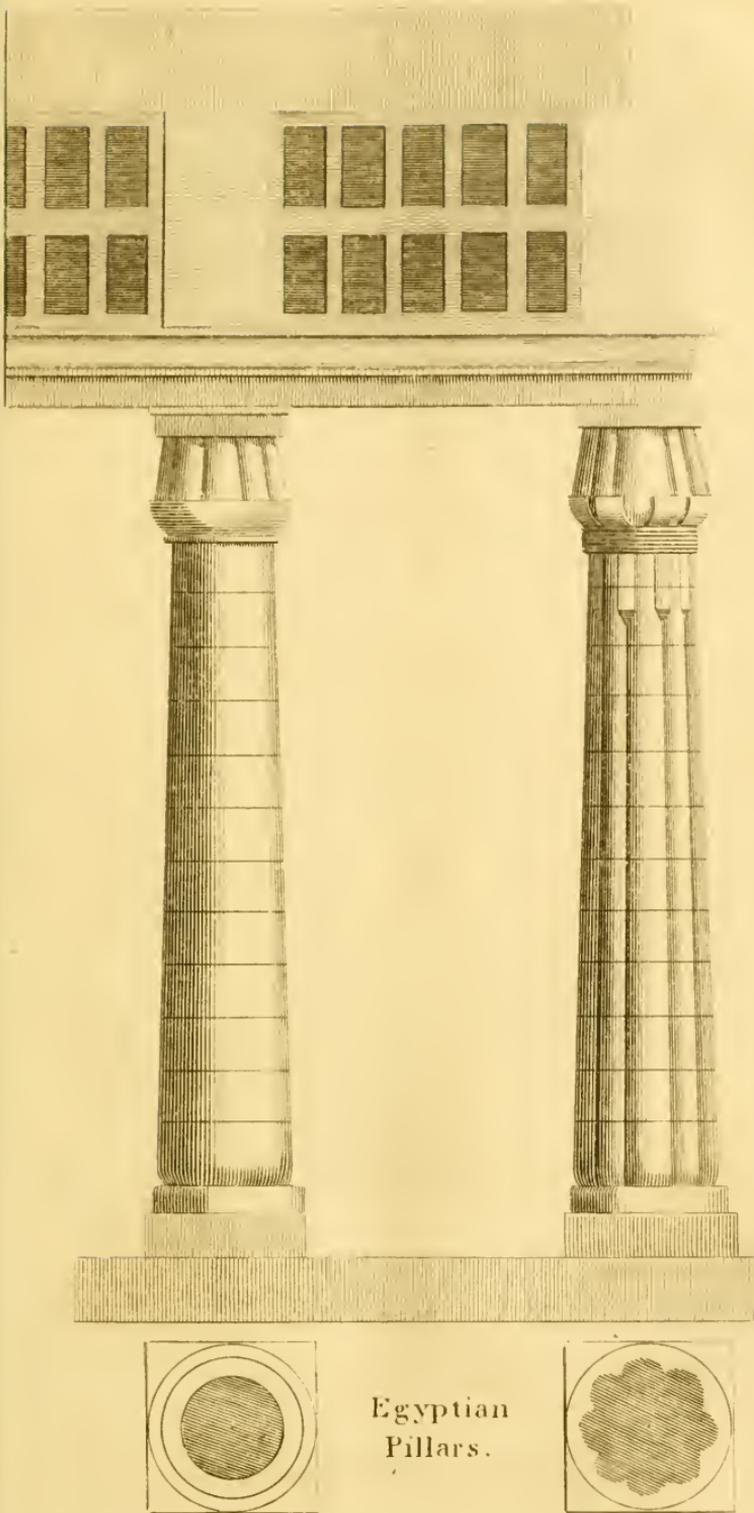
*Suggested PARTS of Columns.*



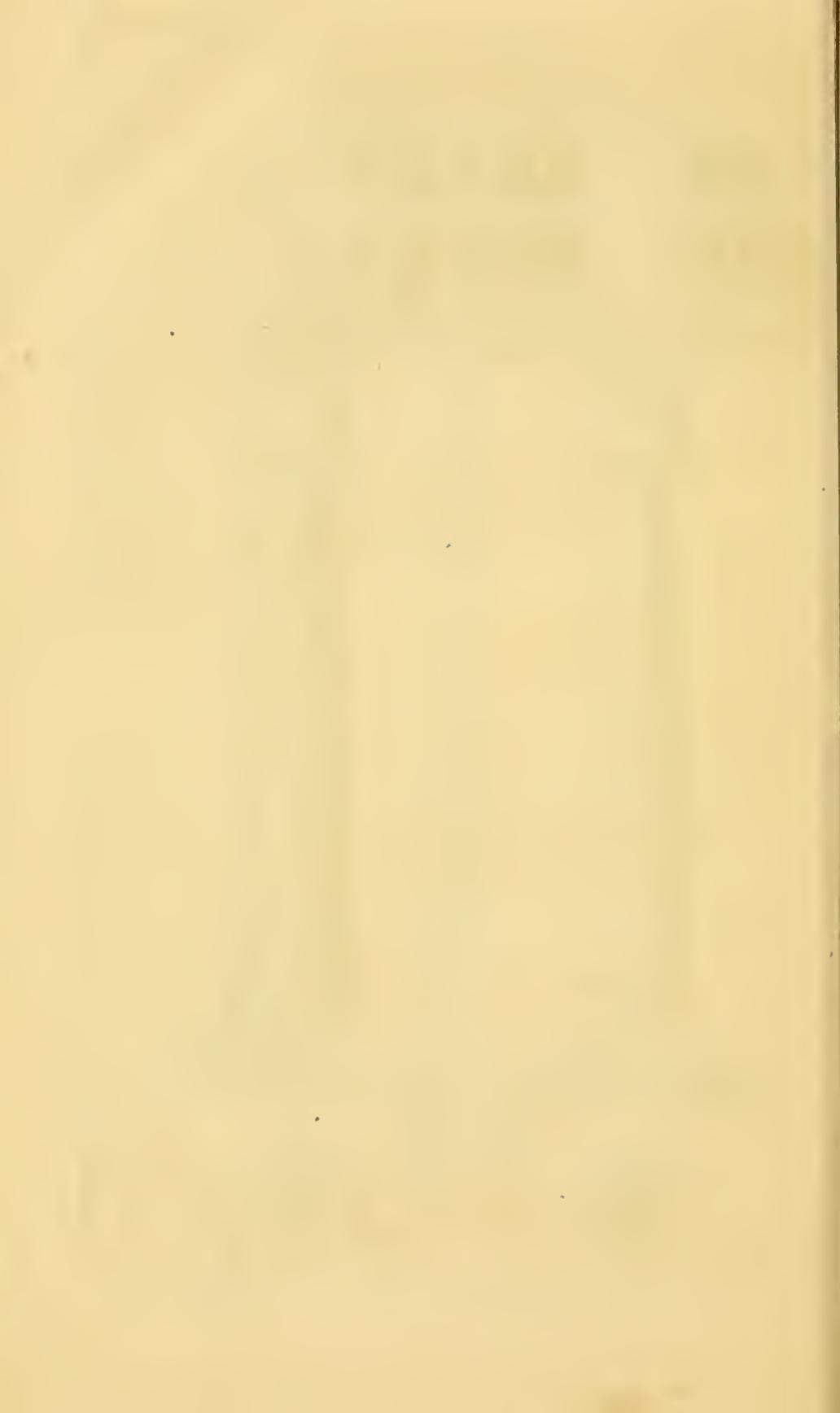


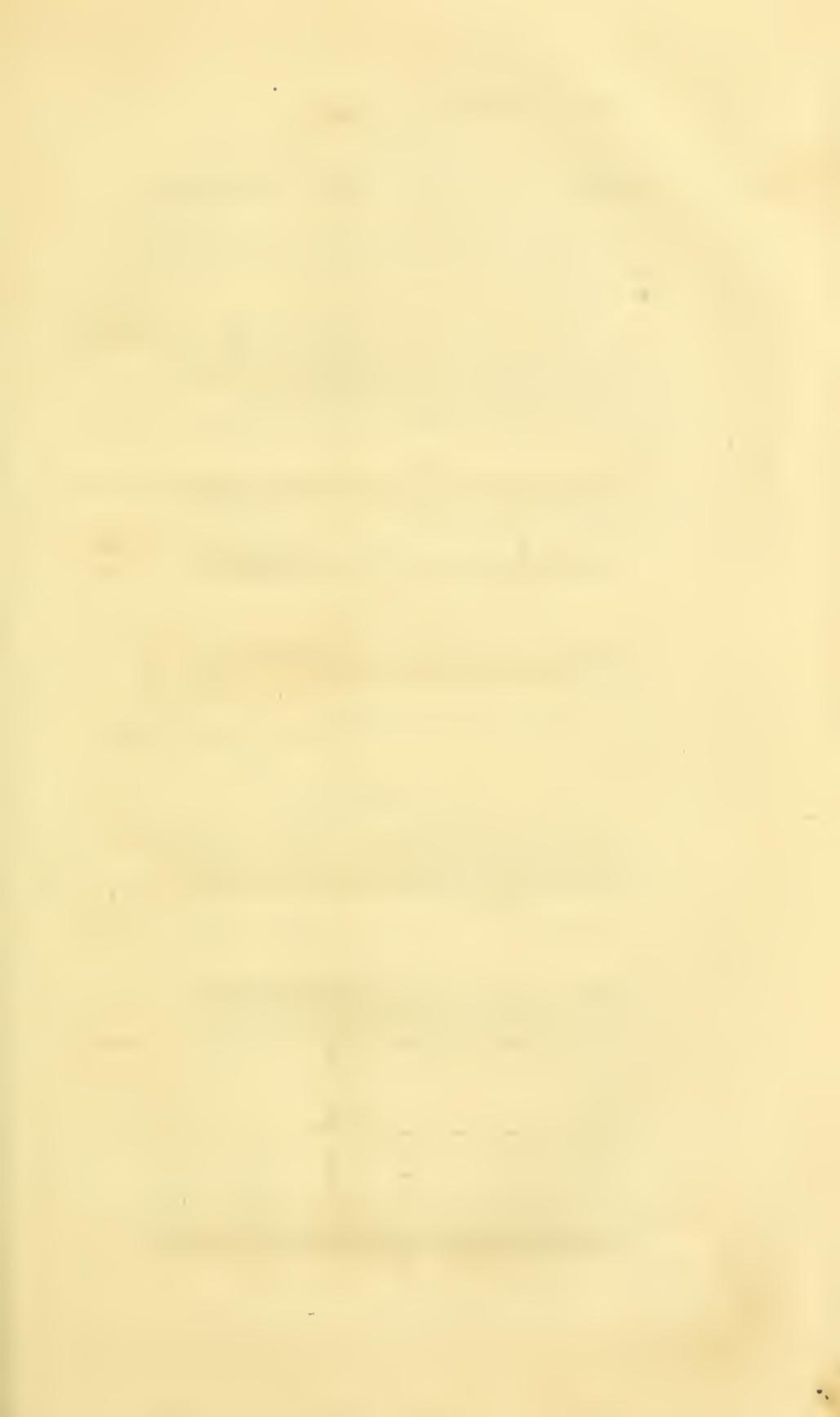


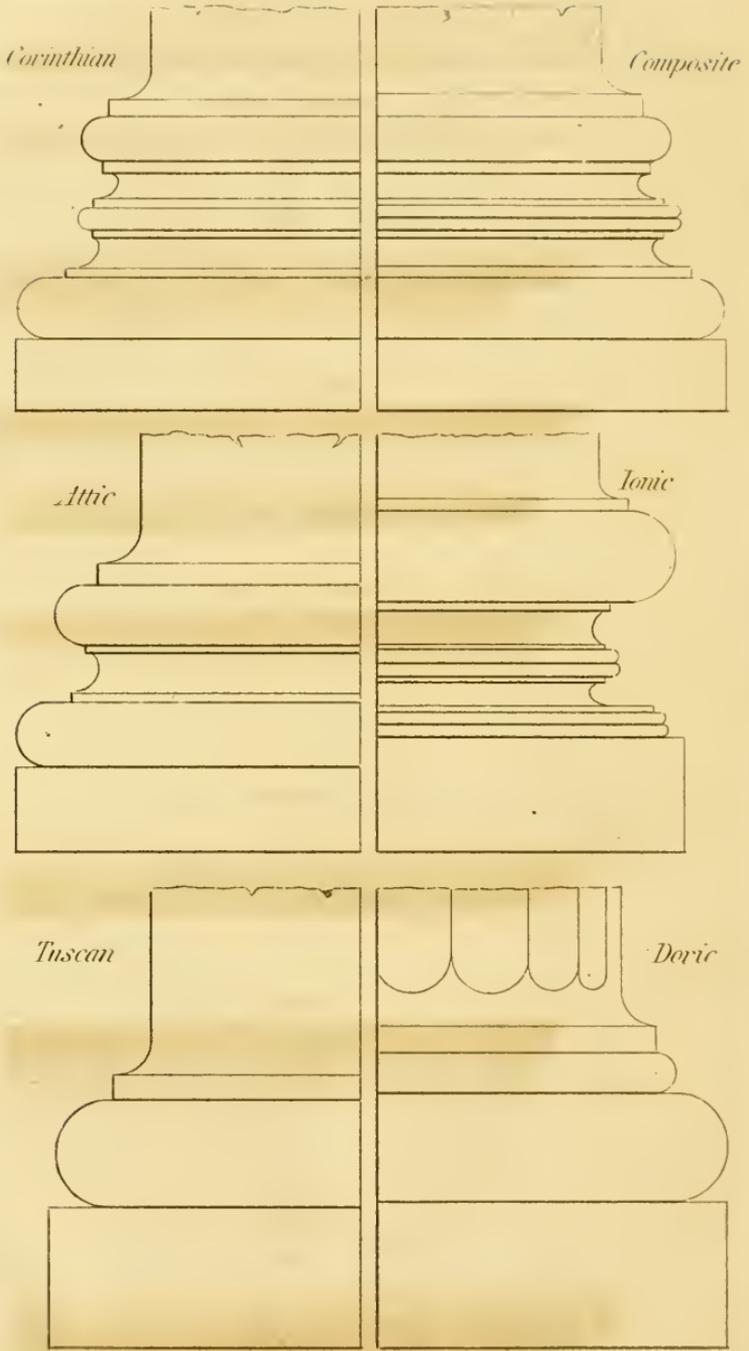
Egyptian Obelisks.



Egyptian  
Pillars.







MOULDINGS.

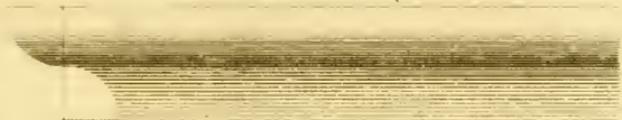
*Annulet, List, or Square.*



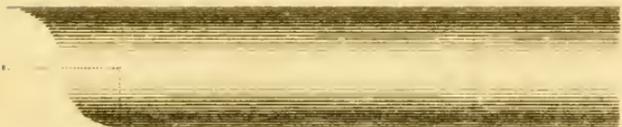
*Astragal or Bead.*



*Cima reversa, or Ogee.*



*Cima recta.*



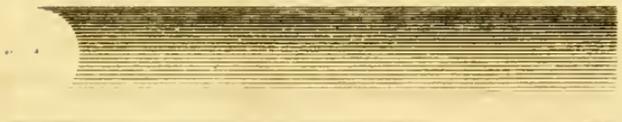
*Cavetto, or Hollow.*



*Ovolo, or Quarter round.*

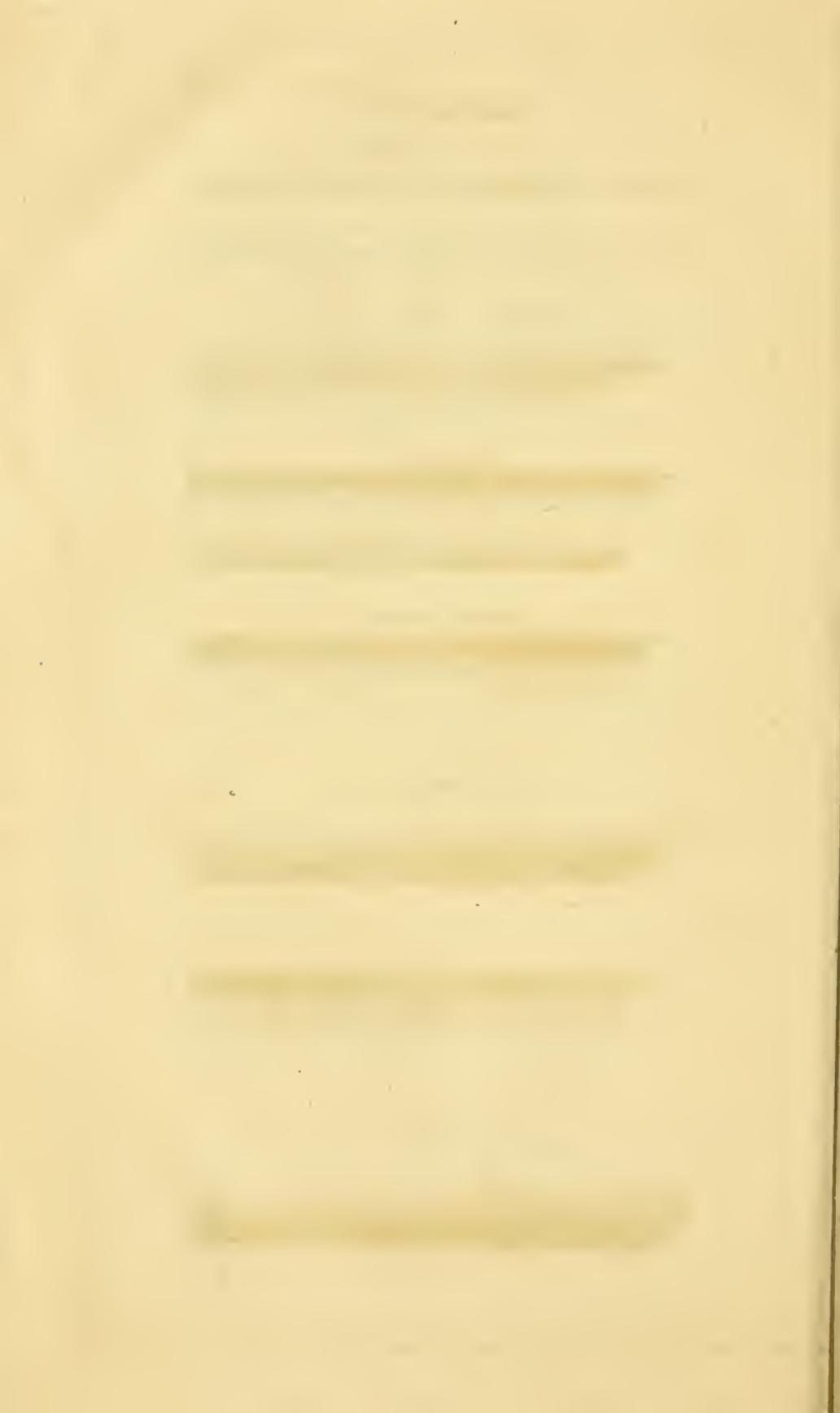


*Scotia.*



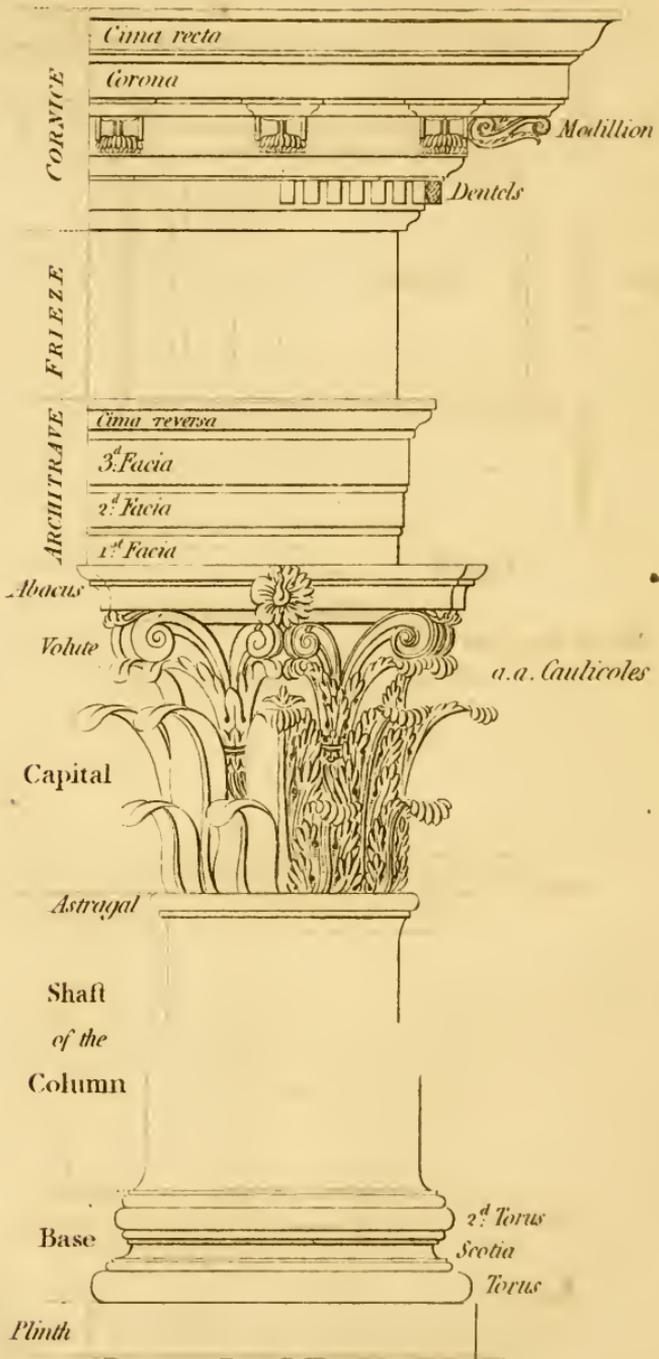
*Torus.*



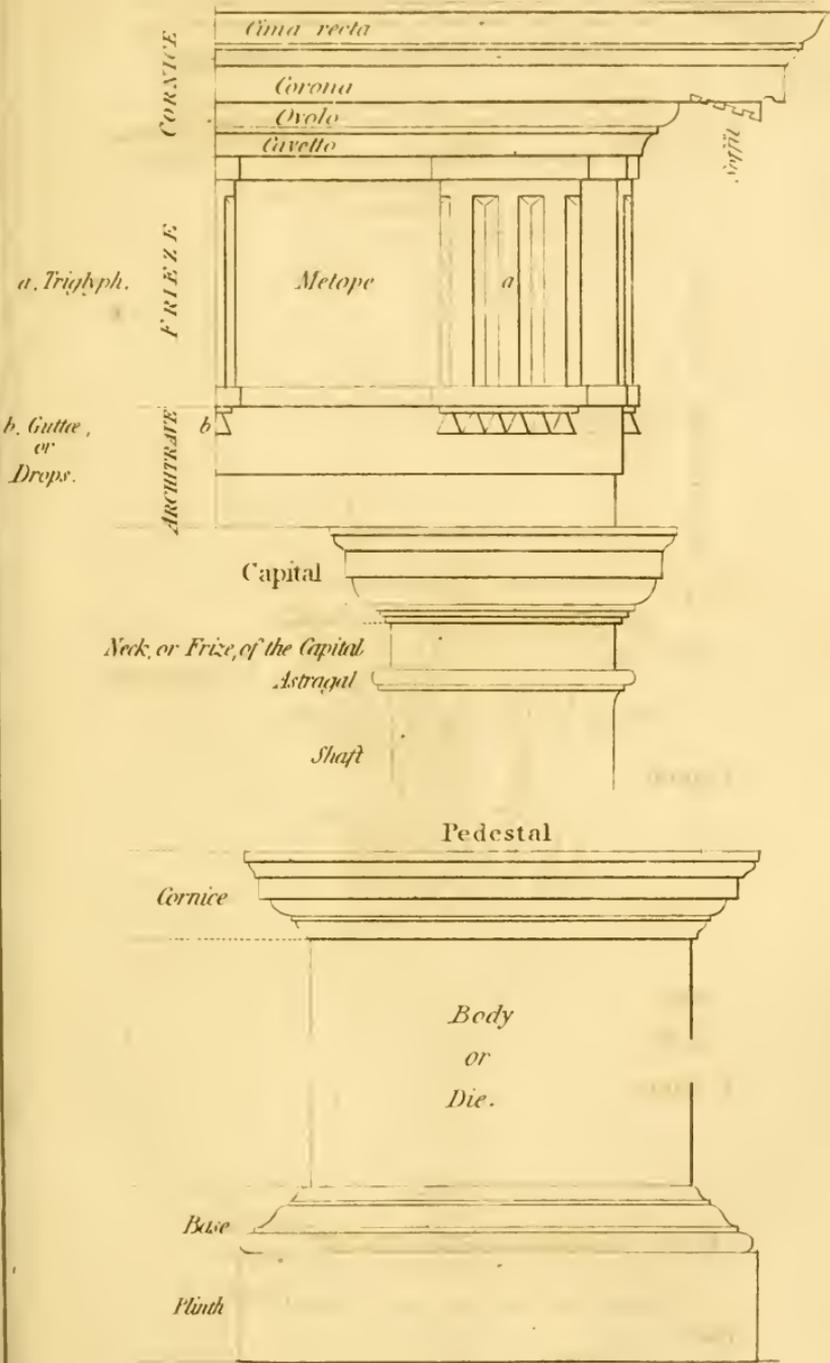




PARTS of an ORDER.

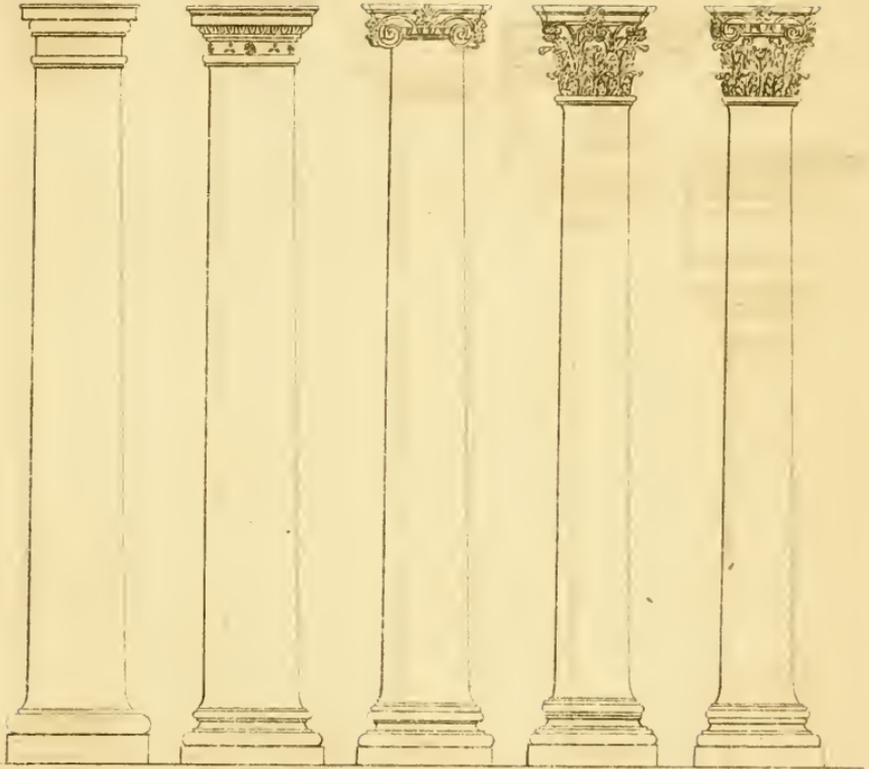


PARTS of an ORDER.









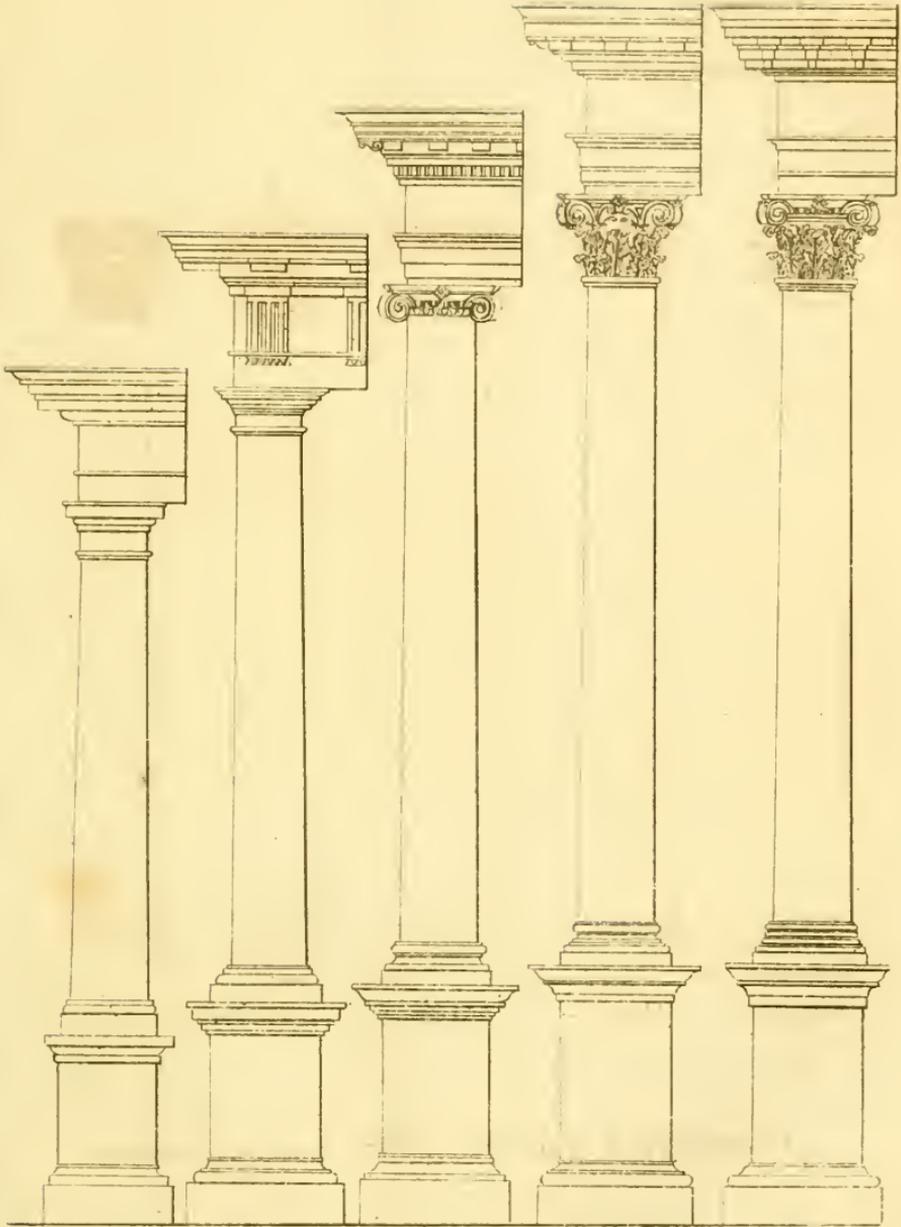
Tuscan.

Doric.

Ionic.

Corinthian, Composite.

*PROPORTION of the ORDERS on the same HEIGHT.*



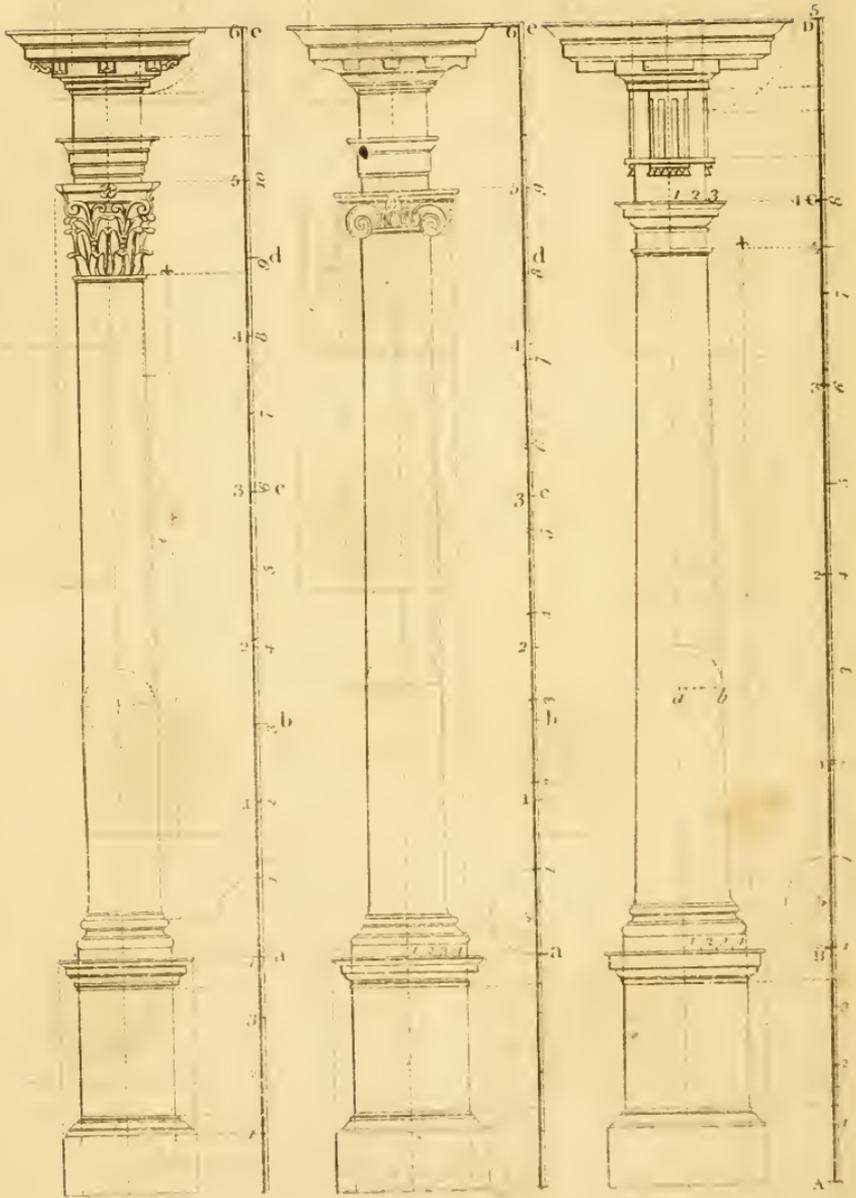
Tuscan . Doric . Ionic . Corinthian . Composite .

*PROPORTION of the ORDERS on the same MODULE*





PRINCIPLES of DRAWING the ORDERS.

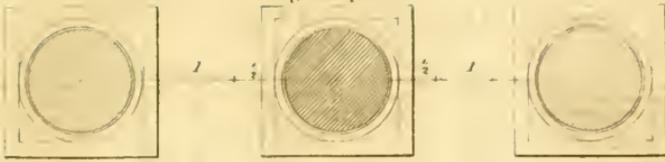


Corinthian

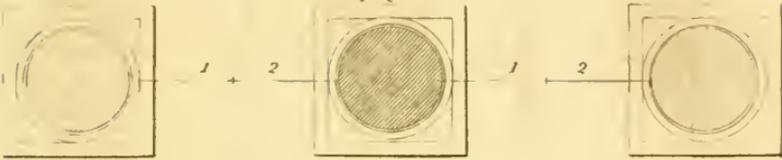
Ionic

Doric

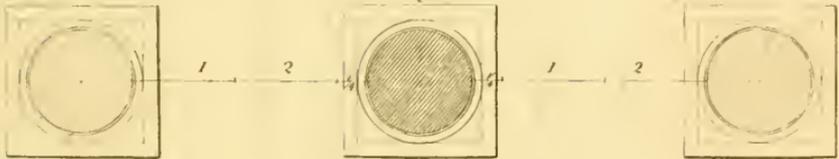
*Pycnostyle*



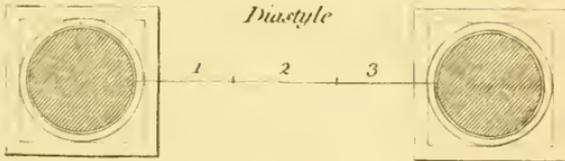
*Systyle*



*Eustyle*



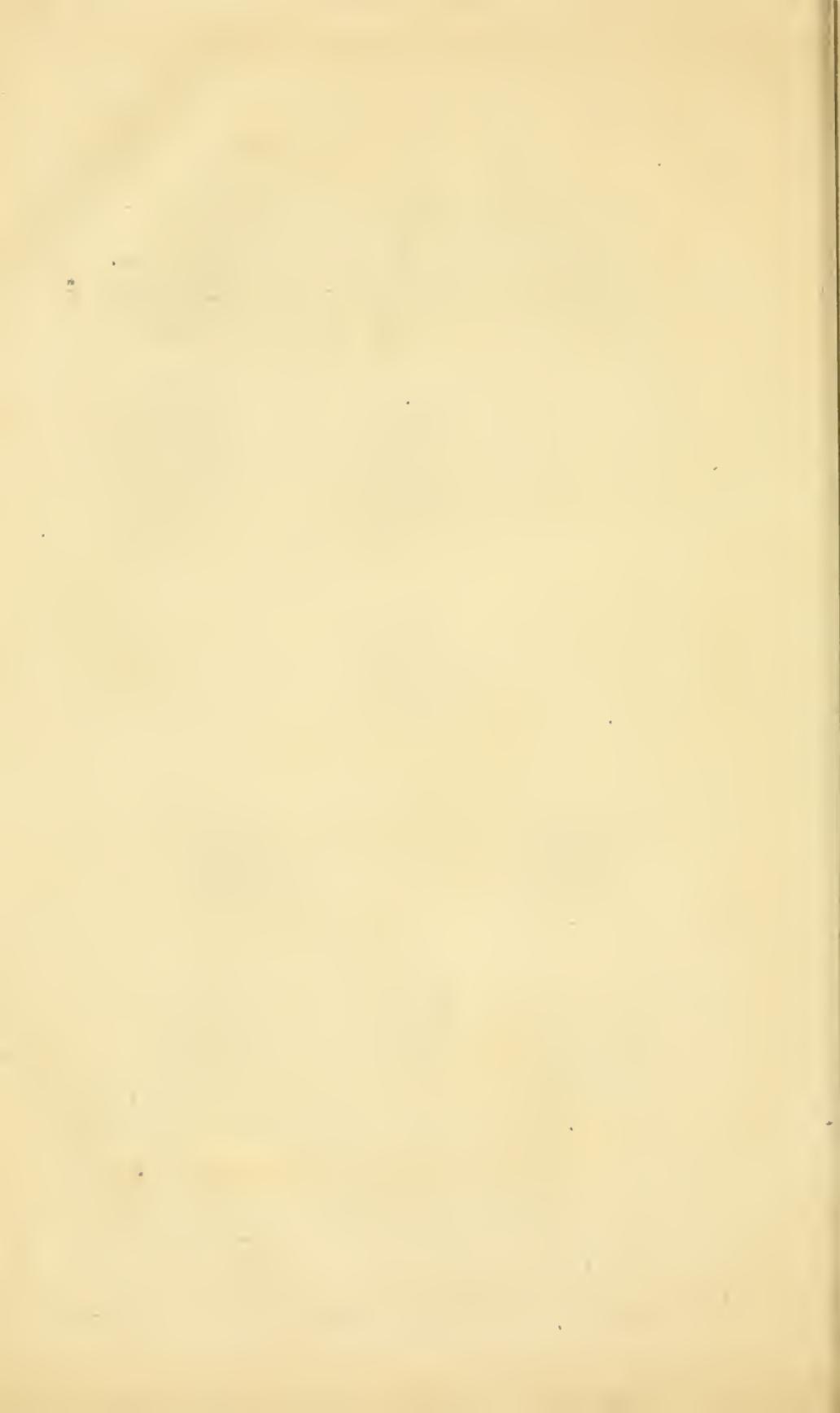
*Diastyle*



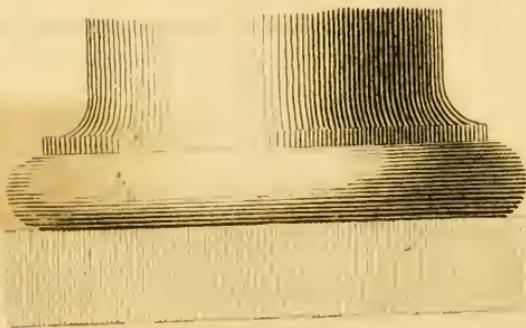
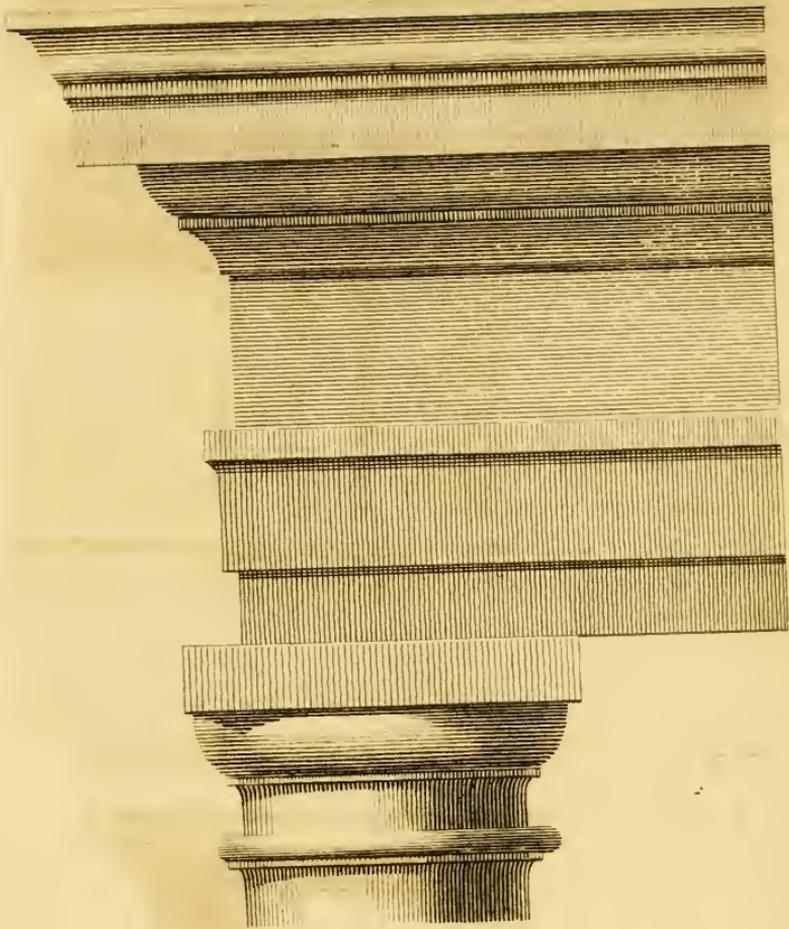
*Areostyle*



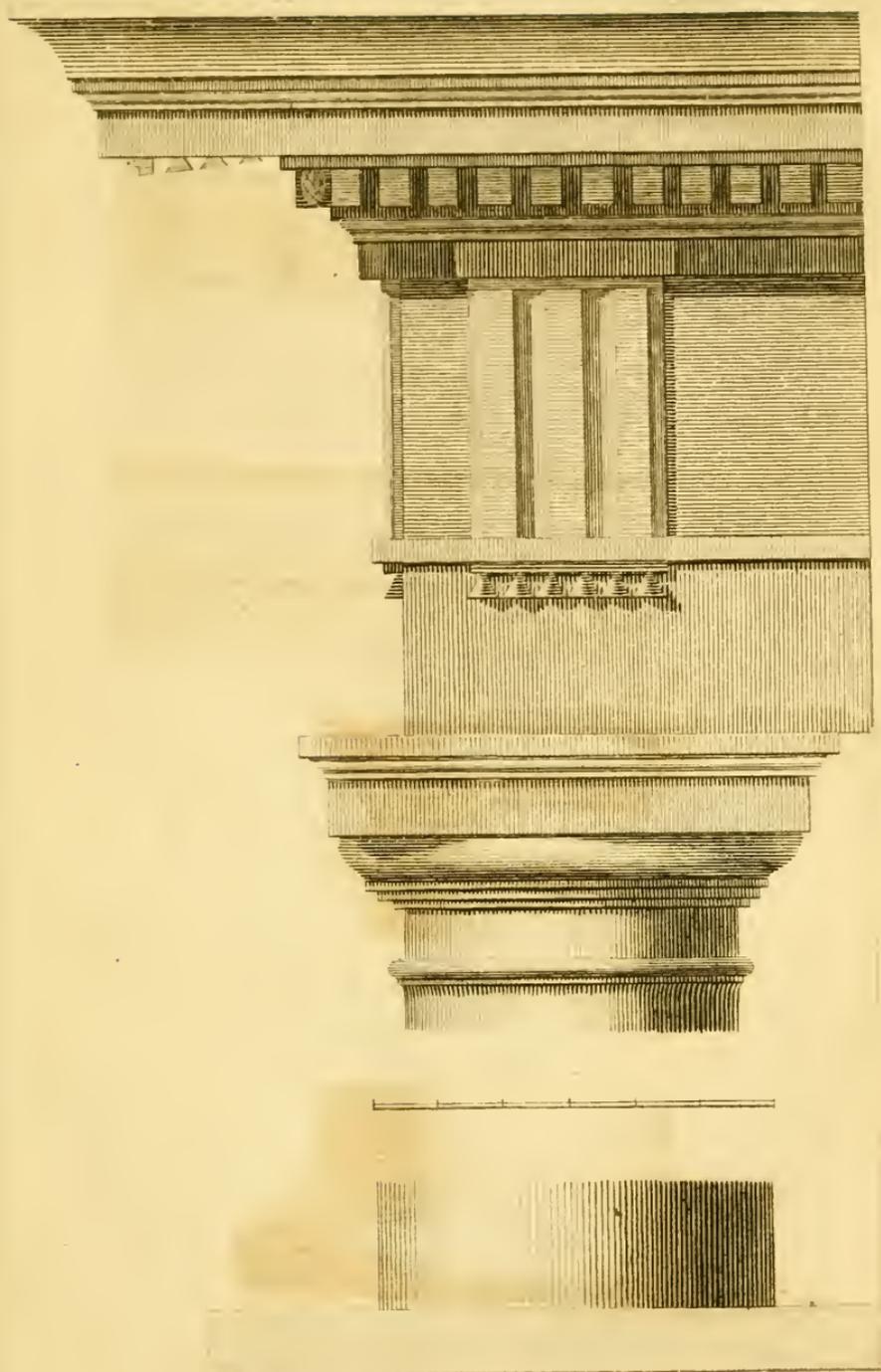
INTERCOLUMNIATIONS.



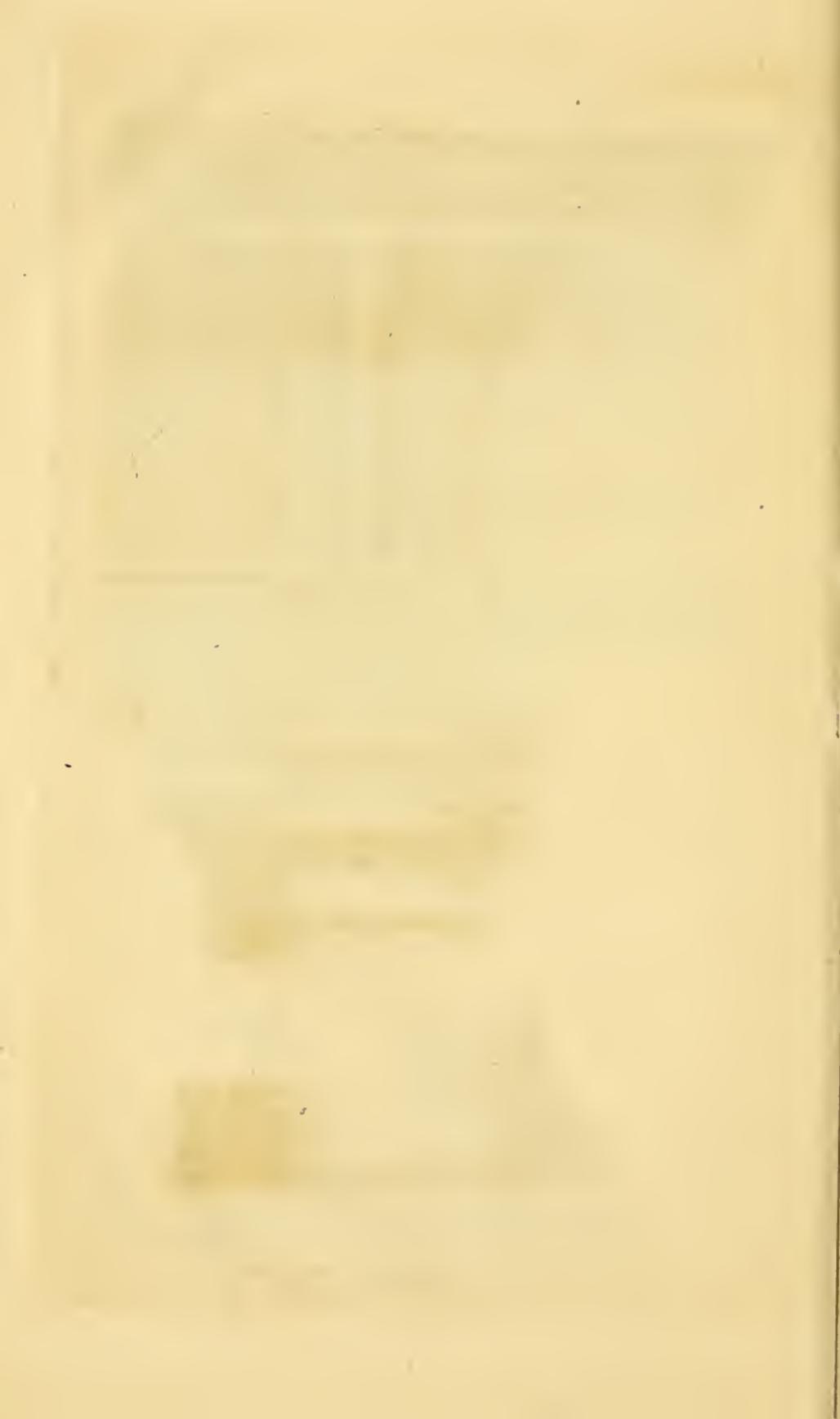




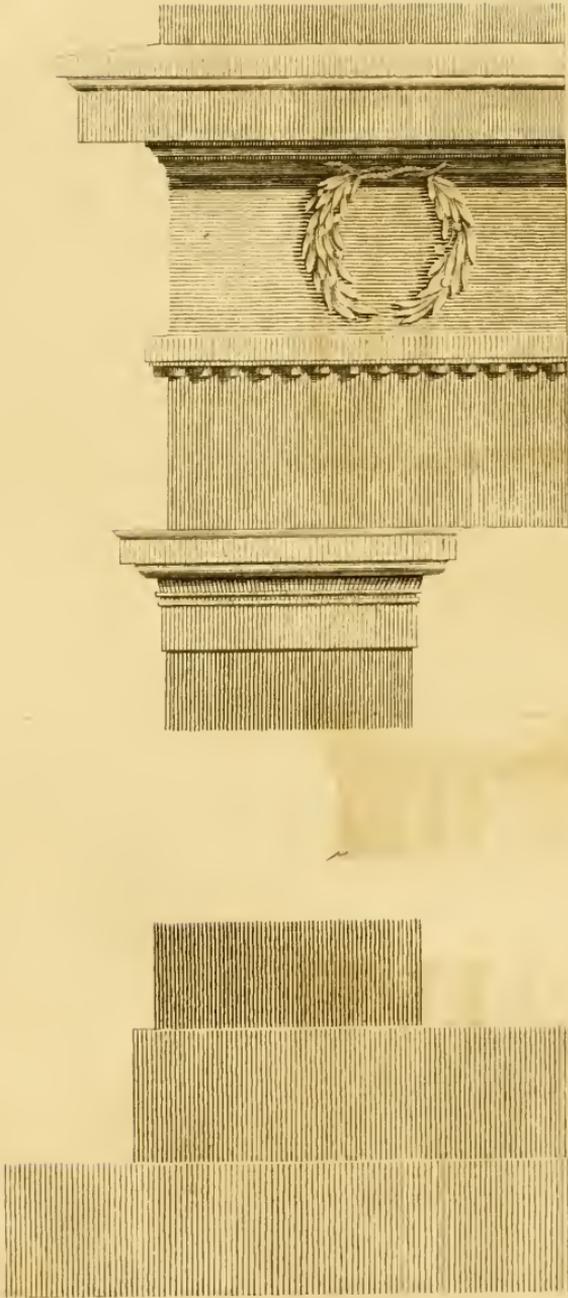
*TUSCAN ORDER.*



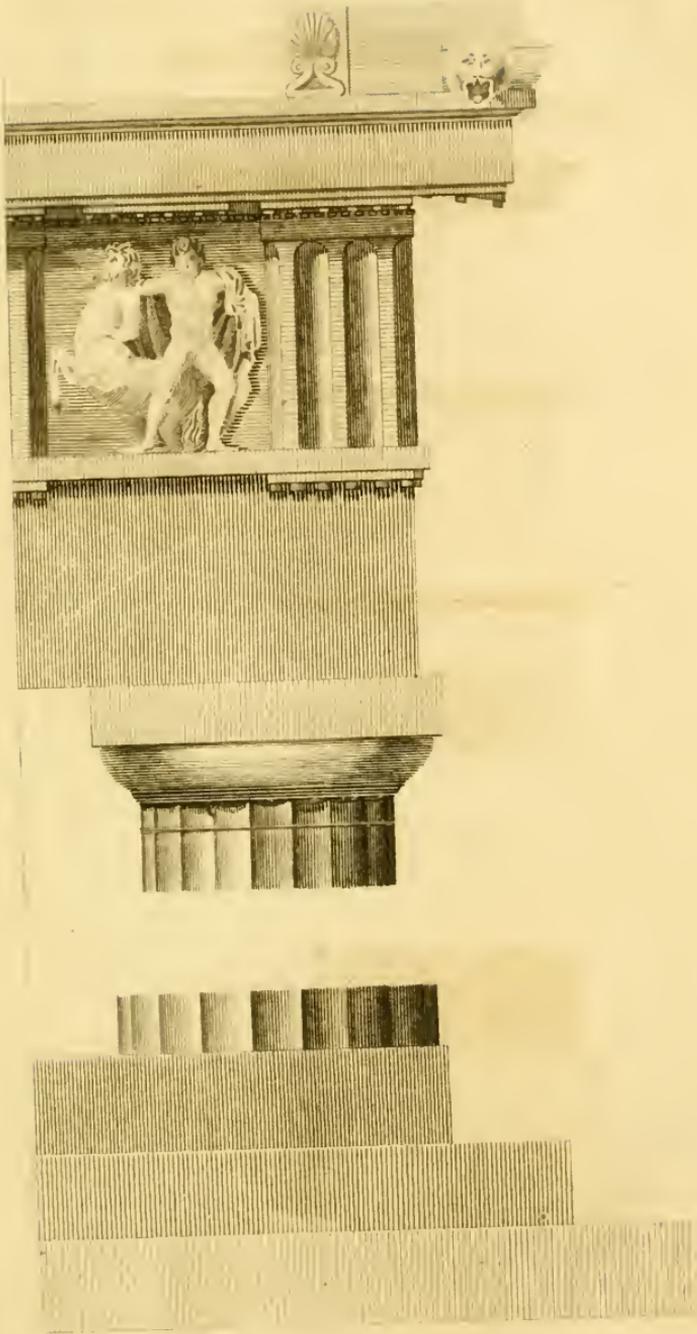
*DORIC ORDER.*







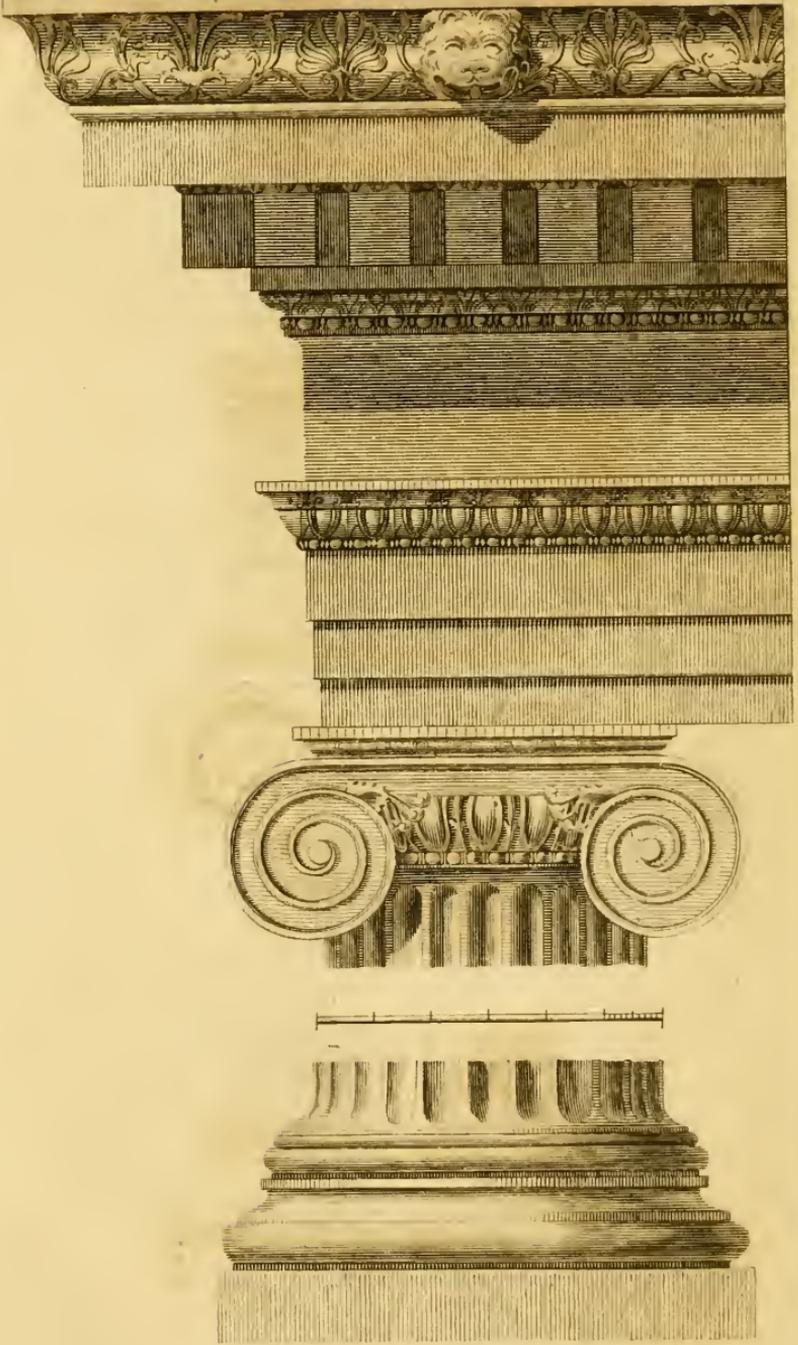
*DORIC ORDER.*



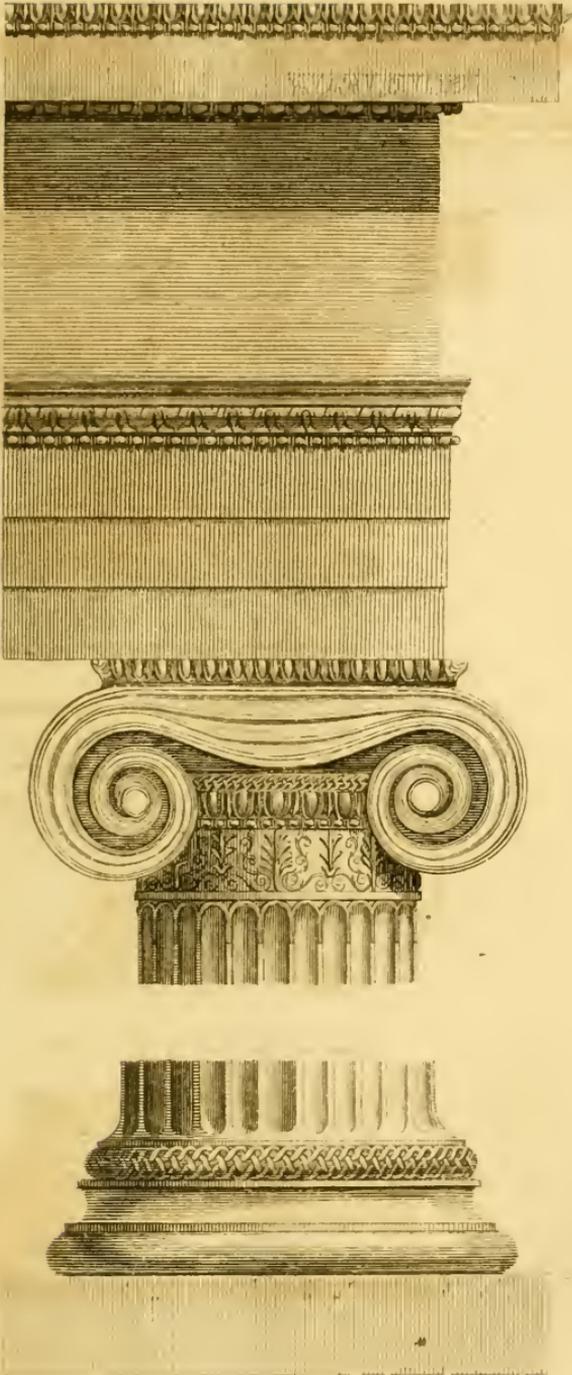
*DORIC ORDER.*



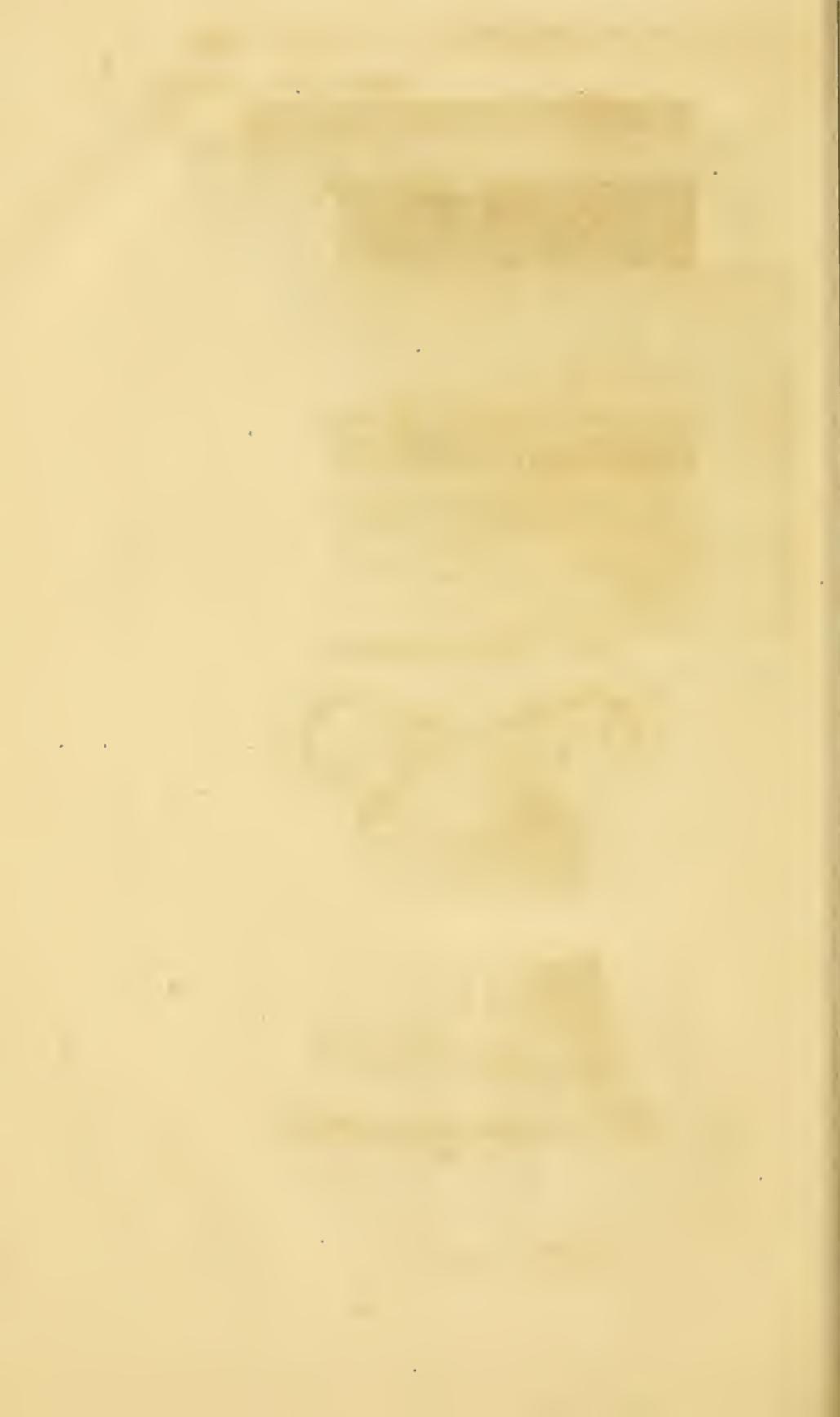




IONIC ORDER.



*IONIC ORDER.*



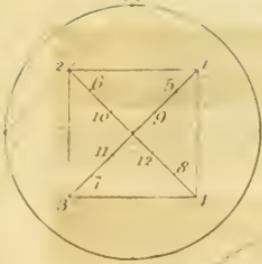




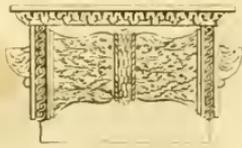
*IONIC ORDER.*

The IONIC VOLUTE.

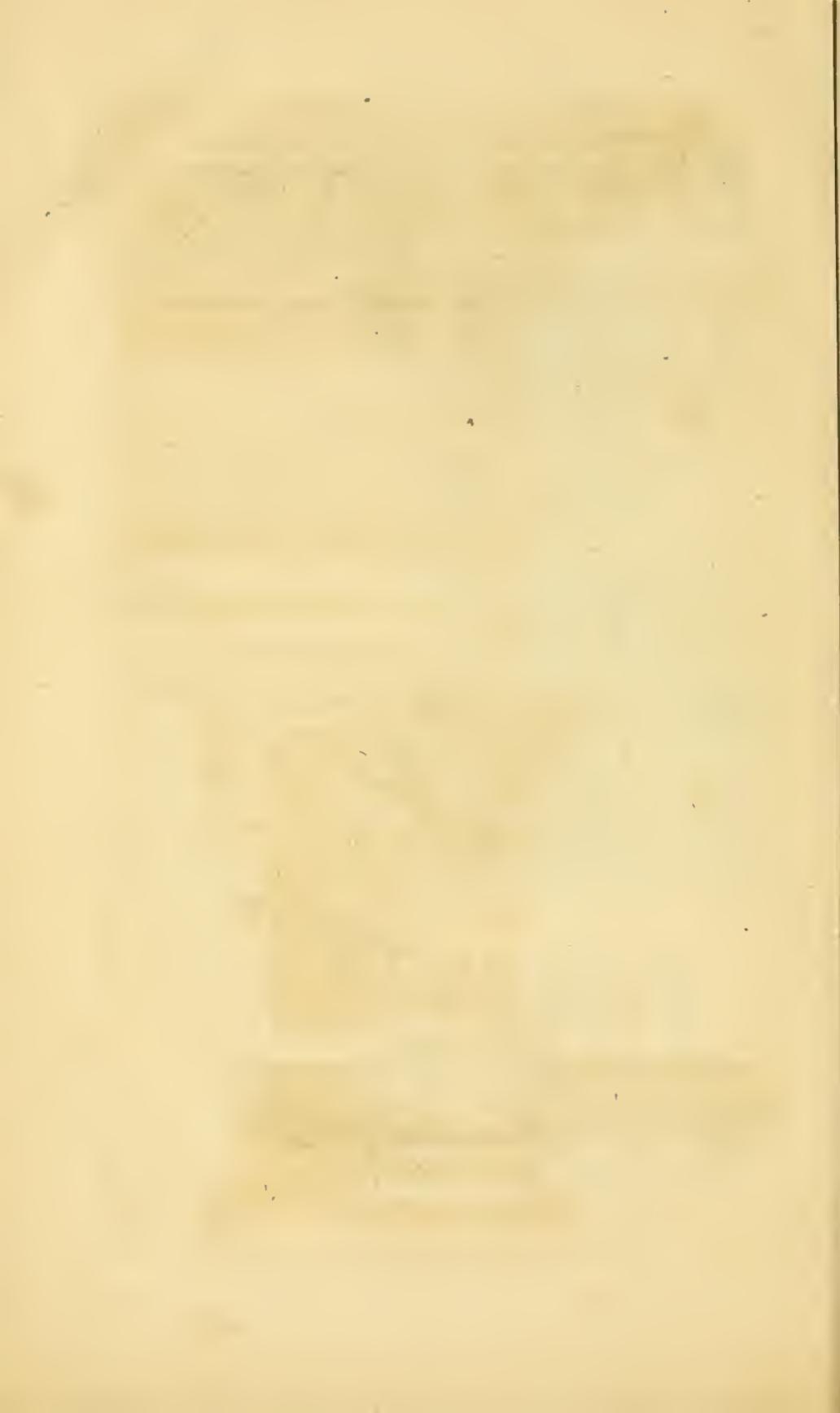
A

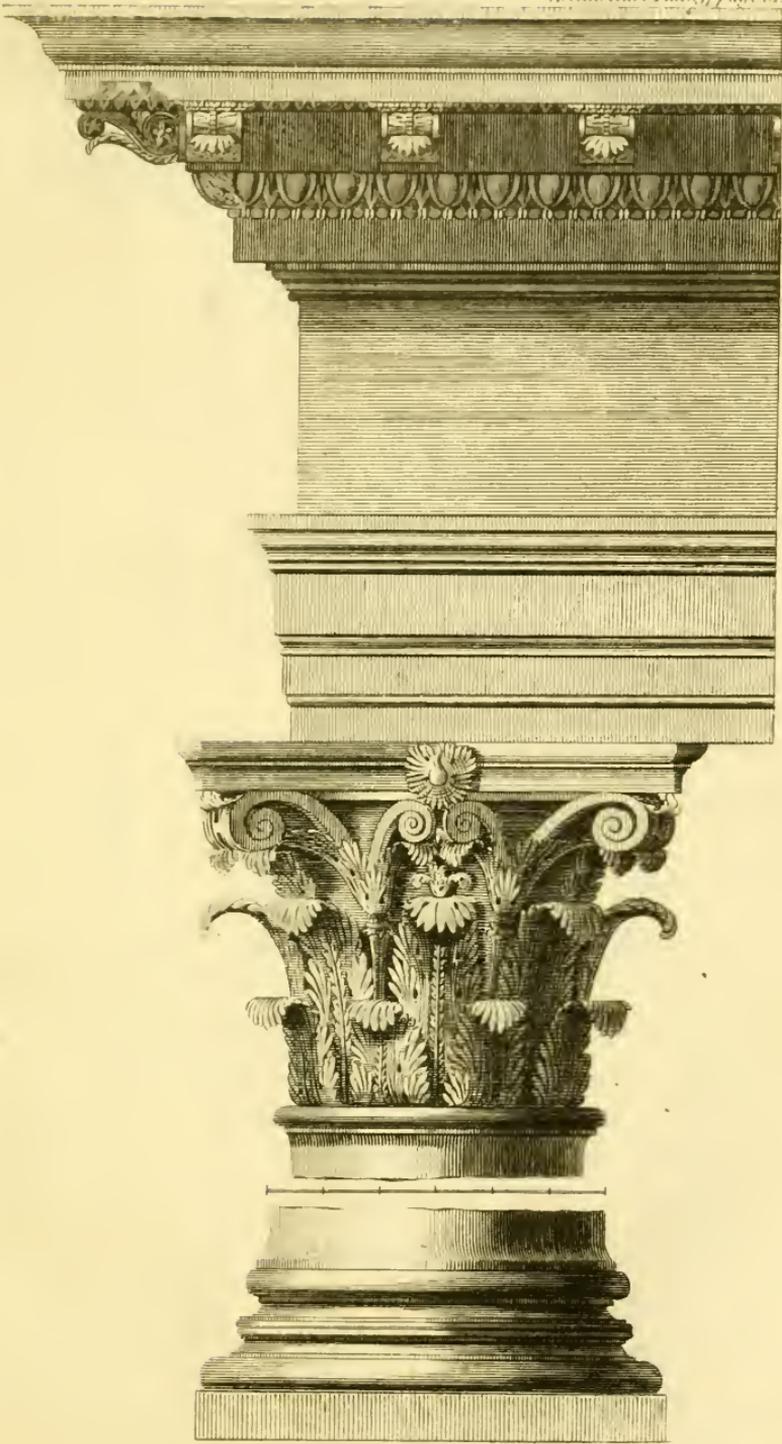


B

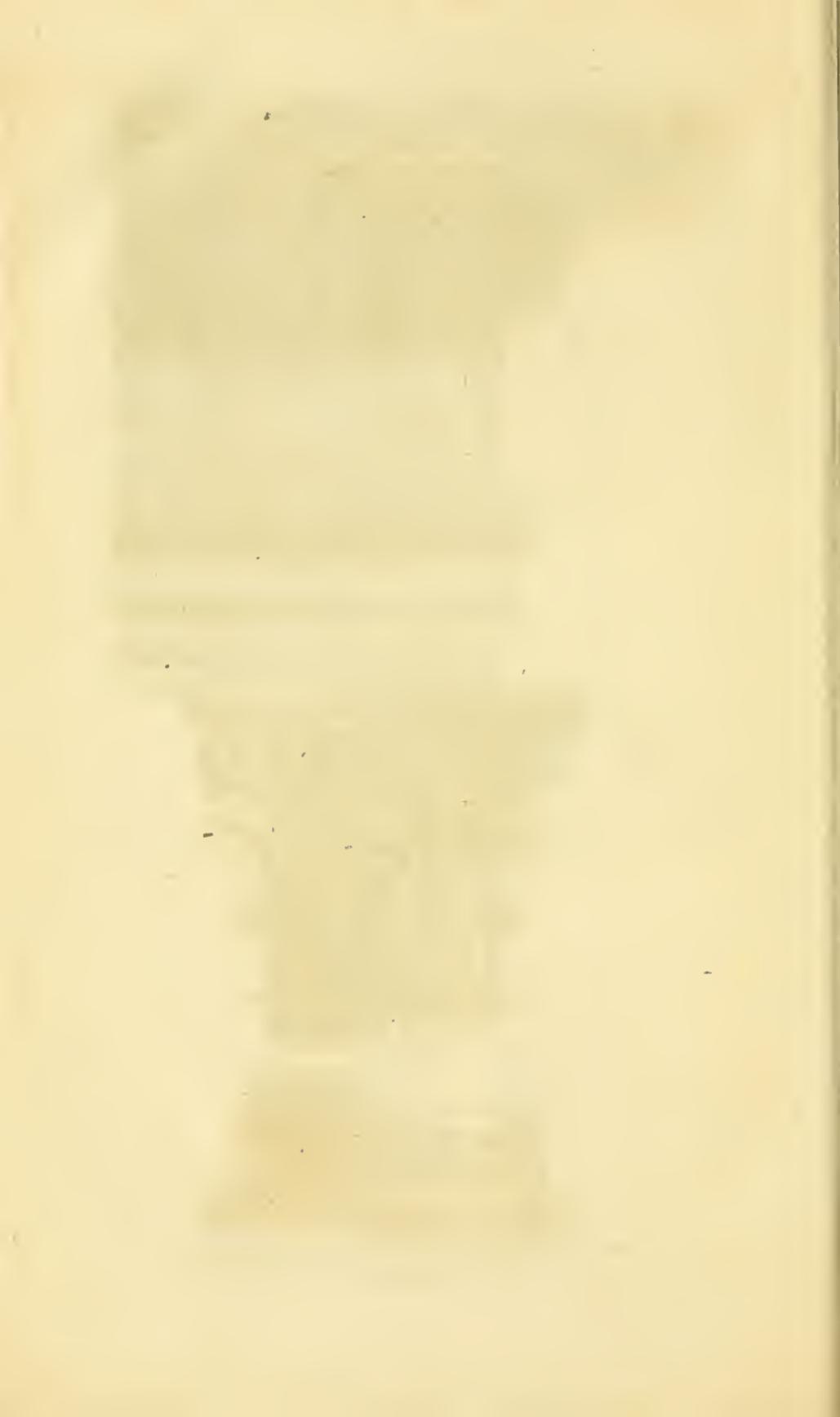


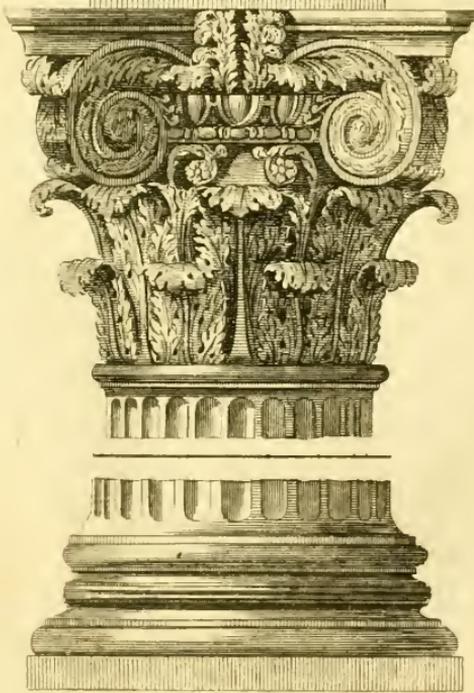
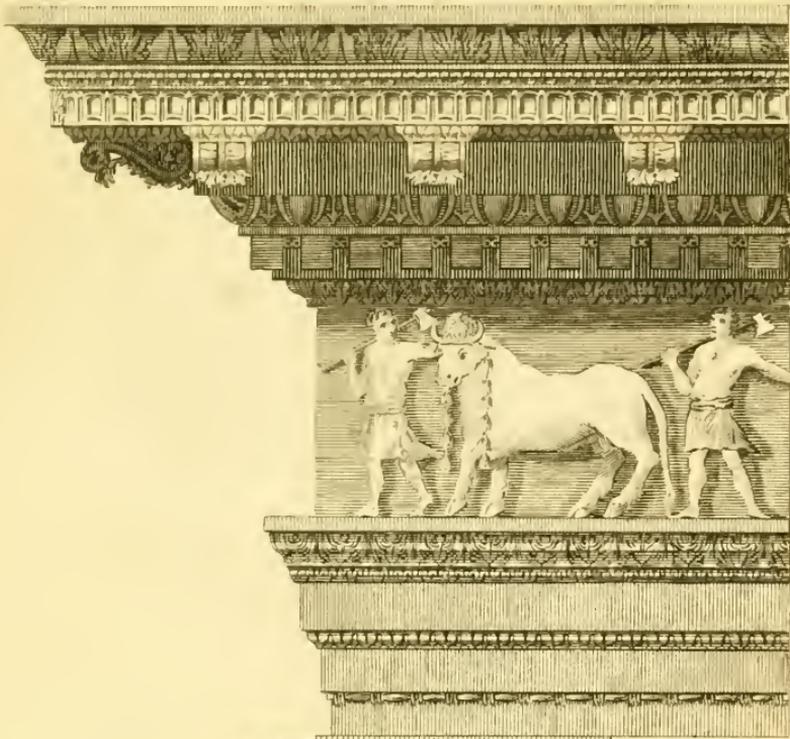
C



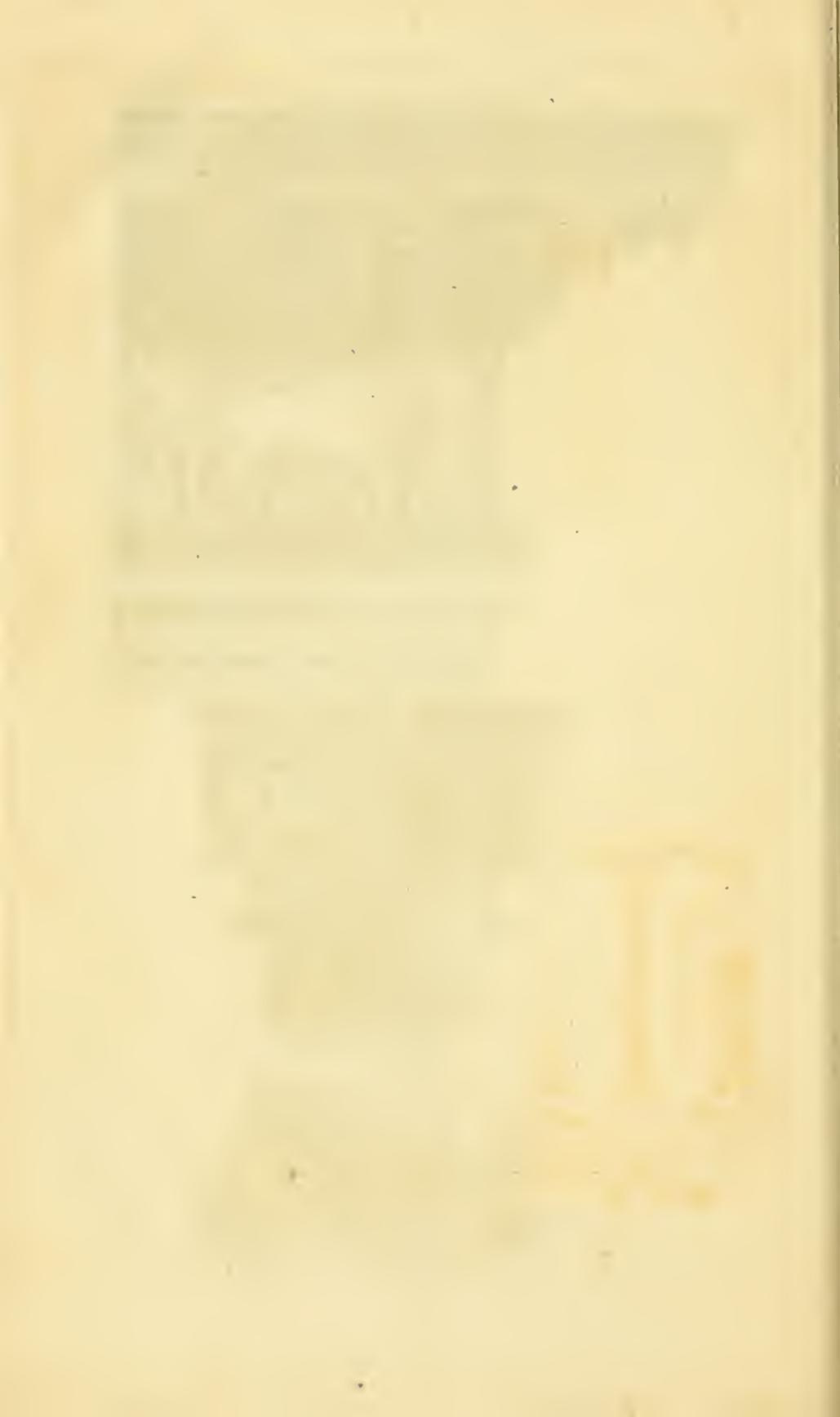


*CORINTHIAN ORDER*

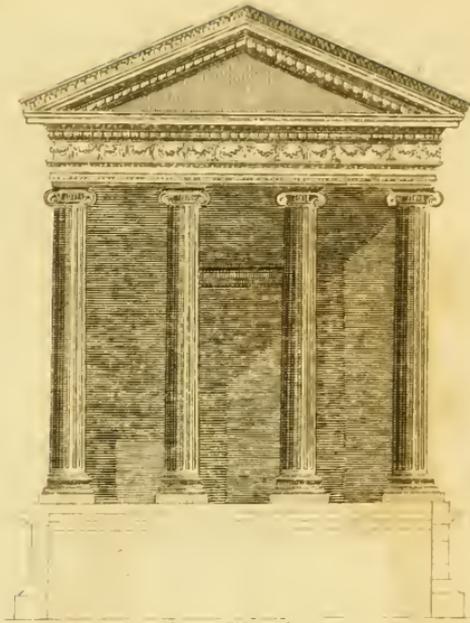




*COMPOSITE ORDER.*

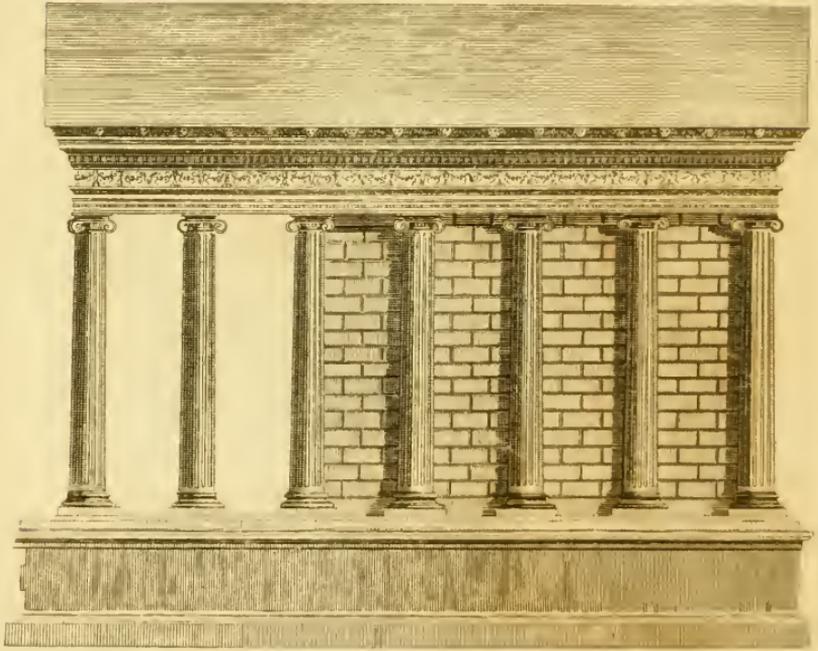




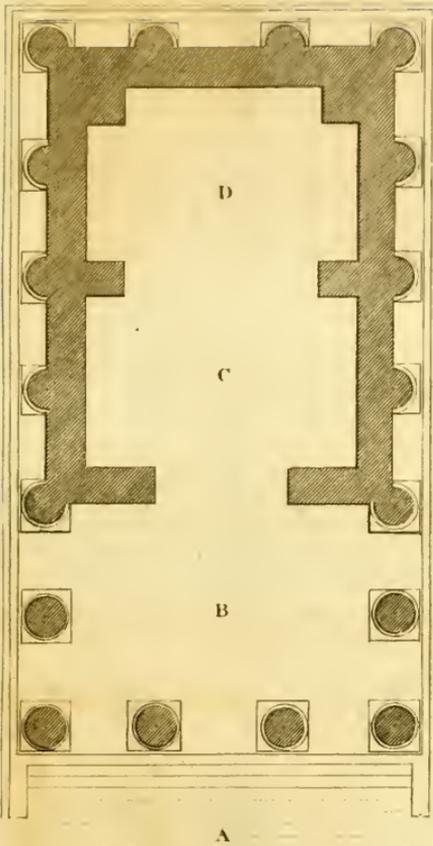


*Front Elevation.*

*Side Elevation.*



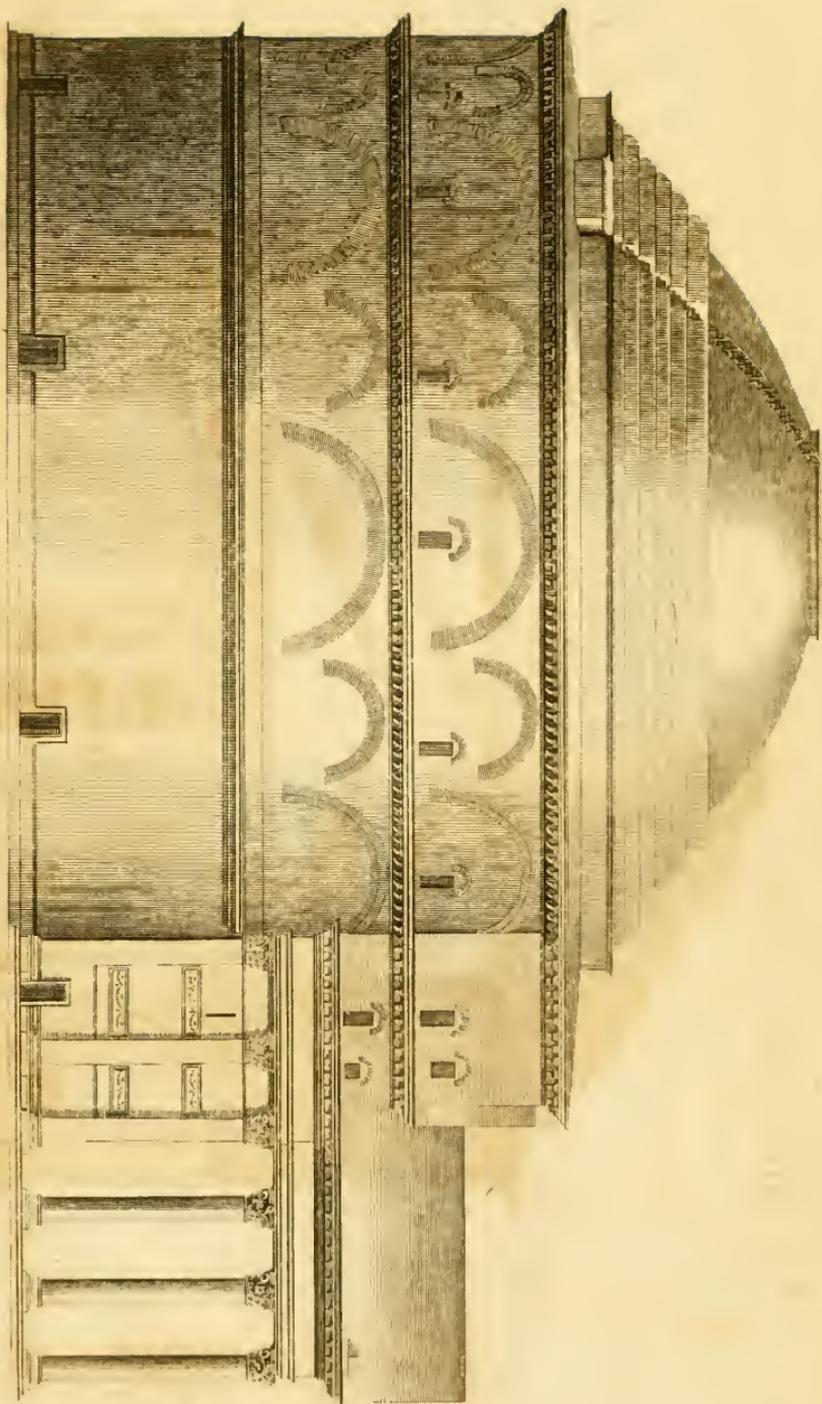
*TEMPLE of FORTUNA VIRILIS.*



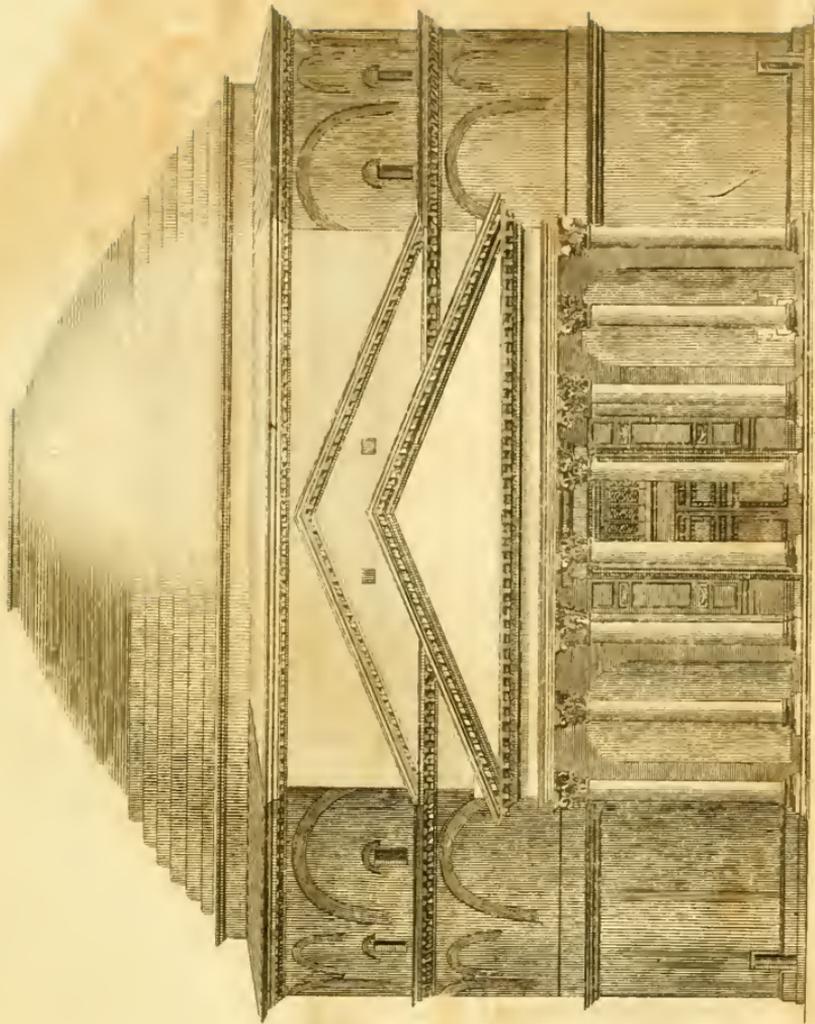
*Plan of the Temple of Fortuna Viridis.*







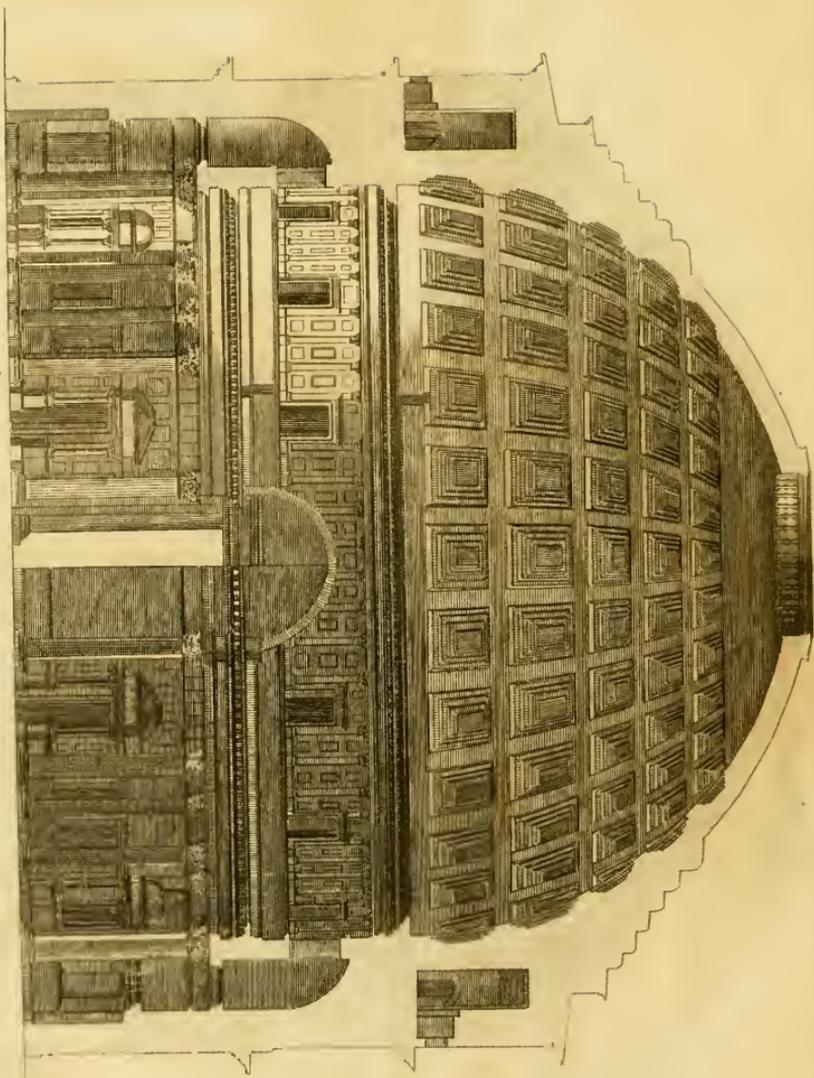
Side ELEVATION of the PANTHEON at Rome.



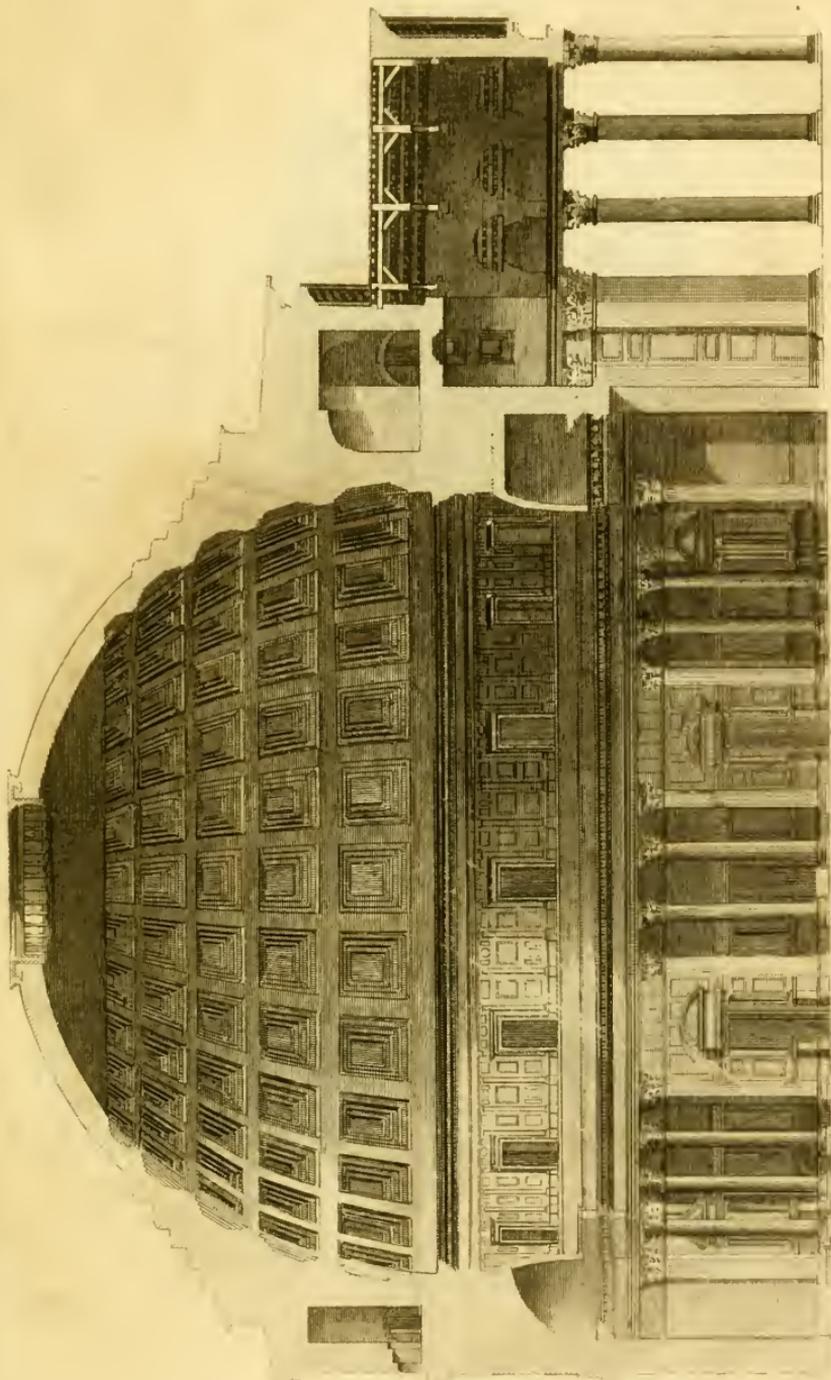
Front ELEVATION of the PANTHEON at Rome.





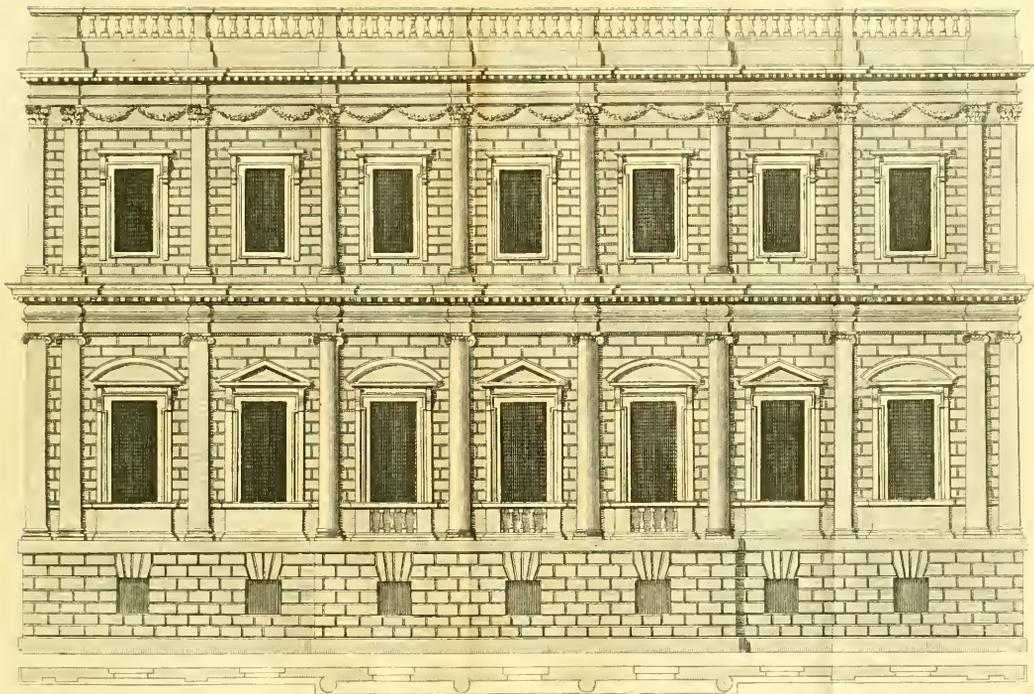


Section of the PANtheon at Rome seen in front.



Section of the PANTHEON, seen in flank.

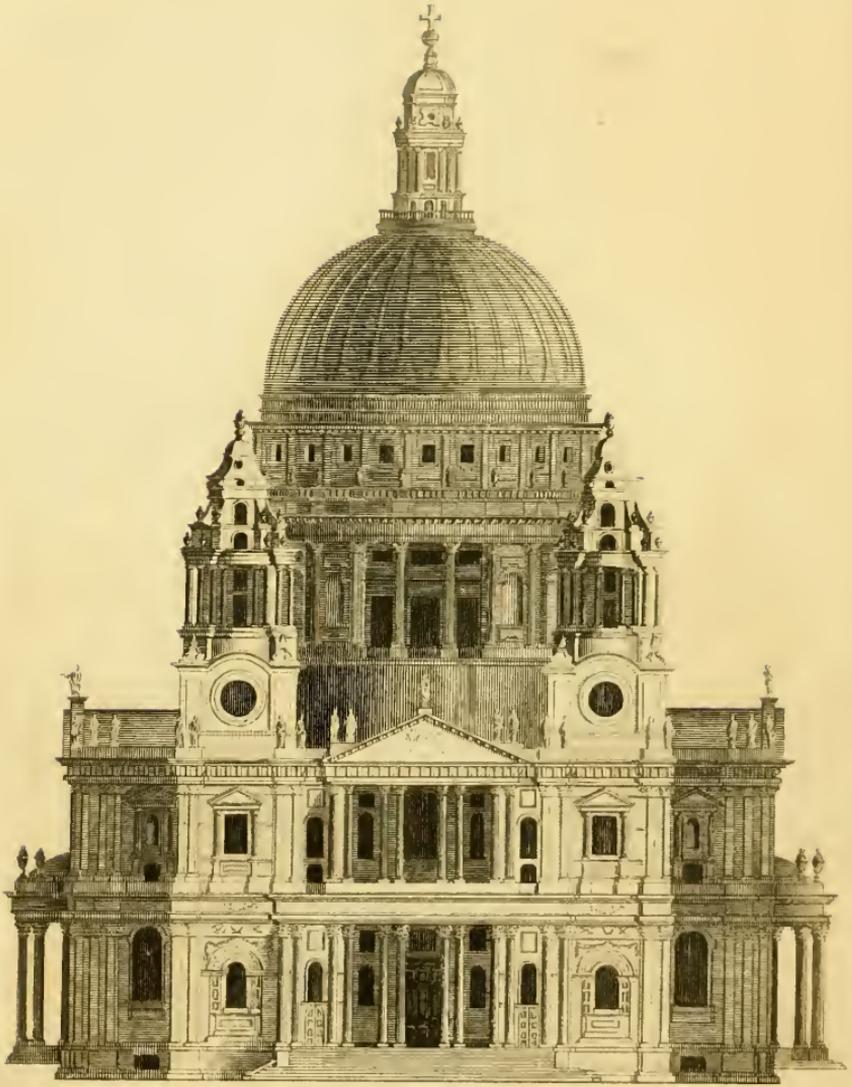




*The BANQUETING HOUSE, White Hall.*



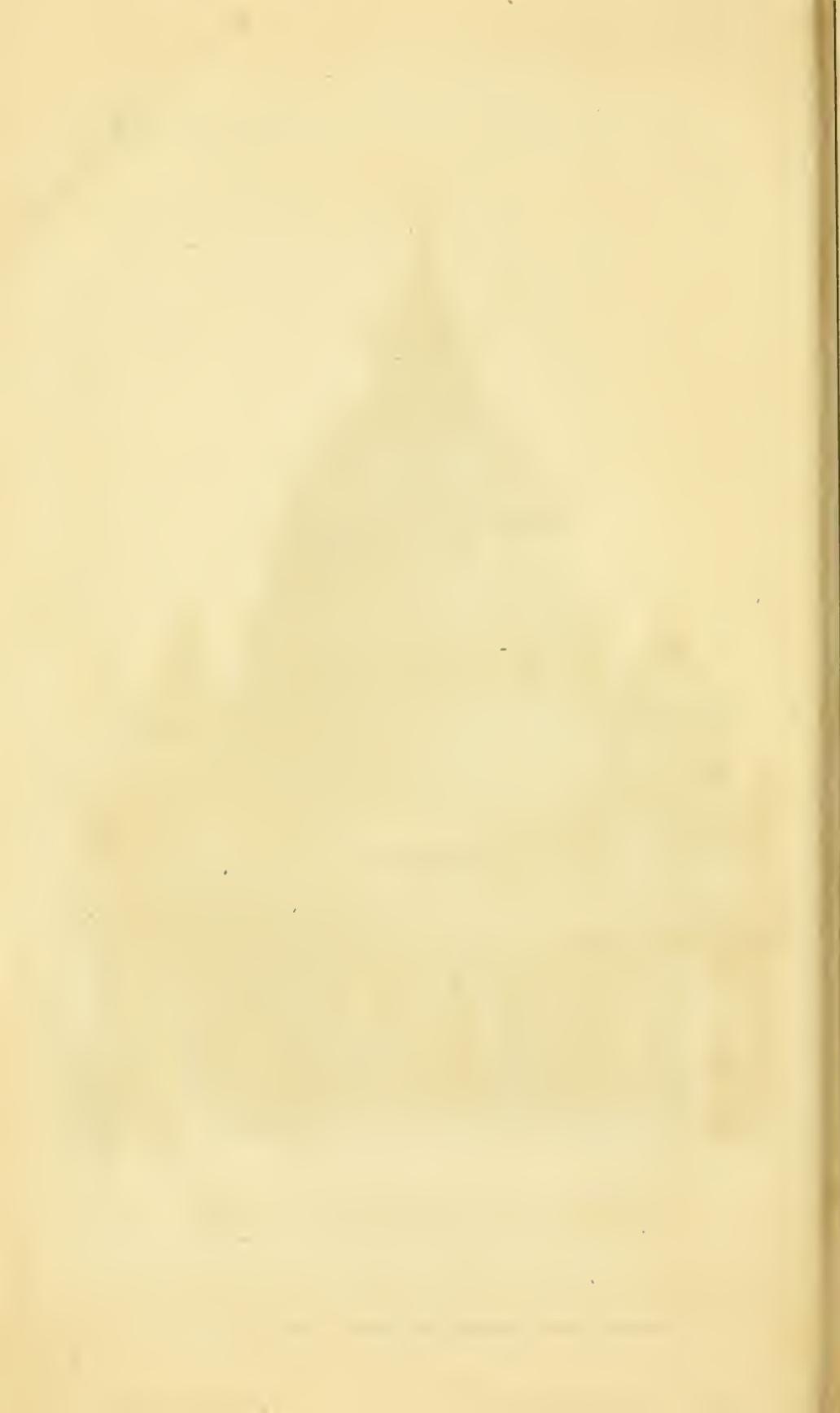




*FRONT of ST PAULS at LONDON.*



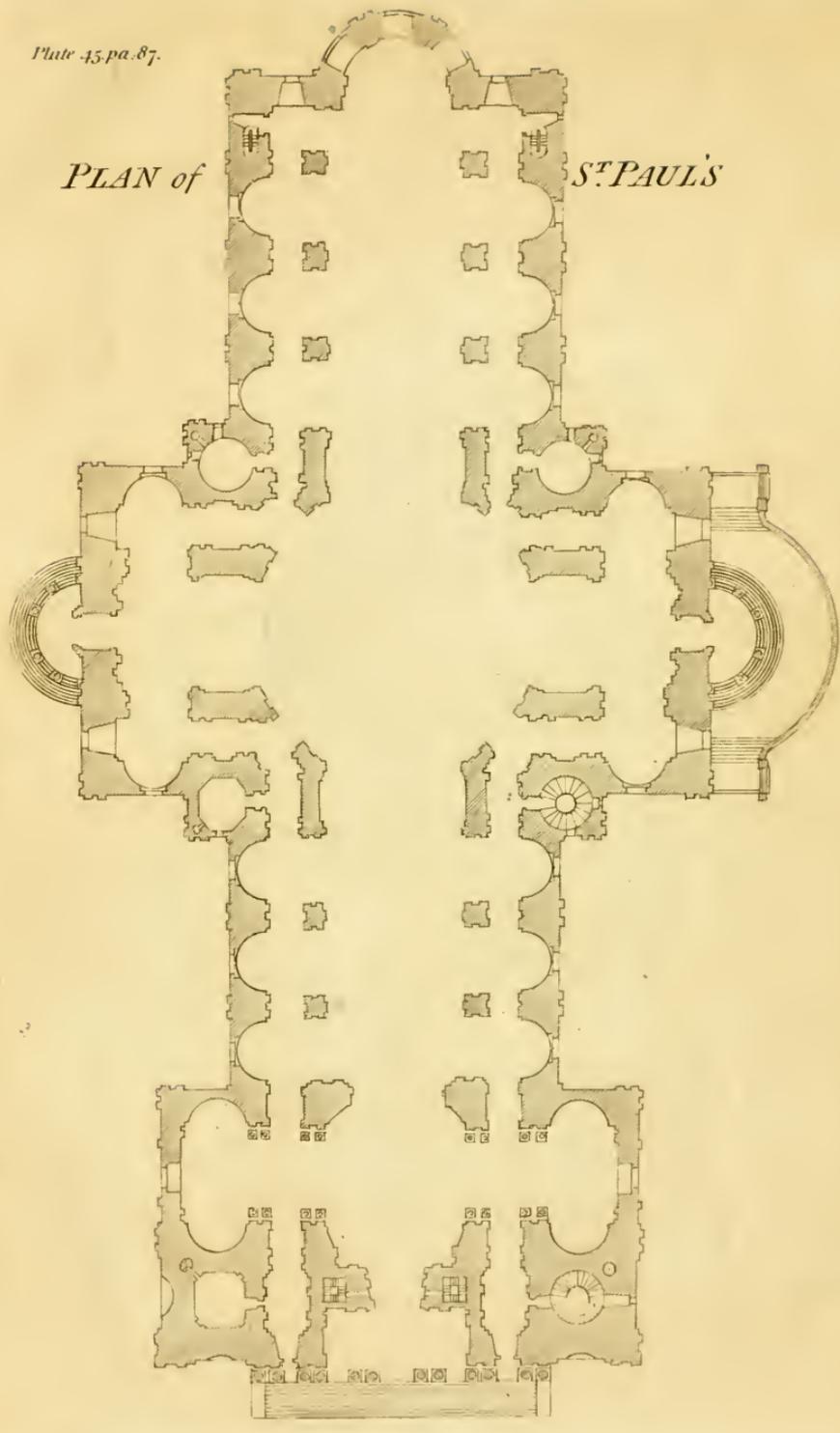
*FRONT of ST PETERS at ROME.*





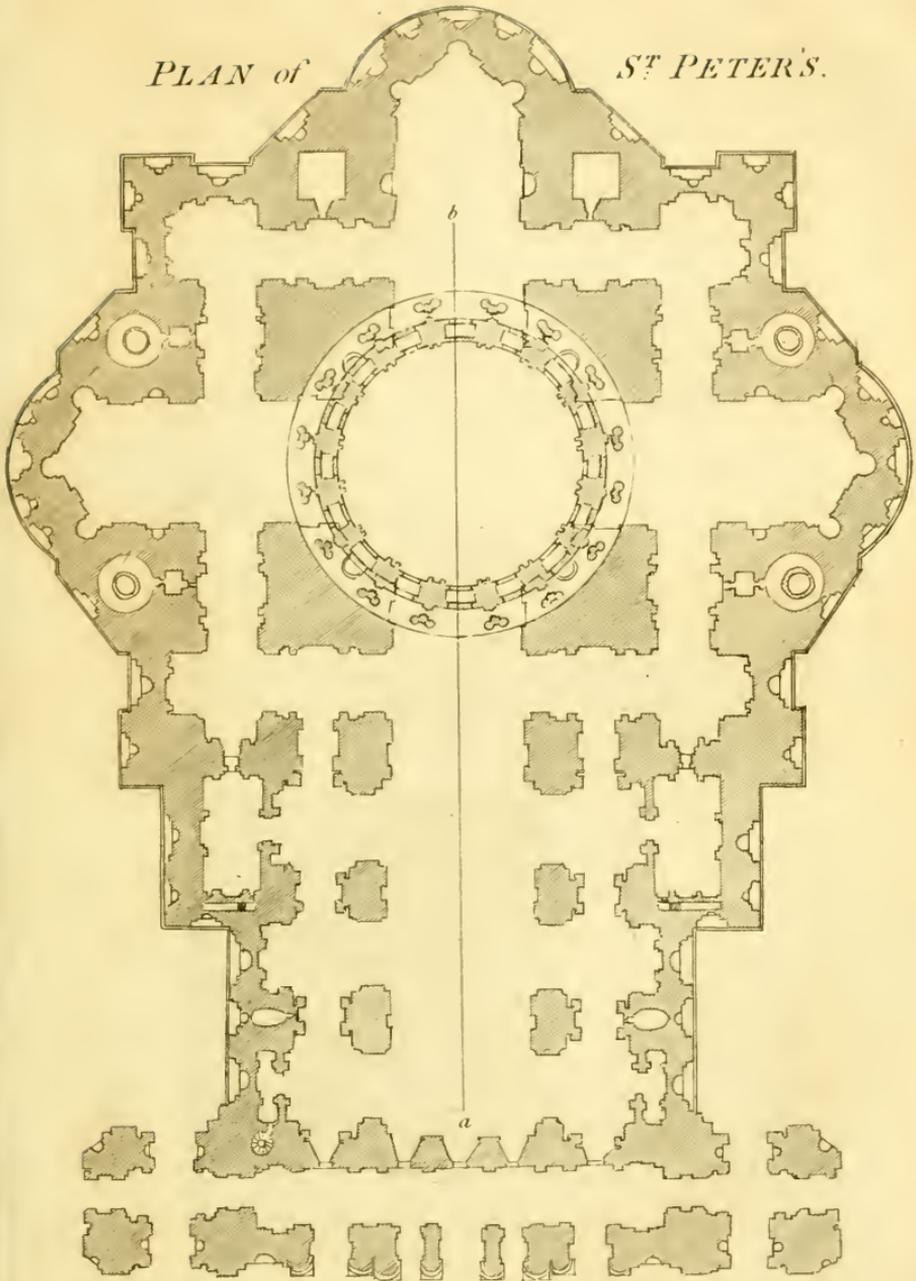
PLAN of

ST PAUL'S

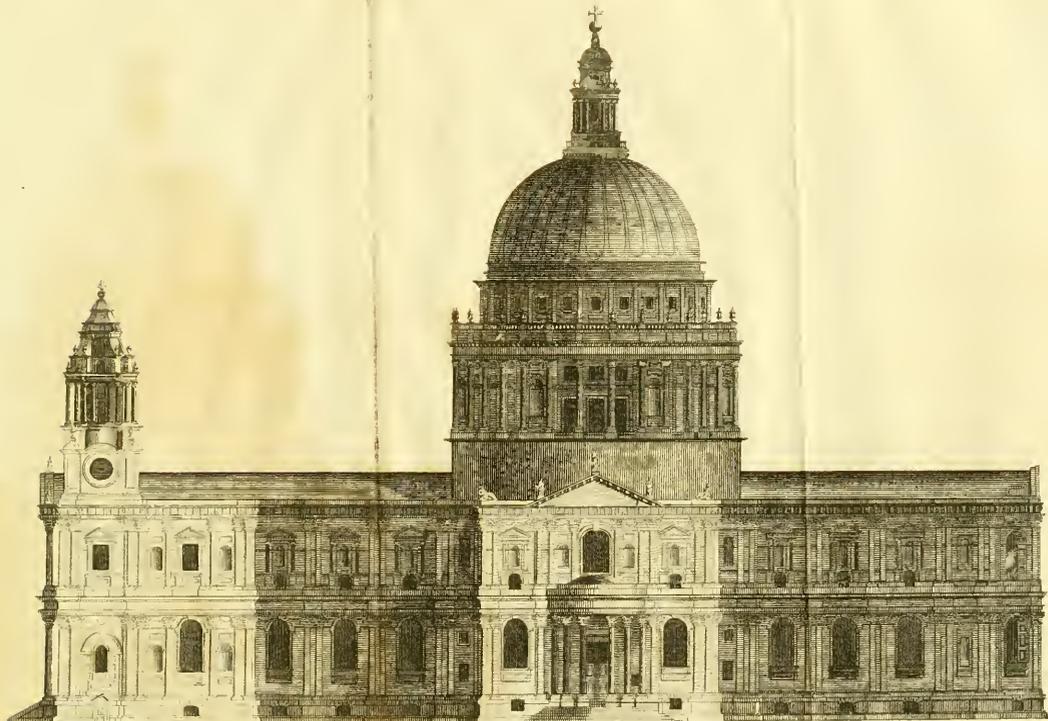


PLAN of

ST PETER'S.



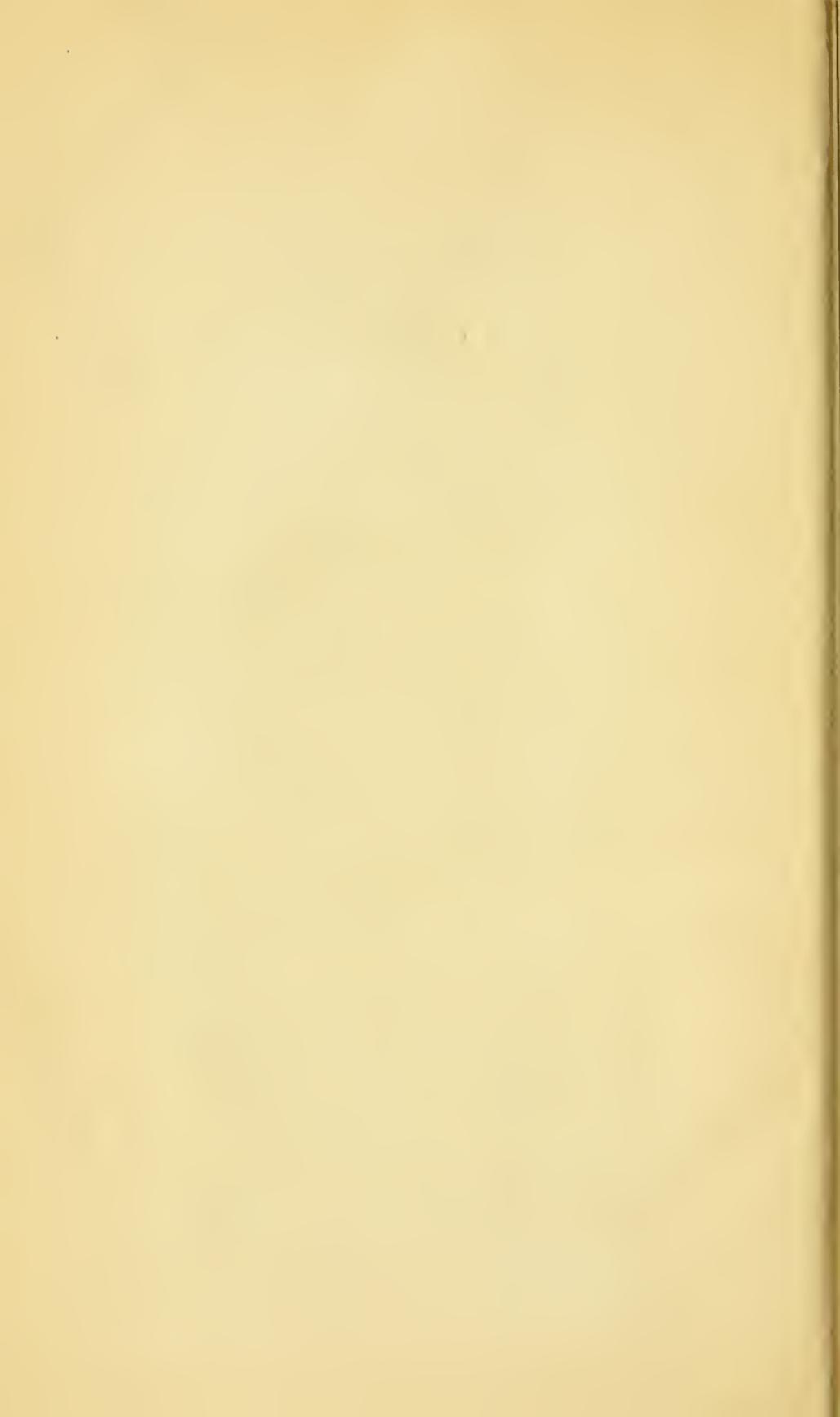




*SIDE ELEVATION of ST PAUL'S at LONDON.*











Sp Coll.

N31

A7

V.3

5841

