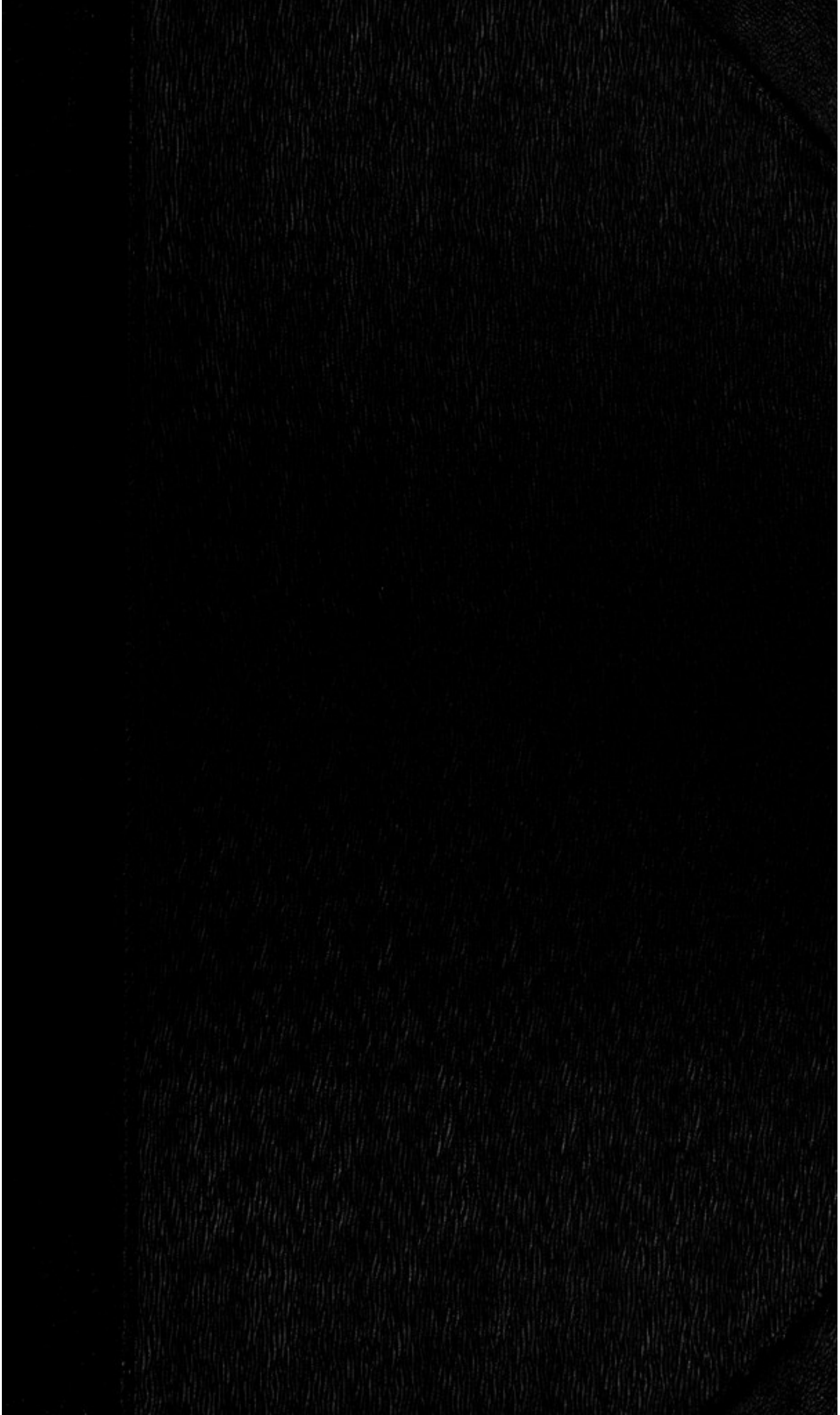
Medicine made to agree with the institutions of nature, or A new mechanical practice of physick ... / by Dav. Stephenson, M.A.



Advertiſement.

HAVING obtain'd his Majeſty's Letters Patent for ſome new Inventions and Improvements relating to Mechanicks, Hydraulicks, Navigation, Magneticks, *&c.* A ſummary Account and Abſtract whereof is contain'd in the following Propoſitions; if any Perſons deſire farther Information thereupon, or are willing to join in carrying the ſame into Execution, upon applying to the Author DAV. STEPHENSON, they may receive full Satisfaction, he having prepared proper Draughts and Models for demonſtrating the Truth thereof.

MECHANICKS.

1. Propoſition, contains a new Method, whereby Motion, Power and Force may be produced, either with ſolid or fluid Bodies, in a much greater Quantity, than can be done by any other Methods which human Art can invent. And how the Power and Force thus produced, may be applied for communicating Motion to all Sorts of Machines, either for raiſing Water, or overcoming any other Reſiſtance how great ſoever. The Solution of this capital Problem, which virtually comprehends the whole of practical Mechanicks, is demonſtrated by proper Draughts and Models thereunto relating.

2. Propoſition, exhibits a new Method for putting either great, ſolid or fluid Bodies into a circular Motion, whereby a great Power may be produced from the centrifugal projectile Force, which the ſaid Bodies will acquire upon becoming ſubject to this particular Law of Motion. And in what Manner the centrifugal Force thus produced, may be applied for working all Sorts of Engines; as is demonſtrated by Draughts and Models.

3. Propoſition, propoſes a new Method for diminiſhing Friction in Engines, by the Interpoſition and Preſſure of Fluids apply'd to ſuch Parts of the Engine, wherein the greateſt Friction and Reſiſtance to its Motion conſiſts; as is demonſtrated by Draughts and Models.

4. Propoſition, propoſes a new Method for collecting and applying the Force of Men, in a much greater Quantity, and more commodious Manner, (in ſuch wiſe that one Man ſhall be equivalent to two the common Way) either for working the Capſtane, Windlaſs, Crane, *&c.* whereby thoſe mechanical Organs and Engines will be rendered of more general Uſe; as is ſhewn by Draughts and Models.

5. Propoſition, contains divers new Methods for collecting and applying the Force of running Water, in a much greater Quantity, and more advantageous Manner, for communicating Motion to all Sorts of Engines. In the Solution of this capital Problem, ſundry new Machines are deſcribed, which may be applied either for raiſing Water, or producing any other Effects whatever, which Machines may be erected and worked upon all Parts of Rivers, Currents, Inlets, and Arms of the Sea; where no other Engines can be erected or work'd for want of a ſufficient Fall, Force and Current in the Water, which Machines having this Property of being erected and worked upon all Rivers, Currents, *&c.* where no other Engines can be erected or worked, will prove of univerſal infinite Uſe for the Improvement of all commercial mechanical Arts, Trades, with the Manufactures of all Commodities; as is ſhewn by Draughts and Models.

6. Propoſition, propoſes ſome new Methods for collecting and applying the Force of the Wind, in a greater Quantity, and more commodious Manner for communicating Motion to Engines, whereby they will be of more general Uſe; as is ſhewn by Draughts and Models.

7. Propoſition, propoſes a new Method for conſtructing the Pyrometer, for meaſuring the Fluxionary Increments and Decrements produced in the Dimenſions of Bodies by the different Degrees of Heat apply'd thereto; with its Uſe and Application for meaſuring the true Lengthning and ſhortning of the Pendulums of Clocks, and how to correct the Irregularities produced therefrom, whereby they will become fitted for meaſuring Time more equably, both by Land and Sea. The Uſe of this Inſtrument is farther exemplified, for ſetling a permanent immutable Standard-Meaſure for the Lengths, Capacities, and Weights of Bodies, which are all yet wanting; as is demonſtrated by Draughts.

8. Propoſition relates to a new Method for conſtructing the Barometer, Thermometer, and Hygrometer, with the Deſcription of a new Inſtrument for drawing Objects in Perſpective, upon all Sorts of Plains, *&c.* as is demonſtrated by Draughts and Models, *&c.*

HYDRAULICKS.

1. Propoſition, propoſes two new Methods for raiſing Water, the firſt is through ſtreight open Pipes inclined to the Horizon, in an Angle between ten and twenty Degrees. The ſecond Method is through ſpiral vertical Pipes. In both which Methods no Uſe is made of any Valves, Forcers or Piſtons, *&c.* grounded on the Laws and Principles of the centrifugal Force. By this Method Water may be rais'd in very great Quantities to ſmall or moderate Heights, which will render it greatly

greatly preferable to any other, for draining and recovering ſuch Lands as are overflowed and rendered Waſte by Inundation; as is demonſtrated by Draughts and Models.

2. Propoſition, propoſes divers new Engines for raiſing Water in great Quantities, and to any Heights, with leſs Expence of Time and Power, than any heretofore invented; which Engines may be work'd by any of the common auxiliary Powers, as Men, Horſes, Wind, Water, Fire, *&c.* beſides the new general Powers propos'd in the two firſt Propoſitions in Mechanicks. Theſe hydraulick Engines have one Property, beſides many others, whereby they are eſſentially differenced from all others, namely, that the Forcers operate upon the Water, with a continued circular Motion and Stroke, without Intermiſſion or Reverſion, whereby the Water is kept flowing in a conſtant uniform Stream in the Force-Pipes, without the Uſe of any Valves, which are one principal Imperfection in all modern Water-Works, whereas in all other hydraulick Engines the Forcers or Piſtons operate upon the Water by Strokes alternately revers'd, with a rectilinear Motion, which occaſions a Loſs of Power, Time, and Water; which is made to flow unequally, and per Saltum, through the Force-Pipes; as is demonſtrated by Draughts and Models.

3. Propoſition, propoſes a new Method for conſtructing of Fire-Engines, and applying a much greater Power thereto, and in a more commodious Manner; which ſame Principles will ſerve alſo for conſtructing Ventilators, *&c.* as is ſhewn by Draughts.

NAVIGATION *and* MAGNETICKS.

1. Propoſition, propoſes a new Method for conſtructing the Chain-Pump, Capſtane, and Windlaſs, and for applying the Power thereto in a much greater Quantity, and more advantageous Manner, whereby thoſe moſt neceſſary mechanical Organs and Engines will be rendered of more general Uſe in all Caſes, but more eſpecially on board Ships; as is demonſtrated by Draughts and Models.

2. Propoſition, contains a new Method for weighing the Anchors of Ships, in a more ſafe expeditious Manner, whereby the Cable will be much ſaved and relieved from the great Strains, ſhort ſudden Bendings, and other Accidents, by which it becomes quickly deſtroy'd; as is demonſtrated by Draughts and Models.

3. Propoſition, propoſes a new Method for conſtructing the Rudders of Ships, and for hanging and applying them in a more commodious Manner for communicating Motion to the Ship; as is exemplified by Draughts.

4. Propoſition, propoſes the Conſtruction of a new fluid Quadrant, for taking more exactly and readily the Altitudes and angular Diſtances of the Cœleſtial Bodies, by Night as well as Day, without requiring any viſible Horizon, Shade, *&c.* which Quadrant ſhews at one and the ſame Time and Obſervation, not only the Altitudes, but likewiſe the Azimuths and Amplitudes of the Objects obſerv'd, whether it be the Sun, Moon, fixt Stars, Planets, or Comets. As is demonſtrated by Draughts.

5. Propoſition, propoſes ſome new Methods grounded on the Principles of Opticks, for finding with the horizontal Needle, the true angular Inclination which the magnetick Meridian hath with the true Meridian, and thereby ſhew the true Variation of the magnetick Needle or Compaſs, which is a Point ſtill greatly wanted to the perfecting of Navigation. As is demonſtrated by Draughts and Models.

6. Propoſition, contains a farther Application of the ſame optical Principles, for finding with the Dipping Needle, the true Force and Direction of the magnetick Virtue, and thereby ſerve to perfect the Theory, and diſcover the true Direction, Properties and Laws of Magnetiſm. As is demonſtrated by Draughts and Models.

7. Propoſition, contains a farther Application of the ſame optical Principles, for improving the Compaſs, and rendering the ſame more exact for all Operations to be performed therewith, either for ſurveying by Land, or finding the true Way and Courſe of a Ship at Sea. And upon the ſame Principles it is propos'd, that the Azimuth Compaſs may likewiſe be improved, for finding more exactly the true Azimuth, and Amplitudes, of the Sun, and Stars. As is demonſtrated by Draughts, *&c.*

GEORGE *R.*

GEORGE the Second, by the Grace of GOD King of *Great-Britain*, *France* and *Ireland*, Defender of the Faith, *&c.* To all to whom theſe Preſents ſhall come, Greeting; Whereas Our Truſty and Well-beloved DAVID STEPHENSON, Maſter of Arts, hath humbly repreſented unto Us, that he hath with great Labour, Application and Expence compos'd a Book, in Folio, Entituled, (MEDICINE *made to agree with the* INSTITUTIONS *of* NATURE, *or a* NEW MECHANICAL PRACTICE *of* PHYSICK, *containing certain New and Infallible Methods, Principles and Machines, for Preſerving Health and Curing Diſeaſes)* He hath therefore humbly pray'd Us to grant him the ſaid *David Stephenſon* Our Royal Privilege and Licence, for the ſole Printing, Publiſhing, and Vending the ſaid Book, and likewiſe for the Making and Vending of all the ſeveral Machines, Inſtruments, and Apparatus thereunto belonging, for the Term of Fourteen Years. We being graciouſly inclin'd to give all due Encouragement to Works that may be of publick Uſe and Benefit, are pleaſed to condeſcend to his Requeſt; and do by theſe Preſents (as far as may be agreeable to the Statute in that Caſe made and provided) give and grant to the ſaid *David Stephenſon*, his Executors, Adminiſtrators and Aſſigns, Our Royal Privilege and Licence for the ſole Printing, Publiſhing and Vending the ſaid Book, and likewiſe for the Making and Vending of all the ſeveral Machines, Inſtruments and Apparatus thereunto belonging, for and during the Term of Fourteen Years to be computed from the Day of the Date hereof; ſtrictly forbidding all Our Subjects within Our Kingdoms and Dominions to reprint or abridge the ſaid Book, in the like or any other Size or Manner whatſoever; or to import, buy, vend, utter, or diſtribute, any Copies thereof, Reprinted beyond the Seas, or of any of the Machines thereunto belonging, during the aforeſaid Term of Fourteen Years, without the Conſent and Approbation of the ſaid *David Stephenſon*, His Heirs, Executors, Adminiſtrators, or Aſſigns, under their Hands and Seals, firſt had and obtain'd, as they will anſwer the contrary at their Peril: Whereof the Commiſſioners and other Officers of the Cuſtoms, the Maſter, Wardens and Company of *Stationers* are to take Notice, that due Obedience be render'd to this Our Pleaſure herein declared.

Given at Our Court at *Kenſington* the Thirty-firſt Day of *July* 1744, in the Eighteenth Year of Our Reign.

By His Majeſty's Command,

HOLLES NEWCASTLE.

N. B. This Book to be had only of the AUTHOR, at the Office of Ordnance in the Tower, *London.*

MEDICINE made to agree with the INSTITUTIONS of NATURE;

OR A

NEW MECHANICAL PRACTICE

OF

PHYSICK:

CONTAINING

Certain New Principles and Methods for *Preſerving Health*, and *Curing Diſeaſes*; grounded on the Eſtabliſhed Laws of NATURE, MOTION, and the ANIMAL OECONOMY: Wherein is given the *Solution*, *Demonſtration*, *Uſe*, and *Application* of that Capital and moſt Uſeful, but hitherto Unregarded and Unattempted

PROBLEM.

Shewing how to apply all the Mechanical Properties and Qualities of thoſe three Catholick Agents and Inſtruments of NATURE, namely, AIR, WATER, and MOTION; in all Degrees, Quantities, and Combinations, by proper Machines, either to the whole Human Body, or to any particular Region or Member thereof, and likewiſe to the Lungs, and Reſpiring Organs; by which three General Principles, together with Aliment, all the Intentions and Alterations neceſſary to be produced in the Animal Solids and Fluids, for Attaining Health, Long Life, and the Cure of Diſeaſes; will become effected in the moſt Perfect, Safe, Expeditious, Univerſal Manner.

The Mechanical Solution of this CATHOLICK PROBLEM, ſo much wanted, being of all others the moſt Uſeful, as comprehending the whole MATERIA MEDICA, with the whole PRACTICE of PHYSICK, in its utmoſt Extent and Perfection; is therefore propos'd as a Subject meriting the moſt ſerious Attention and Encouragement of the Publick, in order to bring the ſame to Perfection; but more eſpecially of all the Phyſicians in *Great Britain* and *Europe*, to whom it is humbly Addreſs'd and Referr'd, and who it's hoped will employ their joint Endeavours towards bringing the ſame into Practice, for the General Benefit of Mankind.

By DAV. STEPHENSON, M. A.

——— *Si quid Noviſti Rectius Iſtis,*
Candidus Imperte, ſi non, His Utere ——— HOR.

Sequamur NATURAM, *in* { CAUSIS SIMPLICEM, EFFECTIBUS MULTIPLICEM.

LONDON:

Printed by J. HART for the AUTHOR. MDCCXLIV.

PREFACE.

1. SIMPLICITY and UNIFORMITY are ever found to be the inſeparable Criterion and diſtinguiſhing Characteriſtick of TRUTH, in all the Productions both of NATURE and ART. Of this ſimple Procedure of Nature, we are furniſh'd with an admirable beautiful Inſtance, in the Caſe of the Centripetal Force, or the univerſal Attraction and Gravitation of Matter; by which one Simple Principle and General Law of Motion, acting in Conjunction with the Centrifugal Projectile Force, all the Phænomena relating to the Motions, Magnitudes, Diſtances, Denſities, Orbits, Velocities, Periodical Revolutions, *&c.* of the Planets, both Primary and Secondary, with the Comets, which compoſe this Solar Syſtem, are moſt exactly adjuſted and regulated. And we find moreover this great Principle and Law of Motion, the Attraction of Matter, extending its Dominion not only to the great inanimate Bodies within the Solar Syſtem, but likewiſe to the Animal, Vegetable, and Mineral Kingdoms; in ſuch wiſe that under the Influence of this ſame General Law of Attraction, conſider'd as acting under a particular Modification and Reſtriction, namely, the Attraction of Coheſion, all that relates to the Nutrition of the Solids, with the Secretion of the Fluids, in the Bodies of Animals and Vegetables, *&c.* are produced; the ſeveral Glands ſerving as ſo many Stomachs, Digeſtors, and Strainers, into which the Animal Fluids being diſcharg'd, having firſt undergone various Degrees of Tenuity and Velocity, in Circulating through the Arteries miniſtring to each Gland, which Arteries are more or leſs complicated and convolv'd, according to the Nature of the Fluids to be ſeparated therefrom. Which Fluids being emptied into the Pelvis or Baſon of each Gland, where having but a ſmall Degree of projectile Motion, whereupon the Law of Gravity or Attraction being more at Liberty, and coming to take Place, the ſeveral Particles become thereby ſeparated, ranged, and claſſed together, according to their ſimilar Natures, Gravities, and attractive Powers; and being thus form'd into diſtinct Specifick Fluids, are afterwards diſcharg'd out of the Glands by proper ſecretory Veſſels, which being imbued originally with their proper Liquor, attracts and receives (when in a natural healthful State) only ſuch Parts of the Fluids as are of a homogeneous ſimilar Nature and Texture therewith. We find moreover, that it is by this ſame Law of Attraction, that all the principal Proceſſes and Operations in Chemiſtry are produced, ſuch as Diſſolution, Fermentation, Precipitation, Cryſtalization, with the Solution of Bodies by Menſtruums, *&c.* Moreover by this ſame Principle it is that we are capable to explain and underſtand, by what Laws the Reflection and Refraction of the Rays of Light are effected; with what relates to the Nature of Colours, Opticks, Viſion, *&c.* And thus we find how ſimple frugal Nature applies this one general Cauſe and Law of Motion, the Attraction of Matter, conſider'd under different Circumſtances and Modes of Acting, to the Production of almoſt all the Operations and Effects, both in the animate and inanimate Syſtem of Things.

2. As we never obſerve in the Works of Nature, more Cauſes, Inſtruments or Powers made uſe of, than what are juſt neceſſary to produce the Effect, or attain the End propoſed; ſo True Philoſophy, conformable to this Precept of Nature, preſcribes the following General Rules for our Obſervance and Conduct in our Reſearches after Truth; namely, never to make uſe of more Powers, Cauſes or Inſtruments, to produce any Effect, or to account for any Phænomenon, or the Production, Symptoms, and Cure, of any Diſeaſe; when fewer, or one alone, is ſufficient and adequate to the Purpoſe. And never to make uſe of hypothetical, complex, remote, imaginary Cauſes or Principles, to explain any Appearance, Effect, or Diſeaſe; when the ſame can be done by Cauſes more ſimple, and ſuch as we know to be actually and really exiſting in Fact. And to begin to reaſon, *à poſteriori*, by proceeding from Effects and juſt Obſervations, to inveſtigate the Cauſes; and from the Symptoms, to diſcover the original Diſeaſe. Of this ſimple true Method of Philoſophizing, conformable to the Inſtitutions of Nature, we are furniſhed with a moſt beautiful ſucceſsful Specimen, in the Philoſophy and Aſtronomy of the famous Sir *Iſaac Newton*, wherein we find Him with incomparable Sagacity, by means of the foreſaid ſimple Principle and General Law of Motion, namely, the Power of Gravity or Attraction, properly applied, to have demonſtratively prov'd this to be the true original Cauſe and Spring by which all the Effects and Phænomena relating to the Theory of the celeſtial Motions are produced and govern'd; with what relates to the Doctrine of Light, Colours, Opticks, Viſion, Elaſticity, Animal Secretion, Nutrition, *&c.*

3. If now according to this great Exemplar and Model of Simplicity preſcrib'd to us by Nature, we proceed to compare the New or *Newtonian* Philoſophy and Aſtronomy, with that of the Antients, the very Simplicity of the former, as being grounded upon one obvious, ſelf-evident Principle, namely, the Attraction of Matter, apply'd under different Modes of Operating, is ſufficient alone to evince and eſtabliſh the Truth and Excellency thereof preferable to all other Syſtems whatever; as being all embarraſs'd more or leſs with many hypothetical, perplex'd, inexplicable

explicable Principles, that have no other Exiſtence, but in the warm pregnant Imagination of their ſeveral Authors and Patrons.

4. If now we proceed in like Manner to compare the preſent State of Phyſick with that of the Antients, obſerving to make Simplicity of Principles, the Rule and Standard-Meaſure, according to which we paſs Judgment thereupon, as in the foregoing Caſe, between the Old, and the New, or *Newtonian Philoſophy*; I'm afraid the Concluſion will come out different to what it did in the other Caſe; and that it will be found, that the Practice of Phyſick in the primitive Ages was more ſimple and pure, as being grounded on fewer and more ſimple Principles, and thoſe chiefly the Non-Naturals, and by which alone the Antients appear to have been fully as ſucceſsful in the Cure of Diſeaſes, as the Moderns, tho' aſſiſted with all the endleſs Train and Poſſe of Medicines, that can be furniſhed from the Animal, Vegetable and Foſſil Provinces. And if Simplicity of Principles be allow'd as the beſt Evidence and Criterion of Truth; however the modern State of Phyſick in reſpect to the Theory, may deſerve the Preference to that of the Antients; yet in regard to the Practice, the ſame appears to have departed greatly from the aforeſaid Standard Rule of Simplicity, as will become fully manifeſt upon examining into the modern Account and Catalogue of Diſeaſes, with their Cauſes, Remedies, and the *Materia Medica*, all which are become increas'd without Number, Bounds, or End.

5. As we find therefore not only the great inanimate Machine of the Solar Syſtem, but likewiſe moſt of the other Operations and Effects in the material World, to be all regulated and governed chiefly by this one ſimple general Principle and Law of Motion, the Power of Gravity, conſidered as operating under different Reſtrictions and Limitations; we may conclude for certain, that as Nature is ever uniform and conſiſtent in all her Works, that the Laws and Principles which ſhe hath laid down for Government of the Microcoſm, and for regulating the Movements of the living ſelf-moving Machine of Animals, are but few and ſimple likewiſe; from whence it muſt neceſſarily follow, that the diſtinct original ſpecifick Diſeaſes, which are only certain Perturbations and Irregularities in thoſe few fundamental Laws and Principles of the Animal Œconomy, are but few in Number, and produc'd but from a few ſimple general Cauſes only, and may be all cured by the like few ſimple general Remedies alſo; as I ſhall endeavour to demonſtrate in the following Eſſay. But ſhall firſt trace Phyſick back to its firſt Original, and conſider it in its native State, and ſhew what are the true Principles thereof.

6. Phyſick being one of thoſe Arts which the Law of Nature and Self-Preſervation hath render'd abſolutely neceſſary, is therefore in ſome meaſure communicated, known, and practiſed by all Mankind, the general Principles whereof being innate and congenite with the human Underſtanding; and conſequently the Practice thereof muſt have had its Beginning from the Time that human Nature became firſt ſubject to Diſeaſes; yet notwithſtanding this its great Antiquity, with the many Additions, Alterations and Improvements, which it hath acquir'd in revolving thro' ſo many ſucceſſive Ages, it is at this Time a general and real Complaint, and that among the beſt Phyſicians, that Phyſick is ſtill involved in great Uncertainty and comparative Obſcurity; for Proof whereof we need only refer to the almoſt infinite Number of Books that have been wrote relating both to the Theory and Practice of Phyſick, in all which, except what has been wrote by Drs. *Mead*, *Cheyne*, *Arbuthnot*, *Freind*, *Morgan*, and a few others, we meet with little elſe but perplex'd contradictory Theories, Hypotheſes and Opinions; and as to the Practice of Phyſick, there we may with juſt Wonder and Aſtoniſhment obſerve, the Regiſter and Catalogue of Diſeaſes, with their Cauſes and Remedies, or the *Materia Medica*, daily increaſing and multiplying beyond all poſſible Comprehenſion, to the utter Confuſion and Diſcredit of true Phyſick.

7. Providence, as has been obſerv'd above, hath communicated the Knowledge and Practice of Phyſick in ſome Degree to all Mankind, having for that Purpoſe ſtamp'd and impreſs'd certain general immutable Laws and Principles upon the whole Animal Creation, by which every Animal becomes inſtructed and prompted to the Uſe of certain general Means, as are neceſſary both to preſerve its Being in Life and Health, and to cure ſuch Diſeaſes as may happen thereto in the Courſe of its Exiſtence; this Poſition we muſt either allow for true, or deny the Providence of God, by ſuppoſing Him to create any Beings without providing them with what is neceſſary for their Support and Exiſtence, and inſtructing them alſo in general, how, in what Caſes, Quantities, Times, Seaſons, and other Circumſtances, they ought to uſe and apply them, for attaining the aforeſaid Ends. And upon this Principle is grounded that common proverbial Saying, That every Perſon at Forty, is either a Phyſician or Fool; plainly implying, that God hath put it in the Power of every Perſon, with uſing due Reflection and Attention to the general Rules and Means of Health, thus preſcrib'd by Nature and the Univerſal Reaſon common to Mankind, to become in a great Meaſure and for ordinary their own Phyſicians. And thus, for Example, we obſerve, that all Mankind being taught by the Law of Nature and Self-Preſervation, (as Brutes are by Inſtinct) as ſoon as they find themſelves arreſted with any Diſeaſe, do naturally, and of their own Accord, betake themſelves either to total Faſting and Abſtinence for a Time, or to a temperate, light, low Diet, and Regimen; and if they obſerve Nature indicating or inclining to get rid of the Diſtemper, either by Vomiting, Sweating, *&c.* to be ready to forward and promote her Intentions, which are always beſt effected by the moſt ſimple Means and Medicines. The due Obſervance of which plain, obvious General Rules, thus preſcrib'd and communicated to all Mankind by the Voice of Nature

and

and univerſal Reaſon, will always prove the true Aſylum and Sanctuary from the Purſuit and Attacks of every Diſeaſe; and if timely attended to, and diligently perſever'd in, will never fail to bring the Diſtemper to capitulate and ſurrender.

8. From what hath been ſaid it follows, That thoſe univerſal, immutable Laws, Principles, and Rules of Health, cœval and congenite with humane Nature, are the only original, perfect Plan and Foundation of true rational Phyſick, and by which as an infallible Touchſtone, and diſtinguiſhing Criterion, one may readily diſcover the Difference between the Practice of Phyſick that is natural, true and genuine, from what is falſe, ſpurious and corrupt; that being ever the pureſt and moſt perfect, which comes neareſt to, and agrees beſt with the original Plan and Syſtem of Inſtitutions ordain'd by Providence.

9. From what hath been before remark'd it likewiſe follows, That it is only from a rational Freedom of Inquiry and Reaſoning, grounded upon accurate Experiments and juſt Obſervations, join'd to a diligent Attention to, and proper Uſe and Application of thoſe general Means and Rules of Health, preſcrib'd to us by the Author of Nature, that we can expect to ſee Phyſick improv'd, and reſcued from its preſent State of Confuſion and ſceptical Empiriciſm, with the heavy Yoke of Bondage and Tyranny, to which it hath been long ſubject, through the Ignorance, Avarice and Artifice, of Quacks, and certain Dealers and Traders, both in the Galenical and Chemical Pharmacy.

10. Phyſick, like all other Profeſſions, Faculties and Arts, being ſubject to become corrupt, and to depart from its primitive Rectitude, through the Innovations and Craft of deſigning Men, ever prone and inclin'd to Novelty and Change. Whenſoever this happens to be the Caſe, there is but one Way to ſet them Right, and to come at the Truth again; and that is by bringing them back to their Original, and comparing them with the ſtandard, immutable Laws and Rules of Nature and univerſal Reaſon. In order then to diſcover what are the firſt true General Principles of Medicine or Phyſick, we muſt for that End trace it up to its firſt Source and Spring-Head, and compare it with the original Plan of Nature, the only great and beſt Phyſician, and for this Purpoſe we are to conſider what are the general Means and Principles ordain'd by God, as abſolutely neceſſary to the Continuance of animal Life; now theſe we ſhall find to be Aliment; Air; Elementary Fire or Heat; Motion or Exerciſe; with the Paſſions; which general Principles, according as they are regularly, or irregularly uſed and apply'd, are the true, original, univerſal Cauſes and Inſtruments of Animal Life, Health, and Diſeaſes; and as they are the true and proper Cauſes of all Diſeaſes; ſo by neceſſary Conſequence they muſt be the only true, proper Means and Remedies for the Cure of all Diſeaſes.

11. Taking the foreſaid General Principles to be deſigned by the Author of Nature as the only true *Materia Medica*, and original Plan of Phyſick, from which alone we are to ſeek the true Means for preſerving Health, and likewiſe the productive Cauſes of all Diſeaſes, with the true and proper Means and Remedies for Curing the ſame. Conformable whereunto, and in Imitation of this original, moſt perfect ſimple Plan, Exemplar and Model of Nature, I have attempted the Compoſition of this Treatiſe, containing a new Mechanical Practice of Phyſick, wherein I have reduced all the Means of Health, with the Cauſes and Remedies of all Diſeaſes (except ſuch as are hereditary and impreſs'd upon the firſt original Stamina of the Animal Machine) to Aliment, Water, Air, Elementary Fire, Motion, and the Paſſions; wherein I have deſcrib'd and demonſtrated by proper Draughts, *&c.* divers new Methods and Practices for applying the Mechanical Properties and Qualities of Air, Water, and Motion, by proper Machines to the humane Body, both univerſally, and partially, and likewiſe to the Lungs and reſpiring Organs; whereby all the Intentions, Alterations and Effects that either can, or are neceſſary to be produced in the Animal Solids and Fluids, either for Preſerving Health, or for the Cure of all Diſeaſes, will become effected in the moſt perfect, ſafe, certain, expeditious, univerſal Manner. In conſequence of which new Methods, the whole *Materia Medica* and Practice of Phyſick will become reduced to the foreſaid Catholick Principles and Remedies of Nature's Appointment, and reſcued from the unjuſt Uſurpations and Innovations of the Ignorant and Crafty, who inſtead of following the plain, ſimple, obvious Rules of Nature, are ever holding forth falſe Lights, and endeavouring to impoſe upon Mankind perplex'd imaginary Syſtems of their own Invention; by which Methods the Practice of Phyſick is now fallen into the greateſt comparative Confuſion, Diſcredit and Diſhonour.

12. But here I think it neceſſary, before I proceed further, to remove what appears to me to be an ill-grounded erroneous Opinion, that ſeems to have prevail'd of late; and this the rather, inaſmuch as it ſeems greatly to countenance and give riſe to ſeveral Practices of the moſt pernicious Conſequence, and which naturally tend to ſap and undermine the very Foundation of all true Rational Phyſick; and that is relating to the original Generation and Production of Diſeaſes, with reſpect to which ſome Phyſicians as well as Philoſophers ſeem to give into the Opinion, that Diſeaſes ſpecifically new are daily ſpringing up, that were never known or had any Exiſtence before; but this I think a very abſurd and unphiloſophical Opinion, for this very evident Reaſon, That allowing this Opinion to be True, the preſent eſtabliſh'd Order of Nature and Second Cauſes muſt be thereupon ſubject to perpetual Alteration; for if we allow the Bodies of Men to be ſpecifically the ſame now, as in former Ages; abating for particular Circumſtances and

Accidents, they muſt be equally liable to the ſame ſpecifick Diſeaſes at one Time as another, ſuppoſing the Preſence and Agency of the ſame productive Cauſes; but as we have no Reaſon to think that either the Bodies of Men, or any other Part of Nature, or Second Cauſes, have undergone any eſſential Alteration from what they were in paſt Ages, conſequently whatever Diſeaſes we find them ſubject to at one Time, we may conclude they were equally liable to be attack'd and arreſted by the very ſame Diſtempers at any other Period of Time, ſuppoſing the Preſence and Influence of the ſame productive Cauſes. Indeed I allow, that as one Age or Period of Time may differ greatly from another in Point of Virtue, Induſtry, and Temperance; ſo the Bodies of Men with their Offspring and Children, will be found to differ greatly alſo, in one Age and Period of Time from another. Thus in an Age of Temperance, Sobriety, and Induſtry, the Bodies of Men with thoſe of their Progeny will be more healthful, ſtronger, and fitter for all Kinds of Labour and Martial Exerciſe; whereas in an Age of Luxury, Intemperance and Idleneſs, (too much the prevailing Vices of the preſent Times) they will become neceſſarily more unhealthful, relax'd, weak, and effeminate; which morbid Conſtitutional Imperfections will become intail'd by Hereditary Right upon their Poſterity. Likewiſe in an Age of Temperance and Induſtry, Diſeaſes will appear leſs frequent, and not ſo rife, violent, and fatal, as in an Age of Intemperance and Diſſoluteneſs: But all this while there is not the leaſt Room or Ground to conclude from thence, that any Diſeaſe ſpecifically New has been at all introduced, by reaſon the Bodies of Men, which are the material Subject, Cauſe, Subſtratum, and Seminium of all Diſeaſes whatever, are eſſentially the ſame at all Times, and the productive Cauſes of all Diſeaſes are alſo eſſentially the ſame, no Part of Nature or Second Cauſes being at all eſſentially chang'd. So that the Diſeaſes of one Age, Seaſon, or Period of Time, can only differ circumſtantially and accidentally from thoſe of any other Age, Seaſon, or Period of Time; that is, in reſpect of their Frequency, Malignity, Rifeneſs, Violence, Univerſality, Mortality, *&c.* And from this Conſideration it appears how extremely trifling and vain it is for to diſpute and argue about the firſt Original Appearance of any Diſeaſes, as hath been done of late with much Contention and Warmth by ſome otherwiſe learned Authors, as in the Caſe of the Venereal Diſeaſe, *&c.* Foraſmuch as this and all other Diſtempers may date their Exiſtence from the ſame Era and Epocha of Time, being all virtually, potentially, and ſeminally, tho' not actually, coexiſting *ab Initio*. From whence may be drawn the following practical Concluſion and Rule, That as the Diſeaſes incident to Mankind are ſpecifically the ſame in all Ages and Seaſons, excepting only in reſpect of the accidental Differences and Circumſtances aforeſaid, it follows by neceſſary Conſequence, that Phyſick, or the Art of preſerving Health, and curing Diſeaſes, ought for to be eſſentially one and the ſame in all Ages and Periods likewiſe, excepting only in circumſtantial Differences as to what regards the Majus and Minus, or the greater and leſſer Apparatus; for as the ſame general ſpecifick original Diſeaſes differ only in Degrees, Accidents, and Circumſtances, in one Age or Period of Time from another; ſo the Means and Remedies for curing them require only to be ſtronger or weaker, and diverſified with reſpect to Circumſtances of Time, Place, Quantities, Qualities, *&c.* accordingly.

13. I have digreſs'd and inſiſted the longer in laying open the Abſurdity and Fallacy of the aforeſaid Opinion, foraſmuch as it ſeems calculated on purpoſe to patronize the preſent modern Practice of increaſing the Catalogue and Number of Diſeaſes, with their Cauſes, and the *Materia Medica*, infinitely without Number or End, to the utter Confuſion and Diſcredit of Phyſick; which is become render'd thereby like to a perfect Chaos, over which there reſts a thick impenetrable Gloom and Darkneſs, wherein if a Perſon once enters, he will run a great Hazard of being bewilder'd and loſt, as to what real Service he can do either to himſelf, or the reſt of Mankind. For from what has been ſaid in the laſt preceding Number it follows, that the Practice of Phyſick ought to be ever ſimple, plain, invariable, and eſſentially the ſame throughout all Ages; allowing only for ſome accidental Differences and Circumſtances, whereas was this modern Opinion true, Phyſick can have no eſtabliſhed Rules or Principles, neither as to Theory nor Practice, nor any Limits or Bounds affixed thereto, but muſt be ever changing, according as the Diſeaſes change, and other new ones become introduced, in like Manner as we change our Cloaths, according to the prevailing new Taſte and Faſhion of the Times; whereas true Phyſick both with regard to the Theory and Practice, is ever immutably one and the ſame, both being neceſſarily founded upon the eternal, unchangeable, eſtabliſh'd Order of Nature, and the mutual Relation of Second Cauſes.

14. From what hath been ſaid it appears, that the diſtinct original Specifick Diſeaſes, and general morbid Conſtitutions, are but few and eſſentially the ſame in all Ages and Seaſons, allowing for ſome accidental Differences and Circumſtances; from whence it follows, that the Remedies proper for curing the ſaid ſpecifick Diſeaſes may be reduced to a like Simplicity alſo, which would be doing the greateſt Service to true Phyſick, which is become overwhelm'd with an endleſs infinite Number of Medicines, the greateſt Part whereof are not only of no Manner of Uſe, but for the moſt Part deſtructive of the Health of Mankind. And this very great and ſore Evil of increaſing the *Materia Medica*, and Catalogue of Medicines, by a vain endleſs Reſearch after the Diſcovery of new Remedies, appears to take its Riſe and to be introduced along with the aforeſaid new Opinion and Hypotheſis, as being a natural neceſſary Conſequence following therefrom, which meeting with Countenance and Encouragement from ſuch as traffick in Medicines, and more eſpecially from the Addreſs and Induſtry of ſome deſigning Enthuſiaſtick Chemiſts, who after a long and fruitleſs

Reſearch

Reſearch in Queſt of the Philoſopher's Stone, *&c.* began at laſt to offer their Aſſiſtance and Labours towards the Improvement of Phyſick, by applying and ſetting their all-transforming, wonder-working Engine and univerſal Menſtruum, the Fire, to work, in order to prepare univerſal Remedies, Specificks, Noſtrums, *&c.* for the Cure of all Diſeaſes; but hitherto all in vain and to no Purpoſe; for however Chemiſtry muſt be allowed to be very uſeful, when properly apply'd and directed to what is its proper End, that is, to the Improvement of the mechanical commercial Arts, Trades, and Manufactures, and likewiſe to natural Experimental Philoſophy, yet ever ſince its Application to Phyſick, which is but of modern Date, the Practice of Phyſick I think never has, and in all Probability never will, receive any real Benefit therefrom, if not infinite Prejudice and Damage, there being no Manner of Affinity, Congruity, and Agreement between the Principles which compoſe animal Bodies, and ſuch Medicines as are only the fortuitous, ſportive, forc'd Productions of intenſe artificial Fires, which Remedies being abſorb'd and impregnated with ſo much concenterated Fire and ſaline Spiculæ, *&c.* are much better fitted to tear, rend and deſtroy, than to repair and reſtore the animal Machine.

15. From the Methods and Practices deſcrib'd in this Treatiſe, for preſerving Health, and curing Diſeaſes, with the occaſional Remarks added thereupon, I think it may be laid down as a fundamental Maxim and Aphoriſm, and which is as demonſtrable from the Laws of animal Mechaniſm, as any Propoſition in *Euclid*, That Aliment, Water, Air, elementary Fire or Heat, Motion or Exerciſe, with the Paſſions; are the primary Catholick Inſtruments of Animal Life, Health, and Diſeaſes; and that whatever Intentions and Alterations are neceſſary to be produced in the Animal Solids, and Fluids, either for preſerving Health, or curing Diſeaſes; may be more expeditiouſly, ſafely, certainly, and univerſally effected, by applying the mechanical Properties and Qualities of the ſaid univerſal Principles and Remedies, by proper Machines, to the human Body, and its Parts; than by all the endleſs Medley of Medicines wherewith the *Materia Medica* now ſuperabounds. Let us therefore with the primitive great Phyſicians learn to hearken to the Voice, and follow the plain ſimple Precepts of Nature; and turn our Enquiries to find out what mechanical Effects Aliment, Water, Air, Motion, and the Paſſions, have upon Animal Bodies, conſider'd as operating thereupon with all their Properties and Qualities, and that in all Degrees, Quantities, Alternations, and Combinations, ſeparately, or jointly; with what Diſeaſes are produced therefrom, and by what Methods the ſaid general Cauſes may be converted into the moſt efficacious Means and Remedies for curing all the ſaid Diſeaſes. And abandoning the vain endleſs Reſearch after the Qualities of every inſignificant uſeleſs Drug, let us make the aforeſaid Catholick Capital Principles and Remedies of Nature's Appointment, the whole of our Study, and the only ſure Foundation of Practice, in the due and proper Uſe and Application whereof, we ſhall find all the Means neceſſary for preſerving Health, and the Cure of Diſeaſes.

16. As the Methods deſcrib'd in this Treatiſe for preſerving Health, and curing Diſeaſes, are entirely new, I am ſenſible this Undertaking of mine will undergo various Teſts and Trials, and be either approv'd or condemn'd, according to the different Underſtandings, Intereſts, and Inclinations of Men; not doubting but it will be ridicul'd and deſcry'd by your nominal Pſeudo-Phyſicians, Specificians, Empiricks, *&c.* For whoever will attempt to encounter vulgar Errors and Practices, muſt expect to be run down as far as poſſible by popular Noiſe and Clamour; and likewiſe whoever attempts to introduce any Thing new into Practice, let the ſame be ever ſo uſeful, muſt lay his Account to meet with Oppoſition, ariſing from the different Views, Intereſts, and Paſſions of Men, it being no eaſy Matter to overcome popular receiv'd Opinions and Prejudices, and to bring Perſons to change their old, for a new Way of Thinking and Acting; until Time, Experience, and the Example of Perſons of clear diſintereſted Reaſon and Judgment, bring them to ſee their Error. However, let the Event be what it will, or let who will oppoſe this Undertaking, I take Encouragement and place my Hopes of Succeſs wholly in this, That as the whole is founded upon the original Plan of Nature, ſo I doubt not but that like a Houſe built upon a Rock, it will ſtand its Ground in Spite of all Oppoſition, and will at laſt, like Truth, in due Time prevail.

17. The End and Deſign of this Treatiſe, being to reſtore Phyſick to its primitive Simplicity and native Purity, by bringing it to correſpond and agree with the general Laws and original Inſtitutions of Nature; the ſame might very juſtly claim the Attention and favourable Reception of the Publick, was the Performance executed anſwerable to the Importance, Uſefulneſs, and Dignity of the Subject; which if it hath ſuffer'd through my Incapacity, I hope at leaſt what I have done, will ſerve to excite and ſet ſome abler Head and Hand to work to compleat and perfect the Plan and Undertaking, which of all others is the moſt noble, uſeful and extenſive, as having the moſt immediate Connection with the temporal Happineſs of Mankind. And if I may be indulg'd the Liberty of paſſing a general Judgment thereupon myſelf, without being ſuſpected of Partiality, I humbly think there is nothing advanc'd in this Treatiſe but what is ſtrictly agreeable to the Principles of true Philoſophy, and the moſt perfect Theories of the Animal Œconomy, with the eſtabliſh'd Laws of Motion, and Animal Mechaniſm; ſo far as the ſame are yet known and diſcover'd. But conſcious how apt Mankind are to be biaſs'd and miſled by Self-Intereſt, and not willing to truſt altogether to my own Judgment in this Affair wherein I am ſo much a Party intereſted, I have for that Reaſon conſulted ſome of the moſt learned and experienced Phyſicians thereupon,

upon, and have had the Satisfaction of their Approbation; I have never heard any material Objection to the Principles and Practices deſcrib'd in this Treatiſe; the only Objection I have met with, is the Difficulty of reducing it into Practice, partly on account of the Apparatus and Machinry, and likewiſe from the Prejudices of Phyſicians and Surgeons, who will be unwilling to reſign and lay down their old, and to adopt a new Practice; as to the former Part of the Objection, it is to be conſider'd, that moſt, if not all the beſt Inventions, and moſt uſeful Diſcoveries have been ſubject to the like Objection at their firſt Appearance, and have been thought clogg'd and embarraſs'd with invincible Difficulties, which yet have been happily ſurmounted afterwards by future Application and Induſtry, and I doubt not in the leaſt but this preſent Undertaking will be attended with the like Succeſs, as the ſame is founded upon true and rational Principles; ſo that to this Part of the Objection relating to the Difficulty of bringing thoſe new Methods into Practice, it will be ſufficient at preſent if I anſwer thereto in the Words of the Poet, *Labor improbus omnia vincit.* And as to the latter Part of the Objection, I doubt not but Time, Experience and Facts will convince the World of the univerſal Uſefulneſs of this Undertaking. And therefore as the bringing it into Practice will be of the greateſt Advantage to the Publick, ſo I hope proper Methods will be taken for that Purpoſe.

18. I am withal at the ſame Time ſenſible how very unequal my Abilities are for ſuch an Undertaking, and to the great Importance, Dignity and Uſefulneſs of the Subjects here treated of, which would have deſerv'd the Labours of a much abler Pen, to have ſet them in a truer and more perfect Light, and am moreover conſcious with myſelf of many Imperfections in the Stile, Order and Method of treating the ſame. However, conſidering that the Methods and Practices here propos'd and deſcrib'd are entirely new, and if what I have advanc'd upon thoſe Subjects be but intelligible, and appear withal to be grounded upon true rational Principles; I am ſatisfied that every candid unprejudiced Reader will readily pardon whatever Defects may be found therein, with reſpect to the Accuracy of the Method, Stile, *&c.* Truth and Reaſon being the only great Point, and Standard Rule and Meaſure that ought always to be regarded and kept in View, in examining and paſſing Judgment upon this, and all other the like Performances; and however, it be but a rough unfiniſh'd Piece, as being yet but in a State of Embrioniſm and unform'd, yet am I not afraid to venture it abroad into the World and let it ſee the open Light, being willing to ſubmit it to a fair impartial Examination and Trial, provided that I be allow'd to bring Nature, Truth, Experience, and Facts, for my Evidence, and have Reaſon for my Judge. Remembring withal, before paſſing Judgment, the following Advice and Caution.

——— *in Magnis, & Voluiſſe, ſat eſt.* PROPERT.

Nihil eſt ex omni parte Perfectum.

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INTRO-

INTRODUCTION.

1. BEFORE I proceed to the Conſideration of the diſtinct Parts and Subjects of this Treatiſe, ſhall firſt by way of Introduction, offer ſome preliminary Obſervations relating to the Nature and Origine of Diſeaſes, with their general productive Cauſes, and the mechanical Properties, Effects and Operations of Medicines, whereunto I ſhall ſubjoin ſome general Propoſitions and Problems, which ſerve as the Baſis of the ſeveral new Methods and Practices for preſerving Health, and the Cure of Diſeaſes, as may be found deſcrib'd in this Treatiſe.

2. Firſt then I obſerve, that among Second Cauſes, Motion is the principal immediate Agent and Inſtrument of all the Effects, Operations and Phænomena that are produced in the material Univerſe, and is the primary Cauſe upon which the Power, Force and Energy of every Body or Syſtem of Bodies wholly depends. For Matter or Bodies without Motion, can neither ſuffer any Change in themſelves, nor produce any Change or Alteration in other Bodies, but would remain for ever in a State of abſolute Reſt and Inactivity; ſo that whatever Changes or Mutations happen in Bodies, the ſame are all neceſſarily produced by Motion, either added thereto, or ſubſtracted therefrom. For which Reaſon we find, that according to the preſent eſtabliſh'd Order of Nature, Matter and Motion are render'd inſeperable, the whole Syſtem of Matter, and all material Beings, both animate and inanimate, being for ever ſubject to ſome Degree of Motion, more or leſs, by which they are kept in a continual Circulation and Fluxion, and thereby fitted to undergo and paſs through different States, Forms, Periods, and Appearances, according to the final Ends and Appointments of Providence. And thus we obſerve, that all animal and vegetable Bodies, from the higheſt to the loweſt Degree in the Scale of Life, as well as all other material Beings, even the great Planetary and Cometary Bodies themſelves which compoſe this Solar Syſtem, are conſtituted and form'd to continue only for a certain Revolution and Period, ſome longer, ſome ſhorter, which is no other than a progreſſive Motion, whereby they paſs through different Scenes and States, and put on different Forms and Appearances, which when accompliſh'd, they become reſolv'd again into the general elementary Maſs of Matter, though even then they are neither diveſted of Exiſtence, nor Motion, but are ſtill in a Progreſſion to new Life, Form, and Being.

3. From whence follows this fundamental phyſical Concluſion and Propoſition, that no animal organiz'd Body, *&c.* can ſuffer or become ſubject to any Alteration or Change, either from Health to Sickneſs, or from Sickneſs to Health; but by ſome Quantity of Motion either communicated thereto, or ſubſtracted therefrom; let the Cauſes communicating or ſubſtracting the Motion, be what they will, material or immaterial. And conſequently all Medicines, Means, and Methods for preſerving Health, and curing Diſeaſes, be they of what Kind ſoever, or apply'd in what Manner ſoever, either internally or externally; and let them operate by what mechanical Properties, Powers, or Qualities ſoever, either by their Fluidity, Gravity, Elaſticity, Preſſure, Attraction, Stimulation, Momentum, Attrition, Friction, Motion, Heat, Cold, Humidity, Dryneſs, Effluvia, *&c.* yet ſtill the ultimate Effect of all ſuch Medicines and Means, reſolves at laſt and conſiſts only in the real Quantity of Motion which they either add to, or ſubſtract from the animal Machine, or ſome one or more of its Parts and Organs.

4. As animal Life conſiſts in a fitly organiz'd Body or Machine, endow'd with a certain Quantity of Motion or moving Force, conſequently that muſt be the moſt perfect Practice of Phyſick, or the moſt rational ſucceſsful Method for preſerving the Health and curing the Diſeaſes of the ſaid Body or Machine, which teaches the beſt Methods and Means for regulating its Motions, by adding or ſubſtracting Motion to, and from the ſame, in all Quantities, according as it becomes deficient, or redundant, ſo as to preſerve a due Ballance, and ſuch a Quantity of Motion in the whole Machine, and all its Parts, as agrees beſt therewith.

5. Now in order to aſcertain the juſt Boundaries and Pretenſions of Phyſick and Phyſicians, and to determine how far and in what Caſes humane Knowledge and Art can be aſſiſting in preſerving Health, and in curing Diſeaſes; it will be neceſſary to look back to the firſt original State and Beginning of the humane Body, which conſiſts of two general Principles, the Solids and Fluids; now as to the animal Solids, it is to be obſerv'd, that the original elementary Principles and Stamina which compoſe the firſt infiniteſimal naſcent Solids, are interwoven, platted and twiſted together in ſuch a peculiar Manner, whereby they acquire a certain determinate Degree of Coheſion, Strength, and Elaſticity, which can never be mended or altered for the better afterwards; it being abſolutely out of the Power of humane Art, and of all the Medicines in Nature, to impart or communicate to any one ſingle original elementary ſolid Fiber, or to a Bundle or Syſtem of thoſe Fibers, ſuch as all animal Bodies are compos'd of, a greater Degree of moving Force, Strength, and Elaſticity, *&c.* than what they receiv'd, by virtue of their firſt primæval Formation, Structure and Compoſition.

6. The

6. The elementary Stamina and Principles of the animal Solids, admit of infinite Variety in their original Aſſemblage, Arrangement, and Compoſition, and in the different Manner in which they are twiſted, modified, and interwoven together; from both which Cauſes ariſe thoſe differential Signatures, which ſerve to characterize and diverſify the Conſtitutions, Genius, Temperament, *&c.* in both Sexes, and in the ſeveral Individuals of each Sex.

7. The whole moving Force whereby the animal Fluids become at firſt put into a State of Motion, Heat, and Fluidity, and continued therein, is intrinſically belonging to the animal Solids, as their peculiar Property alone, the Fluids having no Tendency nor Principle of Motion in themſelves, and are only moved, attenuated and circulated by the innate Spring and Elaſticity of the Solids, which Momentum or Quantity of moving Force in the Solids, can't, as has been before obſerv'd, be rais'd above a certain Pitch and Degree, depending upon their original Compoſition and Contexture, which admits of no Amendment from humane Art.

8. From whence it follows, that every individual Animal, by virtue of the original Compoſition, Texture, and Strength of its Solids, becomes endow'd with a certain determinate moving Force, whereby it becomes fitted for living, moving, and circulating a certain Quantity of Fluids, with the greateſt Advantage, for a certain Duration and Space of Time. In the regular Government and Exerciſe of which moving Force, in the ſeveral Stages of Life, conſiſts the Health and Longævity of every Animal; to the End therefore that the animal Machine may have its Exiſtence protracted to the utmoſt Period that Nature allows, it is neceſſary that all its Motions be duly regulated in proportion to the original Formation and Compoſition of its Solids, ſo as neither to ſuffer its Motions to be too much accelerated, or retarded; nor too long continued, or intermited, *&c.* Thus for Example, if this moving Force of the Solids be ſuffer'd to riſe too high and to become too exorbitant and accumulated, the Animal will have its Growth unduly accelerated, and arrive the ſooner at its full State, Maturity, and Diſſolution, and become the more ſubject withal to Diſeaſes of the acute inflamatory Kind; and on the contrary, if this moving Force of the Solids be ſuffer'd to flag and become too much depreſs'd and languid, or not duly exerted; the Solids will be hinder'd from developing and expanding duly, and the Animal will arrive the later at its full Growth and Diſſolution, but become the more ſubject withal to Diſeaſes of the Chronick Kind. So that between thoſe two Extreams of too great and too ſmall a Motion, it is that we are to look for the golden Mean and true Path that leads to the Temple of Health and Longevity.

9. And from hence follows this phyſical Paradox, that ſuppoſing any two Animals of the ſame Species, to have the original Syſtem of their Solids and Fluids conſtituted as greatly different as poſſible in reſpect of Strength, yet provided they be form'd ſimilarly and alike in all Parts, the weakeſt ſhall notwithſtanding live as long as the ſtrongeſt, provided all their Motions be regulated alike, and in proportion to the original Strength and moving Force of their reſpective Solids. And from thence follows this general Concluſion and Propoſition, that the Periods of animal Life abſtracting from Caſualties and Accidents, depend upon the juſt Regulation and Management of the Motions of the Body, by keeping them within proper Bounds, that is proportionate to the moving Power and Strength wherewith the Solids are originally endow'd.

10. However the animal Solids can't poſſibly receive from humane Art any greater Degree of moving Force, than what they derive from their firſt original Compoſition, yet nevertheleſs the ſame may occaſionally, from the Influence of ſome extrinſick Cauſes, have their moving Force rais'd higher, or depreſs'd lower, than what is conſiſtent with Longevity, and a continued State of Health; and in this Reſpect only, it is, that they come properly under the Direction and Management of the Phyſician, whoſe chief Buſineſs is to have a watchful Eye and Regard to thoſe two principal oppoſite States of the Solids, by minding carefully to conſtringe and relax, or to raiſe and lower their moving Force at proper Times, ſo as to keep them within due Limits and Bounds, and in a fit State and Condition for circulating the Fluids; and for that Purpoſe he muſt have a ſtrict Regard at the ſame Time alſo, that the Fluids be kept of a proper Quantity, that is ſuch as is proportionate to the moving Power of the Solids, and likewiſe that they have all the Qualities neceſſary to fit them for the ſeveral Offices of the animal Œconomy. Which general Intentions relating to the Solids and Fluids, with the proper Means and Medicines for effecting the ſame, comprehends the whole Practice of Phyſick, and all that humane Art can poſſibly do towards obtaining Health, Longevity, with the Cure of Diſeaſes.

11. The humane Body may be truly and really conſider'd as a compound hydraulick Machine, conſiſting of many ſingle Machines, each particular Gland, Organ and Muſcle how ſmall ſoever, ſuch as the Stomach with the alimentary Tube and lacteal Veſſels; the Heart with its Syſtem of Arteries and Veins; the Brain and nervous Syſtem; the Liver, Spleen, Kidneys, Teſtes, Pancreas, *&c.* being all ſo many diſtinct hydraulick Engines, except the Lungs, which conſiſting of a Syſtem of ſanguineous and Air-Veſſels, may be properly called a Pneumatico-hydraulick Engine; all which ſeveral Organs, Glands, or Muſcles, being compos'd of elaſtick Tubes, properly diſpos'd and aſſembled together, for forcing, circulating, and ſecreting the reſpective Fluids deſtin'd thereto. Now as all thoſe ſeveral diſtinct Organs and Machines conſtitute but one Compound or Whole, it is neceſſary that they all have a mutual Communication, Subordination and Dependance on each other, and likewiſe that each ſingle Machine and Organ be conſtructed of a due Magnitude relatively

relatively to the others, and with a proportional moving Force in its Solids, to fit it for keeping a Ballance with the other Organs and Glands, and for receiving, preparing, ſecreting, and circulating a certain Portion of the Fluids; which ought for that Purpoſe to be both of a proper Quantity and Qualities. This Momentum or due Quantity of moving Force, that is proper and requiſite for the Solids and Fluids of each particular Organ, Gland, or Machine, I ſhall call its natural conſtitutional Quantity of Motion; when therefore all the ſeveral Organs have their reſpective Magnitudes, moving Forces and Quantities of Motion that is natural and conſtitutional thereto, whereby they will be enabled to maintain a proper Ballance with each other, ſuch an Animal may be conceiv'd to be in a State of perfect Health, having all its Motions duly perform'd, and the Fluids kept duly prepared, repaired, circulated, ſecreted, and apply'd to their reſpective Offices.

12. Now ſuppoſing any animal Body to be thus happily conſtituted as above deſcrib'd (which however I believe to be a Caſe very rarely, if ever to be met with, conſidering the infinite Caſualties and Accidents of Life,) ſuch a Machine can undergo no Change, neither from Health to Sickneſs, nor from Sickneſs to Health; but there muſt be a Change and Alteration produc'd firſt in its Matter and Motion, or in the natural conſtitutional Quantity of Motion or moving Force, either of one, or more, or all its ſeveral Organs, Glands or Machines.

13. The human Body can't poſſibly become ſenſibly affected with any Diſeaſe, but either the whole Syſtem of the Solids, or ſome one particular Organ, or more, muſt firſt give Way and ſtart from its natural healthful Rectitude. The Fluids I allow have their Diſeaſes both as to their Quantity and Qualities, independent and diſtinct from thoſe of the Solids; and may happen to be previouſly indiſpoſed, and as ſuch will neceſſarily affect the Solids, but ſtill thoſe Diſtempers of the Fluids are only to be conſider'd as an antecedent Cauſe, and will not become ſenſibly felt nor obſerv'd until it hath actually produc'd ſome Change, either in the Solids of the whole Body, or of ſome one, or more, of its Organs, Glands or Muſcles; ſo that the ultimate Effect and Seat of all Diſeaſes, whatever may be the antecedent productive Cauſes thereof, is to be refer'd to the Solids, which will have their moving Force thereby either rais'd above, or depreſs'd below their natural conſtitutional Standard-meaſure and Quantity.

14. From whence it follows, that all the Diſeaſes incident to this complex Machine the humane Body, are only certain Perturbations or Changes produc'd in this conſtitutional natural Quantity of Motion, either of one, or more, or all its ſeveral Organs; and this Change can only be produc'd by ſome additional Quantity of Motion, either added to, or ſubſtracted from one, or more, or all the ſaid Organs, whereby they become poſſeſs'd with a Quantity of Motion either greater or leſs, than what is natural and conſtitutional thereto; from whence Diſeaſes of all Sorts will ariſe, which, tho' they are all produc'd and owing to this one Cauſe of too great or too ſmall a Motion in the Solids and Fluids of the whole Body, or ſome one, or more of its Organs, yet will the ſame appear diverſified with various Phænomena, Phaſes and Symptoms, as if they were produc'd by Cauſes ſpecifically different; according as the Change in the natural conſtitutional Quantity of Motion, happens to be greater or leſs, or as it affects one, or more, or all the ſeveral Organs, Glands, *&c.*

15. From whence alſo follows this neceſſary Concluſion, that as all Diſeaſes of what Kind ſoever incident to the humane Body, are produc'd from a Quantity of Motion either added to, or ſubſtracted from the whole Body, or ſome one, or more of its Organs, or from a Change in the Quantity, Qualities, Direction, and Diſtribution of the Fluids; whereby the natural conſtitutional Quantity of Motion of one, more, or all the Organs becomes either rais'd above, or depreſs'd below its proper healthful Standard-Meaſure, and thereby the juſt Equilibrium and Ballance of Motion between the ſeveral Organs and Machines of the Body perverted and deſtroy'd; conſequently the Cure of all Diſeaſes of what Kind ſoever conſiſts wholly, and can't poſſibly be effected any otherwiſe, but by adding or ſubſtracting Motion to, or from the whole Body, or ſome one, or more of its Organs, and in regulating the Quantities, Qualities, Determination, and Diſtribution of the Fluids, until each diſtinct Organ, Gland and Machine becomes poſſeſſed with that Quantity of Motion or moving Force, that is moſt natural and conſtitutional thereto, and whereby they will become fitted for the due Performance of their reſpective Offices, and for maintaining a due Ballance with each other.

16. Now for Exemplification of the foregoing Principles; ſuppoſe in the firſt Place the Solids of the whole Body to be overmuch relax'd from what Cauſes ſoever, whereby having loſt Part of their natural conſtitutional moving Force, the Fluids for Want of a proper contractile impulſive Force in the Solids, to attenuate, ſyringe and circulate the ſame with a due Impetus and Velocity, muſt thereupon become crude, acid, indigeſted and viſcid, and thereby diſpos'd to form Obſtructions throughout the Veſſels and Glands, and lay the Foundation for all ſuch Diſeaſes as retain to the chronical Kind; and on the contrary, if the moving Power of the Solids be rais'd above their natural healthful Quantity, in that Caſe the Fluids being projected and mov'd with too great Celerity, will have their Craſis, Temperament and Texture too much diſſolv'd, heated and alcaliz'd, and become productive of acute inflamatory Diſeaſes, *&c.* Moreover, ſuppoſe any one ſingle Organ or Gland of the Body to have its Solids too much relax'd, relatively and comparatively than that of the other Organs, (which I take to be a Caſe that frequently happens, either from an ori-

ginal wrong Conformation, but moſt commonly from Errors in the Uſe of the Non-Naturals) in this Caſe the Fluids will become neceſſarily determin'd in a greater Quantity and Velocity upon that Organ or Gland, whereby its natural conſtitutional moving Force being in part deſtroy'd, it muſt of courſe become diſeaſed, and the Equilibrium or Ballance between it, and the other Organs and Glands, being alſo in part deſtroy'd, the other Organs and Members muſt in Time gradually participate in the ſame common Fate and become diſtemper'd likewiſe, ſooner or later, according as the Organ or Gland firſt affected, is of more or leſs general Uſe and Importance to the Body. And the contrary Phænomena, Effects and Symptoms will enſue, ſuppoſing the ſame Organ to have its moving Force rais'd above its healthful Standard-Meaſure and Pitch.

17. Now the proper Indications of Cure in both the preceding ſuppos'd contrary States of the Solids are evident, namely, in the firſt Caſe the Solids being over-relax'd, and having loſt Part of their conſtitutional natural motive Force, muſt therefore have a new Quantity of Motion added thereto, by conſtringing, bracing, condenſing, and bringing the conſtituent Fibrillæ and Machinulæ of the Solids into cloſer Union and Contact with one another, obſerving to take away the Cauſe of their Relaxation and Diſunion, or to change the Modus and Manner of its operating. But in the ſecond Caſe, the Solids having too great a moving Force, require to have a Quantity of Motion ſubſtracted therefrom, by relaxing, unbending and ſetting their compounding Fibrillæ at a greater Diſtance from each other, and removing the Cauſe of their too great Tenſion, Rigidity and Stricture, or changing its Manner of operating. So that as the Diſeaſes in the firſt Caſe proceed from too ſmall a Momentum and moving Force in the Solids, ſo the Cure conſiſts in adding Motion thereto. And in the ſecond Caſe, as the Diſeaſe proceeds from too great a motive Force in the Solids, conſequently the true Indication and Intention of Cure muſt be to ſubſtract Motion therefrom, by lowering and taking down their too great Stricture, Springineſs and Elaſticity; and ſo in all other Caſes. Whence it is manifeſt, that in the Cure of all Diſeaſes the general Intentions may all be refer'd to this one alone, of adding or ſubſtracting Motion, to or from the whole Body, or ſome one, or more of its Organs and Glands; and in regulating the Quantity, Qualities, Direction, and Diſtribution of the Fluids, until that all the ſeveral Parts and Organs are reſtor'd to their natural healthful Quantity of Motion, and a perfect Ballance and Harmony eſtabliſh'd between them.

18. Now in order farther to eſtabliſh the Truth of the foregoing Principles, it will be ſufficient for that Purpoſe to ſhew, that all the primary diſtinct morbid Conſtitutions of the animal Solids and Fluids, or which comes to the ſame Thing, that all the general Intentions which Phyſicians propoſe and take for the Cure of Diſeaſes, may be reduc'd to the foregoing one; now thoſe general diſtinct ſpecifick Diſeaſes of the Solids and Fluids, or the general Indications of Cure, as the ſame are conſider'd by Phyſicians, may all be reduc'd to the ſeven Diviſions following.

1. Conſtriction and Relaxation } of the Solids.
2. Stimulation and Pacification }

3. Solution and Reunion of the Solids; this Diviſion belongs more properly to the Province of Surgery.

4. Augmentation and Diminution of the Secretions
5. Rarefaction and Condenſation, or Heating and Cooling } of the Fluids.
6. Derivation and Revulſion — —
7. Solution and Inſpiſſation — —

19. Now all the foregoing general morbid Conſtitutions and Diſeaſes, plainly imply Motion to be either wanting, or abounding in the Solids and Fluids of the whole Body, or of ſome one, or more of its Organs, and conſequently all the Indications for curing the foreſaid general Diſeaſes, plainly point out a Neceſſity of adding, or ſubſtracting Motion to, or from the Solids and Fluids, until that the loſt Ballance and Equilibrium between the ſeveral Organs and Glands is reſtored; from whence it is evident, that in all the morbid Affections and Diſeaſes incident to Mankind, the conſtitutional natural moving Force of the Solids, is either rais'd above, or depreſs'd below its healthful Standard-Meaſure, and that either in all, or ſome one, or more of the Organs of the Body; and conſequently in the Cure of all Diſeaſes, be they of what Kind ſoever, or produc'd from what Cauſes ſoever, this muſt be the only true ultimate final Intention for curing the ſame, either by adding, or ſubſtracting Motion to, or from the whole Body, or ſome of its Organs; and in regulating the Quantities, Qualities, Direction, and Diſtribution of the Fluids, until the ſeveral Organs and Glands become reſtor'd to their healthful conſtitutional Quantity of Motion, and to maintain a mutual Ballance with each other, in which alone conſiſts the Definition and Idea of perfect Health, obſerving either to take away the Cauſe of the Diſeaſe, or change its Modus of operating.

20. The Truth of the foregoing Principles is further manifeſt from what muſt be the laſt Reſolution and Practice of every Phyſician, who after having taken all the proper Means to inform himſelf rightly of the Nature of the Diſeaſe, with its Cauſe or Cauſes, (concerning which he will be always beſt inſtructed to form the moſt certain Judgment from a diligent Obſervation of the Symptoms, &c.) he muſt ſtill at laſt come to this ultimate Judgment and Reſolution, that ſome Change or Alteration is neceſſary to be produc'd either in the Solids or Fluids of the whole Body, or only of ſome one, or more of its ſeveral Organs and Glands. Now this Alteration or Change being reſolv'd upon, be what it will, and let the Means and Medicines made uſe of to effect it be

what

what they will, the ſame can only be brought about by producing ſome Motion in the Solids and Fluids either of the whole Body, or of ſome of its Parts only, and in regulating the Quantity, Qualities, and Determination of the Fluids, ſo as to cauſe their Effects to become manifeſted either outwardly upon the cutaneous Glands, or inwardly upon thoſe of the Stomach and Inteſtines, or upon the renal, or ſalival Glands, *&c.* according as the Symptoms indicate.

21. Having ſhewn that Health conſiſts in a juſt Equilibrium between the moving Forces of the ſeveral Organs, Glands, *&c.* of the Body, and that Diſeaſes are only certain Perturbations or Changes in this juſt Ballance of Motion between the reſpective Organs of the Body, conſider'd either as they affect all, or only ſome of the ſaid Organs. Let us next conſider by what Cauſes this nice Ballance of animal Motion and Health, becomes moſt commonly and principally affected, for by knowing the general productive Cauſes of Diſeaſes, we ſhall be the better able for to remedy and prevent their ill Effects; now what thoſe Cauſes are will be beſt underſtood from conſidering what are the general Cauſes, Principles and Inſtruments ordained by Nature, as abſolutely neceſſary to the Preſervation and Continuance of animal Life and Health.

22. The humane Body conſiſting of an Aſſemblage of contractile diſtractile Tubes, infinite in Number, and in the Manner of their Diſpoſition, Arrangement, Convolution, Curvature, *&c.* fill'd with Fluids, ſubject to great Degrees of Rarefaction and Condenſation; may be conſider'd as a true and real Machine, form'd upon the moſt perfect Principles of Geometry, Mechanicks, Hydraulicks, Pneumaticks, *&c.* at firſt form'd and put into Motion by God, and continued in Motion for a certain Period of Time by the continual Influence of the ſame Almighty creating Power, operating thereupon through and by means of certain general Principles, Cauſes and Inſtruments, which are as follows, being all that are neceſſary to the Continuance of animal Life and Health.

23. Firſt, Solid and Fluid, Aliment or Water; to repair the Waſte and Expence of the animal Solids and Fluids.

24. Secondly, Air, and elementary Fire or Heat; which by their Fluidity, Gravity, Preſſure, Elaſticity, Stimulation, Motion, Heat, Cold, *&c.* ſerve to ſuſtain, brace and keep the whole Syſtem of the Solids and Fluids together, and give them Liberty to grow, expand and develope gradually; and by their ſaid ever variable Properties and Qualities, ſerve as a perpetual Stimulus and Principle for communicating and ſubſtracting Motion to, and from the animal Machine, ſucceſſively and alternately.

25. Thirdly, Motion or Exerciſe; which together with the Paſſions, ſerve as another principal Cauſe and Stimulus for communicating and ſubſtracting Motion to and from the Body; interchangeably with Reſt, to give Time to the Solids to have their Decays repair'd by the Appoſition of proper nutritious Matter.

26. By a due Uſe and Application of the foreſaid general Principles, the animal Machine will have its natural and vital Motions regularly perform'd, and prolong'd to the utmoſt it was made for to laſt, by virtue of its original Structure and Compoſition.

27. From a wrong Uſe and Application of the foreſaid general Principles it is, that the regular natural Motions of the Body become perverted, and Diſeaſes of all Sorts introduc'd. That all the Diſeaſes incident to Mankind (excepting ſuch as are caſual, or owing to an original wrong Conformation, or hereditary Weakneſs impreſs'd upon the firſt Elementary Stamina of the animal Machine, which are Caſes that come not within the Conſideration and Province of Phyſick; as being abſolutely incurable) do neceſſarily proceed from a wrong Regimen as to the aforeſaid Non-Naturals, is what may be laid down as a fundamental Rule and Maxim in Phyſick, and thus we find the greateſt Phyſicians in all Ages, but more eſpecially the Antients, making the aforeſaid cardinal Catholick Subjects, namely, Aliment, Air, Water, and Exerciſe, the whole of their Study, and the ſole *Materia Medica* and Foundation of their Practice, applying themſelves diligently to acquire a true Knowledge of the ſame, but more eſpecially of the Air, and the different Conſtitutions and States thereof in the ſeveral Seaſons of the Year, with the mechanical Effects thereof upon animal Bodies, which they found to be of ſuch univerſal great Influence, that the renown'd *Hypocrates* was uſed to ſay, that the different States of the Air and Seaſons of the Year, was the true general Parent and productive Cauſe of all or moſt Diſeaſes.

28. Now to demonſtrate the Truth of this fundamental phyſical Aphoriſm, namely, that the Air is the principal Cauſe of all, or moſt Diſeaſes, it will be ſufficient for that Purpoſe to conſider the mechanical Operation and Effects, with the univerſal Influence which it hath upon all Parts both external and internal of the human Body; to this End therefore we are to conſider the Air as continually apply'd and operating upon the Body by four different diſtinct Ways as follows.

29. Firſt, the Air has a conſtant general Action and Influence upon the whole external Body, which being compos'd of an Aſſemblage of elaſtick Tubes, fill'd with Fluids ſubject to be greatly rarefied and condens'd, and being conſtantly immerg'd into this fluid Medium the Air, which is ever changing in reſpect to all its Properties and Qualities, of Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Motion, Reſt, Effluvia, *&c.* upon all which Accounts it becomes a perpetual Cauſe and Inſtrument for communicating Motion and Exerciſe to the Bodies of Animals and Vegetables, which become thereby kept in a continual fluxionary State of ebbing and flowing, contracting and dilating, heating and cooling, *&c.* and the Atmoſphere being ſubject to conſtant,

and

and oftentimes great and ſudden Mutations, from one Extream to another, by which Means the Air maintains a univerſal great Influence over the Ballance of Life, by determining it either to the Side of Health, or Sickneſs; according as its Properties and Qualities happen to be relatively, well or ill proportioned to the conſtitutional State of the Body, as will be ſhewn more particularly in the ſecond Chapter.

30. Secondly, the Air is applied and operates conſtantly and alternately with all its variable Properties and Qualities upon the whole animal Fluids, which are continually and ſucceſſively ſubjected to its changeable Operation and Effects, by the joint Mediation and Mechaniſm of the Lungs; and here in this complex Organ the mechanical Effects of the Air are moſt remarkably and ſignally diſplay'd and manifeſted, and by which general Operation upon the whole circulating Fluids, it becomes the primary Cauſe and Inſtrument both of Health and Diſeaſes; according as its Properties and Qualities happen to be relatively well or ill proportioned to the conſtitutional State and Structure of the reſpiring Organs; as is ſhewn more fully in the third Chapter.

31. Thirdly, the Air has moreover a very great and important Uſe and Operation within the primary concoctive Gland the Stomach, with its Appendage the whole inteſtinal Tube, which is the true and real Root of the whole Body, to which it bears the ſame Relation as the Root of a Tree does to the Trunk and Branches. And as the internal Surface of the alimentary Tube from the Mouth quite to the Anus, is to be conſider'd as a real Part of the external Surface of the Body, conſequently the mechanical Effects of the Air within and upon the ſaid Alimentary Tube, will be like an Analogous (allowing for ſome Differences) with what they are upon the external Trunk of the Body; or much rather to what they are upon the Lungs (the internal Area of which Organ, being alſo a real Part of the external Area of the Body) this Organ and the compound Alimentary Tube, by means of the Diaphragm and abdominal Muſcles, having an alternate Motion of Syſtole and Diaſtole at the ſame Time; the Air within the Alimentary Tube being alternately condens'd and rarefied, at each Act of Expiration and Inſpiration of the Lungs, whereby it ſerves to attenuate and diſſolve the Texture of the Food, and to propel and forward its Motion through the lacteal Veſſels and thoracick Duct to the Heart and Lungs, to be farther elaborated and ſanguified, &c. And here again the Air from its good or bad Effects within this compound Alimentary Tube acquires an univerſal Command and Influence over animal Health and Diſeaſes; according as it happens to be well or ill proportioned in Quantity and Qualities, to the conſtitutional State and Structure of this complex Organ the Stomach and Inteſtines; as will be found more particularly deſcrib'd in the ſeventh Chapter.

32. Fourthly, as all the animal Fluids are fully ſaturated and abſorb'd with elementary Air and Fire; as the Atmoſphere undergoes any Change in its Gravity, Elaſticity, Preſſure, Heat, Cold, &c. This internal abſorb'd Air and Fire, arreſted within the Pores and Interſtices of the Fluids, will ſuffer a like Change, and by endeavouring to maintain a Ballance with the external elementary Air and Fire, the whole ſolid vaſcular Syſtem, with the contained Fluids, will by the Action of thoſe two variable antagoniſt Powers, the external and internal Air, with the external and internal elementary Fire, become ſubject to a perpetual State of Motion, Oſcillation and Exerciſe; being thereby kept always contracting or dilating; condenſing or rarefying; heating or cooling, &c. by virtue of which conſtant univerſal Action of the internal Air upon the whole Syſtem of the Fluids, and by neceſſary Conſent upon the whole Syſtem of the Solids likewiſe, the Air acquires a ſtill farther univerſal Empire and Influence over the Life, Health and Diſeaſes of Animals, as it happens to be relatively well or ill proportioned, in its Quantity or Qualities, to the State and Conſtitution of the Solids and Fluids; as may be found farther explained in the third Chapter.

33. We ſee then how our Bodies are in every Part, both Solids and Fluids, internally and externally, and at all Times, ſubject to the abſolute Dominion and Influence of this moſt active ſubtil variable Fluid the Air, which having ſo intimate a Union with all the Fluids, and ſuch univerſal Acceſs and Operation upon the whole Syſtem of the Solids and Fluids; that it may be eſtabliſh'd for a phyſical Maxim and Aphoriſm of eternal Truth; that the Air, including its four general mechanical Operations upon the Body, (as deſcrib'd in the laſt four preceding Numbers) is the principal moſt general Cauſe and Inſtrument that preſides over animal and vegetable Life, and by which all that relates to the Preſervation of Health, and alſo to the Production and Cure of Diſeaſes, in a Manner wholly depends.

34. Thus then we ſee that the true general productive Cauſes of all Diſeaſes are Air, Aliment, elementary Fire, Motion, and Reſt, with the Paſſions, among which the Air is confeſſedly allow'd by all to be the principal and moſt general Cauſe, as it neceſſarily muſt, conſidering its fourfold univerſal Operation upon the Body. When therefore the Air is the Cauſe of any Diſeaſe, from any of its four Ways of operating upon the Body, by reaſon of its being relatively diſproportionate in its Properties, Qualities, or Quantity, to the conſtitutional State either of the whole external Body, or to the State and Structure of the Lungs, or alimentary Tube; and likewiſe of the Fluids; in all ſuch Caſes when the Diſeaſe is produc'd from the diſproportionate Operation and Effects of the Air, in any of the ſaid four Reſpects; it will be abſolutely impoſſible and in vain to expect a perfect ſafe laſting Cure, by any other Means or Medicines in Nature, but from the Air itſelf alone, by changing it for another Air, that is endow'd with Properties and Qualities oppoſite and contrary to thoſe by which the Diſeaſe was produc'd; now to illuſtrate the Truth hereof ſhall produce

duce the following Caſe: Suppoſe then the Air of any Place to be comparatively light, humid, warm, *&c.* ſuch a State of Air, by any of its four general Ways of operating, either upon the whole external Body, or upon the reſpiring Organs, or upon the alimentary Tube, and chylopoietick Organs; as alſo within the animal Fluids, (as has been briefly explained already in the foregoing Numbers) will naturally and neceſſarily produce a general Relaxation of the Solids, with a Viſcidity of the Fluids, and a general Reſiſtance and Obſtruction throughout the ſeveral Series of Veſſels and Glands, whence will enſue, Tumors, Conſumptions, Atrophies, Aſthmas, Agues, Dropſies, Cachexies, Scurvies, Hyſteric and Hypochondriac Affections, Palſies, Cholic, *&c.* with all the long Train of Diſeaſes that retain to the chronical Kind. This being granted, when therefore ſuch a State of Air as above-mentioned is the true Cauſe of the Diſeaſes here ſuppos'd, the true and only perfect Cure is for to change it for an Air that is endow'd with contrary Properties and Qualities, namely, for an Air that is relatively heavy, dry, ſerene and moderately cold; which Change of Air may be had by going into ſome other Place or Country, where the Air for ordinary is poſſeſs'd with thoſe Properties and Qualities; or ſuch a Change of Air may be obtain'd by Art, without being oblig'd to change ones Habitation or Reſidence for that Purpoſe, as I ſhall ſhow in the following Eſſay. Now when the Air is either the ſole Cauſe of any Diſeaſe, or has the principal Share and Agency in producing the ſame, as it always will in moſt Diſeaſes, it would be abſolutely in vain to attempt the Cure by any other Means or Medicines in Nature, but by a Change of Air; for whatever Relief or Reprieve any other Means or Medicines would procure to a Perſon in this Caſe, without changing the Air, would be only palliative, deceitful and fugitive; for as long as the original productive Cauſe ſubſiſts, and continues to act, the Diſeaſe which is the Effect of that Cauſe, can never be perfectly ſubdued, but will return again with freſh Vigour. The Caſe being exactly the ſame as to attempt the Cure of a Dropſy by purging, ſalivating, ſweating, bliſtering, tapping, *&c.* for tho' the Waters may be carry'd off and kept under for ſome Time by thoſe Means, yet ſo long as the renal Glands continue obſtructed, or otherwiſe incapacitated for the due Performance of their Office, which is the principal and immediate Cauſe and Seat of this Diſtemper, it will be impoſſible ever to effect a perfect laſting Cure, without removing and taking away the Cauſe thereof, by reſtoring the renal Glands to their natural conſtitutional moving Force, *&c.*

35. However in the foregoing Number we have ſuppos'd the Air, by any one of its four general Ways of operating upon the Body, as ſufficient of itſelf alone to produce all Diſeaſes, yet this is not to be underſtood, ſo as to exclude all the other general Cauſes, namely, Aliment, Exerciſe, and the Paſſions; any one of which alone are likewiſe capable of producing all the ſame Diſeaſes, all that is meant here, is, that the Air is for ordinary the moſt common general Cauſe, or at leaſt has the greateſt Share and Inſtrumentality therein. But let the Diſeaſe be produc'd either from Air, Aliment, Exerciſe, or the Paſſions; ſeparately, or jointly; there is but one true general Intention of Cure; and that is, to remove and take away the Cauſe of the Diſeaſe, or change its Modus and Manner of acting; and thus if the Diſeaſe be occaſion'd from Errors as to Aliment of any Kind, either in Quantity or Quality, it muſt be chang'd for Aliment with contrary Properties; and if the Diſeaſe be the Effect of too much, or too little Motion and Exerciſe, the ſame muſt be chang'd and varied accordingly. And if the Diſeaſe be owing to any predominant Paſſion, or to a State of Indolence and Inaction, the ſame muſt be govern'd and regulated accordingly; and when any two, three, or all the ſaid four general Cauſes concur, and are jointly concern'd in the Production of any Diſeaſe, Regard muſt be had to change and regulate all the ſeveral co-operating Cauſes accordingly, *&c.*

36. The Cure of all Diſeaſes, be they of what Kind ſoever, can only be truly and perfectly effected, either by removing the Cauſe of the Diſeaſe wholly, or in changing its Modus or Manner of Operating, by cauſing it to act with Properties and Qualities contrary to thoſe by which the Diſeaſe was produced. And as all Diſeaſes are produced from Aliment, Air, Exerciſe, and the Paſſions, conſequently they only are the true, perfect, natural, general Means and Remedies for the Cure of all Diſeaſes: The Truth of which Poſition is ſufficiently eſtabliſh'd and warranted from the two old received Maxims, namely, *Sublatâ vel mutatâ Cauſâ, & tollitur vel mutatur Effectus.* And Diſeaſes are always to be cured by Cauſes, contrary to thoſe by which they were produced. And this appears to be the Judgment of all good Phyſicians, who place their whole Practice and *Materia Medica* chiefly in the four general Means aforeſaid, and in which they will always find the greateſt Succeſs and Safety, with all that is neceſſary to obtain Health, Long Life, with the Cure of all Diſeaſes. And thus we find them in moſt Caſes adviſing their Patients to a free Uſe and Change of Air, upon a well grounded Preſumption, and which ſeldom miſſes, That the Air of the Place is the principal Inſtrument and Cauſe of the Diſtemper; but where to find a proper Change either of Air, Aliment, or Exerciſe, and to know what Properties and Qualities the ſame ſhould have, in order to ſuit and agree the beſt with the Intentions of Cure, and the conſtitutional State of each Perſon; *(hic Labor, hoc Opus eſt)* and herein the diligent and learned Phyſician will have a fair Opportunity of diſtinguiſhing himſelf from Nominal, Pſeudo-Phyſicians and Empiricks, by his extenſive ſuperior Knowledge of the Animal Œconomy, and the true Nature of Diſeaſes, with the Phyſiology of the Air, Aliment, Exerciſe, and how for to apply the ſaid Catholick Principles and Remedies of Nature's Inſtitu-

tion properly, ſo as to make them anſwer the general good Ends for which they were ordain'd, namely, the Preſervation of Health, with the Cure of all Diſeaſes.

37. As Aliment, Air, Exerciſe, with the Paſſions, are the true and only Cauſes of all Diſeaſes, they become of Conſequence the true and only perfect Means and Remedies for Curing the ſame; and from hence it follows alſo, That all other Means or Medicines beſides thoſe Catholick Remedies of Nature's Appointment, are not only vain and uſeleſs, but really prejudicial and deſtructive of Health, eſpecially all ſuch as are derived from the foſſil Kingdom, and are only the Produce and Manufacture of intenſe, artificial Fire, *&c.*

38. The Mechanical Operation and Effects of all Means or Medicines, either for Preſerving Health, or the Cure of Diſeaſes, conſiſts altogether in the Quantity of Motion which they are capable to add to, or ſubſtract from the animal Solids, and in Regulating the Quantity, Qualities and Diſtribution of the Fluids, ſo as to produce a juſt Equilibrium throughout the whole Machine and all its Parts, by keeping the moving Force of the Solids duly proportioned to the Reſiſtance and Reaction of the Fluids. Thus, for Inſtance, among the Remedies now in Practice, thoſe of the moſt noted univerſal Virtue and Efficacy are Emeticks; now the Intention, real Operation and Effects of all Medicines belonging to this Claſs, may be all properly conſider'd as a particular Way of exerciſing or communicating a new and unuſual Quantity of Motion to the whole Syſtem of the Solids and Fluids; by firſt producing an extraordinary Stimulation and Motion in the Stomach, which by the ſtrong Effort which it makes to diſengage itſelf from this uneaſy, ungrateful Stimulation, (by neceſſary Conſent and Connexion, this compound Organ with its Appendage the Inteſtines, being the true and real Root of the whole Body) brings the entire Syſtem of the Solids and Fluids into a State of violent Motion and Exerciſe for a Time, by which univerſal ſtrong Efforts the Body becomes greatly agitated, convulſed, and has a great Quantity of Motion communicated thereto during the Operation of the Medicine, by which frequent ſtrong Contractions and Vibrations thus excited in the Solids, they will be enabled to ſhake off and expel any foreign Particles as may have inſinuated themſelves into their Pores and Interſtices, and thereby relaxing and clogging their Springs; and if there be any degree of Lentor or Viſcidity in the Fluids the ſame will become diſſolv'd, and Obſtructions in the ſeveral Series of Veſſels, Viſcera and Glands remov'd, and moſt of the Secretions increas'd, *&c.* Now all thoſe ſalutary good Effects are wholly owing to the great additional Quantity of Motion that is thus communicated to the animal Solids and Fluids, and not to any transforming Virtues or occult ſpecifick Qualities or Powers in the Medicine itſelf; for could the Body be put into ſuch a State of Motion and Exerciſe without taking any Medicine at all internally, the very ſame ſalutary good Effects would be produced, as is manifeſt from the univerſal great Efficacy of Bathing, the whole Effects whereof conſiſts in its Preſſure and in the great Quantity of Motion and Exerciſe which the Body receives during the Operation, *&c.* And the ſame general Obſervation and Reaſoning is equally true and applicable to Opiates, which by exciting a grateful placid Stimulus and Senſation in the Stomach, *&c.* brings on a general Relaxation throughout the Solids and nervous Syſtem, and thereby diſpoſes the Body to a State of Reſt, Inaction and Indolence. The ſame general Remark is equally true as to all other Remedies and Means of healing of what Kind ſoever, ſuch as Catharticks, Dieureticks, Sudorificks, Salivaticks, Epiſpaſticks, Bathing, Frictions, Cauſticks, Cauteries, Veneſection, Odontalgicks, Opthalmicks, Sternutatories, Exerciſe of all Kinds, *&c.* All which ſeveral Kinds of Remedies are only intended and have no other Effect or Uſe than to communicate Motion more or leſs, either to the Solids and Fluids of the whole Body, or only of ſome one, or more of its Organs or Members; and for directing and regulating the Quantity, Qualities and juſt Diſtribution of the Fluids, ſo as to cauſe them to manifeſt their Effects either upon the inteſtinal, renal, ſalival, cutaneous Glands, *&c.* And from hence it is manifeſt, that all Diſeaſes may be refer'd to this one general Head of too great, or too ſmall a Quantity of Motion in the Solids and Fluids; and conſequently all the Intentions of healing, with the whole mechanical Operation and Effection of all Means and Medicines may be reduc'd to this general one alone, of regulating the Quantity of Motion in the Solids and Fluids, by adding or ſubſtracting, until all the ſeveral Organs and Glands are poſſeſs'd with their natural conſtitutional Quantity of Motion, by which alone they will become enabled to perform their reſpective Offices duly, and to maintain a juſt Ballance with each other, wherein alone conſiſts the Eſſence and Definition of perfect Health.

39. The Powers and Virtues of all Medicines and Means of healing (by what Names or Titles ſoever dignified) whereby they become capable of adding or ſubſtracting Motion to, or from the animal Machine, and in regulating the Quantity, Qualities, Direction and Diſtribution of the Fluids, conſiſts wholly in the mechanical Properties and Qualities wherewith they are endow'd, namely, their Fluidity, Gravity, Elaſticity, Preſſure, Momentum, Attraction, Heat, Cold, Stimulation, Humidity, Dryneſs, *&c.* and whereas all thoſe Properties and Qualities are to be found moſt eminently in thoſe five cardinal Principles, namely, Aliment, Water, Fire, Air, and Exerciſe, conſequently whatever Alterations or Intentions can be produc'd by any other Means or Remedies by virtue of the above mechanical Properties and Qualities, the ſame may be much more certainly, ſafely and perfectly effected by proper Methods of applying the ſaid four Catholick Principles, appointed by Providence as the chief Inſtruments and Cauſes of animal Life, Health and Diſeaſes.

40. From what has been ſaid it follows, that the moſt perfect, ſafe, expeditious Method for the

the Cure of Diſeaſes, muſt be that whereby Motion in all Quantities and Degrees, can be moſt expeditiouſly, ſafely and univerſally communicated to or ſubſtracted from the Solids and Fluids of the whole Body, or of ſome particular Region, Gland, or Organ thereof; and by which the Quantity, Qualities and Diſtribution of the circulating Fluids, can be beſt govern'd and regulated.

41. The foregoing Obſervations and Reaſoning being allow'd for juſt, I ſhall from thence deduce the following general Propoſition, the ſeveral Caſes whereof, with their Solution, Uſe and Application, ſerves as the Baſis of the new Methods for preſerving Health, and curing Diſeaſes, as deſcrib'd in the following practical Eſſay.

Proposition I.

42. The moſt perfect, ſafe, expeditious, univerſal Method for communicating and ſubſtracting Motion in all Quantities and Degrees to and from the Solids and Fluids of the humane Body, and for regulating the Quantity, Qualities, with the Direction and Diſtribution of the Fluids; is by applying a proper Quantity of Preſſure, *&c.* either to the whole external Body and its ſeveral Parts, or to the Lungs, by means of ſome Fluid, either Air, or Water, *&c.*

43. For Proof of this capital Propoſition, I need only appeal to the Conduct and Method inſtituted by Providence for the Continuance of animal Life, having for this Purpoſe appointed the Air, which by its operating with a continual and variable Quantity of Preſſure, *&c.* upon the whole Body, together with its other changeable Properties and Qualities, ſerves as a perpetual active Principle for communicating Motion and Exerciſe to to the whole animal Syſtem, by which Means it becomes the general Agent, Inſtrument and Cauſe that preſides over animal Life, Health and Diſeaſes. As is ſhewn farther in the ſecond Chapter.

44. Nature, which is always the moſt perfect Original to imitate and copy after, inſtructs us farther as to the Truth of the foregoing Propoſition, that a Machine conſiſting of a Syſtem of elaſtick compreſſible Veſſels, fill'd with Fluids, capable of Condenſation and Rarefaction, ſuch as is the humane Body, and likewiſe the Lungs, that the moſt perfect Method for continuing ſuch a Machine in a State of Health and Motion, is by applying an elaſtick Fluid, ſuch as the Air thereto, and cauſing it to operate thereupon, with a continual variable Degree of Weight and Preſſure, *&c.* of which we are furniſhed with an admirable beautiful Inſtance in the compound Operation and Mechaniſm of the Lungs and Air, how that by the alternate variable Preſſure of the Air upon the Blood, as it circulates ſucceſſively through the Syſtem of the pulmonary Veſſels, the Fluids are thereby kept ſtrongly moved, triturated, mix'd, ſanguified and prepared for the ſeveral Offices of the animal Œconomy. As is farther explain'd in the ſecond and third Chapters.

45. That Preſſure when thus apply'd by an elaſtick Fluid as the Air, and that in a proper Quantity, and equable univerſal Manner to a compreſſible vaſcular Machine ſuch as the humane Body, is capable of producing the greateſt and moſt important Changes both in the Solids and Fluids, and that in the moſt perfect, expeditious, effectual and univerſal Manner, is a Truth eaſily demonſtrable from the Structure of the humane Body, and the Principles of animal Mechaniſm, with the eſtabliſh'd Laws of Motion, Impulſe, Percuſſion, and the Preſſure of Fluids moving in elaſtick Tubes, with the Laws relating to the Communication of Motion, *&c.* But the Truth of the foregoing capital Propoſition we have fully confirmed from daily Experience and Facts, which in Caſes of this Nature is always the beſt Rule to judge and go by; and that is from what we may daily obſerve from the Effects of Bathing, by a judicious Application whereof many Diſeaſes receive a perfect Cure, which could never have been effected by any other Remedies; now this great Efficacy of the Bath, whereby it produces thoſe many and great Cures, is principally owing to the Weight and Preſſure of the Water, together with the Stimulus ariſing from its Cold or Heat, whereby the whole animal Machine becomes ſubjected to a univerſal Compreſſion and Contraction, and having a great additional Quantity of Preſſure and Motion communicated thereto during the Operation, the whole ſolid vaſcular Syſtem being put under a general Effort, Squeeze and Struggle, and being made to oſcillate and vibrate ſtrongly and quickly, Obſtructions in the Veſſels and Glands will become thereby remov'd, and the Lentor of the Fluids diſſolved, and the ſame render'd better fitted for their reſpective Offices, *&c.*

46. For farther Proof of the foregoing Catholick Propoſition, namely, that Preſſure when apply'd by means of a Fluid, either Air or Water, to the humane Body, in a proper Quantity, for a requiſite Time, and at due Intervals, is capable of effecting the greateſt and moſt notable Alterations in the Solids and Fluids. It will be ſufficient for this Purpoſe only to conſider the Structure of the Body, which being compos'd of an Aſſemblage of elaſtick, contractile, diſtractile Veſſels, fill'd with compreſſible Fluids, whenſoever any additional Preſſure is laid thereupon, either by means of Water or Air, (but more eſpecially by Air, which being the natural Element to which the Body is ever accuſtomed, will anſwer this Intention much better and more univerſally than Water, except in ſome particular Caſes) the Effects of that Preſſure will be communicated and propagated inſtantaneouſly throughout the whole animal Syſtem, in ſuch wiſe that every the ſmalleſt ſolid Fiber, with the moſt minute evaneſcent capillary Tube, with the contain'd Fluids, will feel the Influence thereof and become ſenſibly affected and contracted thereby; and again upon taking off this additional Preſſure from the Body, the whole ſolid vaſcular Syſtem by its intrinſick reſti-

tutive

tutive Force will expand and dilate, and both the Solids and Fluids undergoing an univerſal Diaſtole, the Body will become increas'd in its Bulk and Dimenſions. And after this Manner the whole Body may be made to oſcillate and vibrate ſucceſſively, from the Surface of the Body to its Axis, and from the Axis outwards to its Surface, and that for as long a Time as requir'd, *&c.*

47. Moreover a variable Degree and Quantity of Preſſure, communicated by an elaſtick Fluid, as the Air, is abſolutely neceſſary to all Degrees of Animal and Vegetable Life, and as Animals differ conſiderably in their Solids and Fluids, they require a different Quantity of Preſſure, and thus Fiſh having their Solids more lax and leſs cohering and firm, and their Fluids more groſs and viſcid, require a greater Preſſure to be laid upon their Bodies, than Land Animals, whoſe Bodies are of a firmer Compoſition; for which Reaſon they are fitted for living under Water, whereby they become Subject to the Preſſure of both Elements, and by going to greater or leſs Depths in the Water, they can at Pleaſure greatly alter the Quantity of Preſſure upon their Bodies, which Land Animals can't do, except it be the winged Race, that can mount aloft to great Heights in the Air.

48. As the Air is allowed by all to be the moſt univerſal Cauſe and Inſtrument of Health and Diſeaſes, as will plainly appear from what has been ſaid, compared with the other Parts of this Eſſay; ſuppoſe now a Perſon had it in his Power for to change that Part or Portion of the Atmoſphere immediately encompaſſing his Body, whenſoever he pleas'd, and whereſoever he went; ſo as to cauſe it to operate (independently of the general Atmoſphere) both upon his whole external Body, and likewiſe upon his Lungs; with all its Properties and Qualities ſo changed and adjuſted as ſuits and agrees beſt with the preſent State and Conſtitution of his Body, and reſpiring Organs; ſuch a Perſon would thereby become effectually ſecur'd from all the Diſeaſes which he would otherwiſe have been ſubject to, from the variable Influence and Effects of the general Atmoſphere. Thus, for Example, ſuppoſe the general Atmoſphere to undergo a ſudden Change with Reſpect to any of its Properties and Qualities, as from being extreamly heavy, to become extreamly light, now ſuch a Change in this one Property of the Air alone, if continued long, is ſufficient to ſubject the human Body to many and great Diſeaſes, by relaxing all the Solids, and giving Liberty to the Fluids to rarify and expand too much; from all which morbid Impreſſions, the Perſon here ſuppoſed will become effectually ſecured, by cauſing or commanding his artificial portable Atmoſphere to operate with ſuch a Degree of Preſſure upon his Body, as he finds ſuits beſt with the State of his Solids and Fluids. Again, ſuppoſe the general Atmoſphere to become of a ſudden extreamly hot, damp, and light withal, in this Caſe it will have a much greater and more general Influence in the Production of Diſeaſes, but ſtill this Perſon with his artificial travelling Atmoſphere, will be unaffected, and Proof againſt all thoſe or any other Alterarations that fall out in the general Atmoſphere, by cauſing this his artificial Atmoſphere to operate with ſuch a Degree of Heat, Dryneſs, and Preſſure, as ſuits beſt with the preſent conſtitutional State of his Body; and ſo for all other Changes, Alternations, and Combinations, that can any wiſe happen in the Properties and Qualities of the general Atmoſphere, this portable partial Atmoſphere, like to a Coat of Armour, affording him a ſure Relief and Sanctuary againſt all ſuch morbid Impreſſions from the Air.

49. In the ſeveral States of the Atmoſphere, as ſuppoſed in the foregoing Number, the Influence of the Air has been underſtood as applied and operating only upon the external Body, by its Effects upon which alone, all Manner of Diſeaſes may be produced, but if we conſider the mechanical Effects of the ſame States of the Atmoſphere, as above ſuppos'd, when apply'd to the Lungs, in that Caſe we ſhall find them to have ſtill a much greater univerſal Influence in the Production of Diſeaſes of all Sorts, which, however, the Perſon with this his travelling artificial Atmoſphere may ſecure himſelf entirely from, by cauſing the ſame to operate with its Properties and Qualities ſo regulated combin'd and adjuſted, as ſuits beſt with the preſent conſtitutional State of his reſpiring Organs.

50. A Perſon provided and arm'd with ſuch a magick artificial Atmoſphere, ſubject to be changed in all Reſpects at his Pleaſure, may bid Defiance to all the Mutations that happen in the general Atmoſphere, for as much as let the State thereof be what it will, heavy or light; denſe or rare; hot or cold; wet or dry; in Motion or at Reſt; impregnated with Vapours and Effluvia of any Kind, or not, *&c.* if he either actually finds or apprehends any ill Effects therefrom, he can fit and prepare his portable artificial Atmoſphere or Shell of Air, with contrary Properties and Qualities, and that in all Degrees, Combinations, and Proportions, as agrees beſt with the preſent State both of his Body and reſpiring Organs; whereby he will become effectually ſecured againſt the malignant Influence, or the relatively diſproportionate Operation and Effects thereof, to which general Cauſe alone, moſt Diſeaſes, as well particular as endemick, and epidemick, are wholly owing.

51. However the foregoing ſuppoſed Caſe of having the general Atmoſphere, or ſuch a Part thereof as ſurrounds our Bodies, ſubject to have its Properties and Qualities changed at the Will and Command of every Perſon, is impoſſible; yet, nevertheleſs, by proper Machines, it may be render'd ſo; this Conſideration, therefore, furniſhed me with the firſt Hint and Occaſion of thinking of a proper Machine and Apparatus for ſolving this moſt uſeful Problem, whereby an artificial Atmoſphere may be at all Times, and for any Space of Time, and in all Places, conſtructed

ſtructed and prepar'd, with its Properties and Qualities ſo regulated, adjuſted and proportion'd in all Degrees and Reſpects, as ſhall fit and agree beſt with the conſtitutional State and Structure both of the Body and reſpiring Organs of every individual Perſon; and likewiſe as ſhall ſuit and anſwer beſt for effecting all the general Intentions that can be propoſed for the Cure of all Diſeaſes, *&c.*

52. It has been already obſerv'd, that the Health and Diſeaſes of the Body depends chiefly upon the Solids, which are always neceſſarily affected in all Diſtempers; and for ordinary, all Diſeaſes make their firſt Attacks upon the Solids, and gain Acceſs and Entrance that way. Now the principal morbid Affections of the Solids are, their being either too tenſe, elaſtick and contracted, or over much relaxed; or in having too great, or too ſmall a moving Force. And as the Air with all its Properties and Qualities has ſuch univerſal Acceſs and Influence over all the Solids, it becomes the principal Cauſe whereby the ſaid two oppoſite morbid States of the Solids are brought about. Thus, if the Air prove to be light, warm, humid, *&c.* the Solids will become relaxed by the Humidity and Warmth of the Air; and for want of a proper Degree of Preſſure in the Air to ſuſtain them outwardly, they will yield and become diſtended by the Fluids, which will become rarified and expanded at the ſame Time, and by the ſame Cauſes; whereupon the Solids will become relaxed, by having their compounding Fibrillæ ſet at too great a Diſtance aſunder, whereby the Force of Coheſion between them being diminiſhed, their Elaſticity and moving Force will alſo become weakned proportionally. And again, when the Air happens to be poſſeſſed with the contrary Qualities, and proves heavy, dry, cold, *&c.* the Solids and Fluids will be affected in a contrary manner to what they were in the former ſuppoſed Caſe. The Solids being brought into cloſer Union and Contact, will become ſtrengthened, and have their Elaſticity and motive Force increas'd, and the Fluids be condens'd at the ſame Time, and by the ſame Cauſes. Now a Perſon, by having a proper Machine or artificial Atmoſphere wherein to incloſe his Body, and by cauſing this artificial Atmoſphere to operate upon his Body and Lungs, for any reaſonable Time, with its Properties and Qualities intended or remitted, regulated and adjuſted in all Degrees, Proportions and Combinations as ſuits beſt, he will become thereby furniſhed with the moſt effectual, perfect, ſafe, univerſal Method, for obtaining thoſe two primary Intentions, which virtually include the whole Practice of Phyſick, namely, of contracting, bracing and raiſing the moving Force of the Solids, when too languid and depreſſed, or of relaxing and diminiſhing their motive Force, when raiſed too high. Such an artificial Atmoſphere being a real fluid Mold, by which a Perſon may new mold and faſhion his Body at Pleaſure, and keep the Springs of his Solids moſt perfectly wound up to what Pitch he pleaſes, in like manner as putting his Wig in Buckle.

53. From the foregoing Obſervations and Reaſoning, I ſhall advance this other general Propoſition for a certain phyſical Aphoriſm and demonſtrable Truth, upon which a new and more perfect Practice may be eſtabliſhed for the Preſervation of Health, and the Cure of Diſeaſes.

Proposition II.

54. All the general Intentions requiſite either for preſerving Health, or curing Diſeaſes, (as enumerated in Number 18.) may be effected in the moſt perfect, ſafe, expeditious, univerſal Manner, by ſubmitting the human Body for a reaſonable Space of Time, and at due Intervals, to a proper additional Quantity of Preſſure, either by means of Air or Water; join'd and aſſiſted with their other mechanical Properties and Qualities, of Gravity, Elaſticity, Heat, Cold, Stimulation, Motion, Attraction, Humidity, Dryneſs, Effluvia, *&c.* applied to the Body and Lungs, in ſuch Degrees, Proportions, and Combinations, as will agree beſt with the conſtitutional State and Structure of the Body, and reſpiring Organs, and for promoting the ſeveral Indications, *&c.*

55. As the mechanical Methods for preſerving Health, and the Cure of Diſeaſes, here only deſcribed in general, but explained more particularly under the proper Heads in the following Treatiſe, are entirely new and uncommon, I am ſenſible the ſame will afford copious Matter for ſuch Perſons to diſplay their Talents, whoſe Genius and Faculties are turned for Raillery, Sneer and Ridicule; and who having nothing from their own Fund and Invention to offer worthy the Attention of the Publick, are ever prepared to cenſure and depreciate the Performances of others. However, to obviate what Objections may either ariſe from ſuch Perſons, or others of a more ſerious Caſt and Diſpoſition; I will only produce one Caſe out of the many that might be cited, which being duly ſtated, conſider'd and determin'd, will fully open up the Deſign, Neceſſity, and Uſefulneſs of the new Methods of curing Diſeaſes deſcribed in this Treatiſe.

56. For this Purpoſe, I will ſuppoſe a Perſon affected either with an Aſthma or Conſumption, I will ſuppoſe farther, that the true original Cauſe of this Diſeaſe, as it regards this particular Perſon, to be produced wholly from ſome one or more of the Properties and Qualities of the Air, either from its Gravity, Elaſticity, Preſſure, Heat, Cold, Moiſture, Dryneſs, Effluvia, *&c.* operating with a Momentum and Force relatively diſproportionate to this Perſon's reſpiring Organs; that the foreſaid Diſeaſes (when not hereditary, or proceeding from a Male-Conformation of the Parts) is moſt commonly produced from the diſproportionate Influence of the Air, as here ſuppoſed, is what every good Phyſician will readily allow.

57. Now the Caſe being thus particularly ſtated, the preſent Practice of Phyſick furniſhes us only with two general Methods of Cure in the above Caſes. The firſt Method directs the Patient to go into ſome other Country where the Air is ſuppos'd to be endow'd with different Qualities. This Method, though much the moſt rational and perfect of the two, is however ſo very circumſcribed and limited, as to be of little Uſe: Firſt, as there are but few Perſons whoſe Circumſtances and Condition of Life will admit of changing their Habitation: And ſecondly, this Method, when it can be complied with, yet labours under this invincible Difficulty and Uncertainty, as it is ſcarce poſſible to know, *a priori*, where to find a Place, the Air whereof ſhall have the Properties requiſite for ſuch a Perſon's Caſe. As this firſt Method can ſeldom be complied with and put in Practice, Phyſicians are forced to have Recourſe for Ordinary to the ſecond general Method, and that is, to endeavour to attack and conquer the Diſtemper by the whole Poſſe and Legion of Remedies of all Forms and Compoſitions, from the animal, vegetable and mineral Provinces; but all in vain, as every honeſt candid Phyſician will allow, for ſuch Remedies, with what Titles and Encomiums ſoever dignified, or by whomſoever recommended, can procure no other than a palliative, apparent tranſient Cure or Reprieve, ſo long as the original productive Cauſe of the Diſeaſe, the Air, continues to operate with the ſame relatively diſproportionate Properties and Qualities.

58. From what hath been ſaid, it is manifeſt, that as yet we have no true, certain, perfect Method for the Cure of this Diſeaſe, *&c.* Now all good Phyſicians will readily allow, that if the Air of any Place could have its Properties and Qualities all chang'd, regulated and adjuſted in all Quantities, Proportions and Combinations, until they are brought to operate with ſuch a Momentum and Force, as ſuits beſt with the preſent conſtitutional State and Structure of this Perſon's reſpiring Organs; and to have the ſaid Properties and Qualities of the Air intended or remitted in all Degrees and Combinations, from time to time, and at all times, according as the preſent urgent Symptoms ſhall indicate and direct, could this be both duly and judiciouſly executed, the Perſon here ſuppoſed will receive a thorough, laſting, ſafe and perfect Cure, which could not poſſibly be effected by any other Means or Medicines in Nature.

59. From the foregoing Conſiderations, I ſhall here propoſe the following Problem, the Solution, Uſe and Application whereof, with its ſeveral Caſes, ſerves as the Baſis and Subject of the following Treatiſe.

PROBLEM.

60. To find a Method whereby the Properties and Qualities of Air, Water, and Motion, namely, their Gravity, Elaſticity, Preſſure, Stimulation, Motion, Heat, Cold, Humidity, Dryneſs, Effluvia, *&c.* may be changed, regulated and adjuſted in all Quantities, Proportions and Combinations, and of applying and cauſing the ſame to operate either upon the whole external human Body, or its Parts, and alſo upon the reſpiring Organs, with ſuch a Momentum and Force, as ſuits and agrees beſt with the conſtitutional State and organical Structure of every individual Perſon; and that at all Times, and for as long a Time, as anſwers beſt with the ſeveral Indications that offer, either for the Eſtabliſhment of Health, or the Cure of Diſeaſes.

61. The right Solution of this Problem, with its ſeveral Caſes, as it comprehends the whole Practice of Phyſick in its utmoſt Extent and Perfection, with the whole *Materia Medica*, being of infinitely greater Uſe to Mankind (to whom Health is the greateſt temporal Happineſs) than the Diſcovery either of the Longitude, perpetual Motion, or Philoſopher's Stone, *&c.* therefore naturally claims the moſt ſerious Attention and Encouragement of the Publick. And whether I have ſucceeded in the Solution of this general Problem, with its ſeveral Caſes, as may be found deſcribed in the following Treatiſe; I humbly ſubmit and refer the ſame to the impartial Conſideration and Determination of the Illuſtrious and moſt Learned the College of Phyſicians in *London*, &c.

62. From the Obſervations already made, with what may be found in the following Treatiſe, the under-mention'd general Rules and practical Aphoriſms may be deduced.

63. Firſt general Rule is, Never to account for the original Production of Diſeaſes, from a Chain and Multiplicity of remote hypothetical complex Cauſes, when the ſame can be done by others more ſimple and ſelf-evident; and which we are fully convinc'd from Reaſon, Experience and Facts, are ſufficient and adequate for producing the ſame. Now thoſe general productive Cauſes of Diſeaſes I have ſhewn to be Aliment, Air, elementary Fire or Heat, Exerciſe or Motion, with the Paſſions; which general Principles will furniſh us both with the true and proper Cauſes of all Diſeaſes, and likewiſe with the moſt perfect, ſafe, ſucceſsful, univerſal Means and Remedies for curing the ſame, as will be more fully ſhewn hereafter.

64. Second general Rule is, never to propoſe or undertake the Cure of any Diſeaſe, by a Multiplicity of Means and Medicines, the Properties and Qualities whereof, with their ultimate Effects upon the Body, we never certainly know; ſuch as are moſt of the artificial Remedies now in Uſe, when all the ſame Intentions of Cure can be more ſafely and perfectly effected by a few ſimple univerſal Means and Remedies, which are for that End appointed by Providence, and diſpens'd to all Mankind pretty equally and alike, and are endowed with all the Properties and Qualities neceſſary to conſtitute them the moſt ſovereign Catholick Means and Remedies; and thoſe we ſhall find

find to be Aliment, Air, Water, elementary Fire or Heat, Motion or Exercise, with the Passions, which when properly used and apply'd according to the new Methods describ'd in this Treatise, will afford all the necessary Means for attaining Health, long Life, and the Cure of all Diseases.

65. Third general Rule and Maxim is, never to undertake the Cure of any Disease by means of Medicines given internally, when the same can be effected by proper mechanical Methods and Means apply'd to the Body externally; now in this Essay I have shewn, that whatever Intentions are necessary to be produc'd in the animal Solids and Fluids, the same may be effected more safely, expeditiously and perfectly, by proper Methods of applying the mechanical Properties and Qualities of Air, Water, and Motion, to the humane Body externally, as also to the respiring Organs, with the joint Assistance of Aliment, than by any internal Medicines however dignified with pompous Epithets, but for the most prove only false and deceitful Titles.

66. By the new mechanical Methods, describ'd in this Essay, for curing Diseases by applying the Air, *&c.* outwardly to the Body, and Lungs; this happy Consequence and important Advantage will be obtain'd, namely, that by this Means the Stomach with its Appendage the intestinal Tube, and chylopoietick Organs, will become wholly freed from all the supernumerary Trouble of serving as a common Canal or Sewer, for preparing and conveying Loads of nauseous Medicines to all Parts of the Body, and be kept and left at full Liberty to do what is their natural and proper Office of preparing the Aliment for the Use and Nutrition of the Body; whereas according to the present fashionable Method of curing Diseases by internal Remedies, the Stomach and Intestines, whether they really want such Helps or not themselves, must notwithstanding, sustain and receive the Shock, Battery and Assault of the whole Posse and Medly of Medicines, and that too when the same are intended only for Relief of some of the Outworks and external remote Parts, such as a Tumor, Ulcer, or Inflammation upon the Finger, Toe, or Penis, *&c.* by which unnatural Method the Stomach and chylopoietick Organs, which are the first principal Organ and Laboratory of the Body, become necessarily demolished by the many violent Shocks, Convulsions, and ungrateful Stimulations which they are thus made to undergo, not only for Relief of their own proper Disorders, but likewise for those of all the other Parts; by which Means they must by Degrees become disabled and incapacitated for doing their own proper Duty, and thereby lay a certain sure Foundation for Diseases of all Sorts; it being an old and true physical Aphorism, that the Errors of the first primary concoctive Gland the Stomach, are not to be made good or repair'd afterwards; so that according to this Method of curing Diseases, Disorders, and Ailments, by internal Remedies, it most commonly happens, that this most essential compound Organ the alimentary Tube and chylopoietick Organs, become destroy'd unseasonably and long before their proper natural Time, and that perhaps to save or give Relief to a Part of infinitely less Consequence, which is curing one Disease, and at the same Time making sure Way for others much worse.

67. Another great and peculiar Benefit accruing from the new Methods describ'd in this Essay, for the Cure of Diseases by applying the Air, *&c.* outwardly to the Body, is, that this Method will prove not only more perfect and universal, but likewise much safer than by using internal Medicines, the Truth whereof is manifest from this Consideration, that in the Cure of Diseases by the new mechanical Methods of applying the Properties and Qualities of Air, *&c.* to the Body, as also to the respiring Organs, if any ill Consequence or Effect should be observ'd to ensue therefrom, the Body or Lungs can have the Cause of that Disorder immediately and wholly taken away, whereupon the Effect or Disorder must disappear and vanish of course. But in curing by internal Remedies, the Case is quite different; for let the Medicine be what it will, there is no recalling of it, so that it must have its full Effect, good or bad, upon the Body, neither is any Physician able either *à Priori*, or *à Posteriori*, to ascertain what are its first or ultimate Effects within the Body, nor to determine the Boundaries and Sphere of its Action, nor what Rout or Paths it takes in the Circulation, nor within what Part, or Parts, whether in the Solids or Fluids, its Effects are chiefly manifested, *&c.* All which Operations and Effects being wholly transacted by imperceptible Agents working in impenetrable Darkness, the Modus of their Operation will be for ever hidden from us. And as to the Issue of the Disease, as well as the Operation and Effects of the Remedy, we can pronounce nothing certain, but must entirely trust to Experience and Observation; our best Reasoning upon such Subjects, how mechanical soever, being only *à Posteriore*. And however, by the Use of internal Medicines, the present Disorder and urgent Symptoms may appear to be subdued and disappear for a Time, as in the Case of curing Agues by the Cortex, and the venereal Distemper, and cutaneous Diseases, *&c.* by Mercury, *&c.* yet no Physician the most knowing and experienc'd can give Security, or be answerable, that those very Medicines have not at the same Time done some real irrepairable Damage, either to the Solids and Fluids of the whole Body, or of some one or more of its principal Organs or Glands, *&c.* which is greatly to be fear'd is most commonly the Case. For which Reasons, when the Intentions of Cure can be effected as well or better by external Means, properly apply'd to the Body, and respiring Organs, or to the several distinct Regions and Parts of the Body, that the same will always be found the safest, and consequently the most eligible Method, and ever preferable to the internal invisible Methods of Cure, which are always uncertain, and often dangerous and fatal.

68. That proper Aliment, and Air, with Exercise or Motion, are the true general cardinal Means for preserving Health, and the Cure of Diseases, hath been a receiv'd unalterable Maxim

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and Aphoriſm with the beſt Phyſicians in all Ages; conſequently the true Practice of Phyſick may be reduc'd chiefly to three general Branches, namely, the preſcribing of a proper Regimen with reſpect to Aliment, Air, and Motion or Exerciſe. Now the firſt great Branch of Phyſick relating to Aliment hath hitherto been greatly neglected and diſregarded, and that chiefly from a very weak trifling Conſideration, of its being the common, tho' very unequal Subject of every Perſon's Obſervation, from whence we find but few Attempts made to improve this moſt material and eſſential Part of Phyſick, except what hath been done by Doctors, *Cheyne* and *Arbuthnot*, but in much too general a Manner, to be uſefully apply'd in particular Caſes. Therefore recommending this as a moſt copious Subject, and highly deſerving to be yet farther improv'd; I ſhall proceed to the Subject of this Treatiſe, which is to ſhew how the other two general Branches of Medicine, namely, Air, Water, with Motion or Exerciſe, *&c.* may be apply'd to the humane Body, and all its ſeveral Parts, in the moſt perfect Manner both for the Preſervation of Health, and the Cure of Diſeaſes.

69. But here I think it neceſſary in the firſt Place for to enter the following general Remark by way of Advice and Caution; that as the mechanical Methods to be found deſcrib'd in this Treatiſe, together with proper Aliment, will be ſufficient to anſwer all the Intentions and Indications that can poſſibly offer either for the Preſervation of Health, or the Cure of Diſeaſes; it is notwithſtanding carefully to be remember'd, that the Uſe and Application of any of the ſaid mechanical Methods deſcrib'd in this Treatiſe, however obvious and plain, are not to be raſhly and unadviſedly enter'd upon without the ſpecial Advice of a Phyſician, it being a receiv'd Maxim, that whatever is capable of doing great Good, when properly apply'd; the ſame when irregularly uſed will be productive of equal Miſchief; wherefore none but thoſe that have by long Experience, Obſervation and Study, acquir'd a thorough perfect Knowledge of the Laws by which the animal Machine or Microcoſm is govern'd, and who know what Changes and Alterations are wanting in the animal Solids and Fluids, and how the ſame may be effected by the Mechanical Properties and Qualities of Aliment, Air, Water and Motion, can pretend with Succeſs to direct the proper Times and Seaſons, when any of thoſe new mechanical Exerciſes here deſcrib'd are to be enter'd upon, and for what Space of Time the ſame are to be continued, with the proper Quantities, Qualities Caſes, and other Circumſtances relating thereto, *&c.* And this Obſervation we find oftentimes verified, and particularly with Reſpect to the Practice of Bathing, which under a ſkilful prudent Management will be found of ſovereign Efficacy in the Cure of many Diſtempers, but when injudiciouſly uſed, will prove as certainly the Parent and productive Cauſe of the very ſame, and moſt other Diſeaſes; as will more fully appear from the two new Methods of Bathing, either with Water alone, or with Air alone, or with both the ſaid Elements, and all their ſeveral Properties and Qualities, mutually combin'd together, in all Quantities, and Proportions, as deſcrib'd in the two firſt Chapters of this Treatiſe, *&c.*

A NEW MECHANICAL PRACTICE OF PHYSICK.

CHAP. I.

General Obſervations on the mechanical Properties and Effects of Bathing, wherein is propoſed the Conſtruction and Deſcription of a new Machine, whereby Bathing of all kinds will be rendered infinitely more efficacious and uſeful, not only in all the Caſes and Diſeaſes wherein it is now uſed and found beneficial, but in many other particular Caſes and Diſtempers, to which the preſent Method of Bathing will no wiſe extend; by which Means the Practice of Bathing will receive the greateſt Improvement, and become rendered the moſt perfect Exerciſe for preſerving Health, and likewiſe the moſt ſovereign univerſal Remedy for the Cure of Diſeaſes, &c.

1. AMONG the Non-Naturals there is none contribute more to Longevity, Health, and the Cure of Diſeaſes, than a well choſen Diet, with Temperance, a good Air, and a well regulated Exerciſe; and among all the different kinds of Exerciſe, there is none that can compare for Efficacy with the Cold and Hot Baths; which, by the concurring Teſtimony and Suffrage of the greateſt Phyſicians in all Ages, are allowed to be the moſt univerſal efficacious Remedies in the whole Compaſs of Nature; and the many extraordinary Cures that are obſerved to be daily and evidently effected thereby, which had been attempted before, but in vain, by the uſe of any other Medicines, ſerve as an abundant Proof of the Truth thereof.

2. Firſt then with reſpect to the Cold Bath, the whole mechanical Operation and Effect whereof upon animal Bodies, may be referred to two general Principles, namely, its Coldneſs, by which it operates as a Stimulus upon the ſenſitive Organs, and brings the whole Syſtem of the Solids into a State of Contraction, which is always the Effect of all Dolorifick Senſation and Stimulation; as Relaxation is the neceſſary Conſequence of all Senſations accompanied with Pleaſure and Indolence. But the principal Property wherein its Efficacy chiefly conſiſts, is its Weight and Preſſure, for this appears to be the principal Intention and End propoſed by Bathing, namely, that in placing the Body under Water, by the additional Weight and Preſſure whereof, like to an univerſal Bandage applied to the Body, the whole elaſtick vaſcular Syſtem may be ſtrongly ſtimulated, compreſſed, and put into frequent contractile and diſtractile Oſcillations, Tremors, and undulatory Motions, whereby the Fluids, if viſcid, will be attenuated and rendered more fluxil, and made to move with an increas'd Velocity and greater Freedom throughout the ſeveral Series of Veſſels, and become better fitted for the Offices of the animal Œconomy, as the Circulation, Secretion, Nutrition, *&c.* and by the frequent ſtrong Vibrations of the Solids, with the increas'd Momentum of the Fluids, the Glands and Viſcera will become ſcoured, all Obſtructions removed, and the Secretions augmented, eſpecially by the renal and cutaneous Glands, *&c.*

3. Beſides the aforeſaid mechanical Effects of the Cold Bath, depending upon its Weight, Preſſure, and Stimulation, ſome Authors maintain moreover, that the Water inſinuates itſelf into the Veſſels in the time of Bathing: This Opinion, however attempted to be eſtabliſhed upon the Evidence of Mathematical Demonſtration, I cannot as yet readily ſubſcribe to, not ſeeing any ſufficient Reaſon to ſupport the ſame; for if ſuch a general Communication was ſuppoſed for the aqueous Particles to paſs thus into, and out of the Body, by means of proper inhaling and exhaling Veſſels, diffuſed all over the Cutis, the Senſe of Feeling muſt be inevitably deſtroyed thereby, inaſmuch as the Nerves miniſtring to Senſation or Feeling, which are plentifully diffuſed all over the Surface of the Body, would become ſo ſoaked and relaxed by the Humidity and Moiſture not only of the Bath in time of Bathing, but likewiſe from the Moiſture of the Atmoſphere, which muſt be continually paſſing into the Body, according to this Opinion, by the *Vaſa Inhalentia*, and by what paſſes out by the *Vaſa Exhalentia*, ſo as to be rendered incapable of performing thoſe quick tonick Vibrations, in which alone the Perfection and Operation of all Senſation conſiſts; for which Reaſons I am ſtrongly inclined to the contrary Opinion, that there is no ſuch general Communication for any aqueous Particles to paſs either into, or out of the Body, by any Veſſels

diſperſed throughout the Cutis; and as for the Diſcharge of the aqueous and aerial Particles out of the Blood, the animal Machine (as I ſhall ſhew hereafter in the third Chapter) is furniſhed with peculiar Glands and Organs, much better fitted for performing that Office. And I am farther humbly of Opinion, that one principal End and Uſe of the *Membrana Adipoſa*, which is expanded as a univerſal Covering over the whole Body underneath the Cutis, is deſigned to ſerve as a Defence and Barrier to prevent any aqueous Particles either from the Bath or Atmoſphere from paſſing into or out of the Body, the Oil and Fat wherewith the Cells of this Membrane are ever plentifully ſtock'd, having a repelling Force in reſpect to Water, the Truth of which Poſition we find confirm'd from what may be obſerv'd daily in the Experiment with a Piece of Spunge, Paper, and any animal Membrane or Filter; which being firſt well ſaturated with Oil, the ſame will never admit Water to paſs through it afterwards; and by Equality of Reaſon, I think it may be fairly concluded, that in a natural healthful State, no watery Particles, purely ſuch and *per ſe*, can paſs either into or out of the Body, by the Cutis, neither from the Bath nor Atmoſphere; the Adipoſe Membrane appearing to be deſignedly and of purpoſe expanded over the whole Body, to ſerve as a warm Covering to envelope the Nerves miniſtring to Feeling, and to defend them from the deſtructive Effects which they muſt have otherwiſe receiv'd, was there any ſuch general Communication by way of the Cutis, for the Circulation and Paſſage of any aqueous Particles into and out of the Body, which muſt have entirely deſtroy'd the Uſe and Operation of the Nerves miniſtring to Senſation, by reſolving and deſtroying their Elaſticity and Texture, there being a certain Degree of Tenſion and Elaſticity requiſite in the Nerves for to perform their reſpective Functions duly. And this Opinion is ſtill ſtrongly confirmed and corroborated, by obſerving, that in the more Northerly Climates, as the Air is ever proportionably more cold and moiſt, all Animals, both terreſtrial and aquatick, have this adipoſe cellular Membrane more plentifully replete with Oil or Fat proportionably, in order to form a ſufficient Defence againſt the Inclemency of the Weather, and to ſecure the Nerves from being damaged, either by the Intruſion and Abſorbtion of any watery Particles from the Atmoſphere inwardly, or by the Emiſſion and Ejection of any ſuch Particles from the Blood outwardly; for the ſame Cauſes which prevent any aqueous Particles from entering into the Body, will likewiſe hinder any ſuch from paſſing out by way of the external Cutis.

4. But what I have farther chiefly to obſerve in relation to the Subject now under Conſideration is, that according to the preſent Practice of Bathing, the principal Property wherein its ſalutary Effects chiefly conſiſts, that is its Gravity and Preſſure, cannot be varied and applied univerſally *ſecundum Majus* and *Minus*, and according to all the different Degrees and Quantities of Weight and Preſſure; which neceſſary Property and Condition it ought to have in order to render it a univerſal Remedy; and that for the very ſame Reaſon that other Medicines and Remedies require to have their Quantities or Doſes diverſified and varied, according to the ſeveral curative Indications and Caſes. Thus for Example, the preſent Practice of Bathing may be reduced to two Caſes, namely, that of a Perſon Swimming or Diving; now in the Caſe of Swimming, ſuppoſe the Area of the Perſon's Body equal to fifteen ſuperficial Feet, and taking one Part with another to be immerged two Feet under Water (which is more than what in this Caſe it really is) in which Caſe he will ſuſtain an additional new Weight and Preſſure from the Water of about 2280 Pounds; now this is both the very greateſt Quantity of Weight and Preſſure, and alſo the very leaſt that a Perſon can receive from the Water in the Caſe of Swimming therein, or by placing his Body in any other Poſture, and at a like Depth therein; ſo that from this Inſtance it plainly appears, that the Operation and Effects of the Bath depending upon its Weight and Preſſure, which is its chief and principal Property wherein its Virtue and healing Efficacy conſiſts, becomes in this Caſe and Way of applying and uſing it, of a limited determined Force and Quantity; ſo that a Perſon, let his Caſe and Condition be what it will, in going into a Bath after this manner, muſt always receive the very ſame additional Quantity of Weight and Preſſure without Variation. And again, as to the other Caſe and Method of Bathing, by Diving or Plunging to any conſiderable Depth under Water, with regard to which it is to be obſerv'd, that there are but very few Perſons that are Maſters of this Practice ever to render it of general Uſe. And moreover, in this Way of Bathing, the Preſſure, with the Stimulus, as well that produced by the Coldneſs of the Water, as that occaſioned by the Surprize from the ſudden Immerſion, become laid upon the Body ſo quickly and all at once, that unleſs all the Organs and Viſcera are ſound, great Damage, and oftentimes fatal Conſequences may enſue therefrom, for which Reaſon this Method of Bathing is rarely practiſed, except in extreme deſperate Caſes, as in the *Hydrophobia*, *&c.* Again, this Practice of Diving or Living under Water (tho' the moſt ſucceſsful and efficacious in obſtinate Caſes) cannot be continued but only for the Space of a few Seconds, which ſhort Time is not ſufficient to effect any important notable Change in the animal Machine, by ſubmitting it to a proper Quantity of Weight and Preſſure, and for a Time ſufficient to produce the curative Intentions propoſed thereby. And this is the chief Reaſon why this Method of Bathing by Immerſion or Plunging under Water, ſo often fails and miſſes in the Cure of the *Hydrophobia*, as will appear from ſome farther Obſervations to be met with in this and the Fourth Chapter, *&c.*

5. Now, in order to remedy this great Imperfection in the Practice of Bathing, either in cold or hot Water, whereby this, otherwiſe the moſt ſovereign univerſal Remedy in Nature (which

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according to the preſent Practice is render'd only a Remedy of a particular limited determin'd Force and Operation) may be reſtored, and made to anſwer all the ſalutary Purpoſes and curative Intentions for which it was deſign'd by Providence. For this End I ſhall here propoſe a new Method whereby a Perſon may have the Weight and Preſſure of the Water upon his Body, either increas'd or diminiſh'd according to any Quantity, and in any Ratio and Proportion requir'd, and as is judg'd will ſuit and anſwer beſt with his particular Caſe and the Indications of Cure; and the Perſon be put in a Condition withal for to continue and remain under the Operation and Effects of ſuch additional Weight and Preſſure for any Time ſufficient to anſwer and produce all the Ends, Purpoſes and Intentions that can be propos'd or expected therefrom.

6. For the Method of ſolving this capital moſt uſeful Problem, *vide* Draught and vertical Section, Fig. 1. Plate 1. compar'd with the horizontal Section and Plan agreeing therewith, Fig. 2. wherein let BBBB, repreſent either a cylindrical or ſquare Veſſel or Barrel of caſt Iron, of two, three, or four Feet in the Clear or Bore, and of ſix, eight, or ten Feet in Height or Length; ſo that a Perſon may have Room either to ſtand upright, or ſit down within the Barrel or Veſſel upon Occaſion. This Barrel (which for better Diſtinction I ſhall hereafter call the Bathing Veſſel) may be caſt with a ſolid cloſe Bottom at one End, and upon the lower open End, which muſt have a broad Ring or Flanch, there muſt be fix'd with Screws or Rivets a ſtrong even metallick Plate n n, with oil'd Leathers between to ſecure the Junctures, ſo as to render it very tight; in the Middle of this bottom Plate n n, is a round Hole o o, wide enough to admit a Perſon to go in and out thereat; withinſide the Bathing Veſſel and over this Hole there is fitted a circular metallick Plate or Cover u u, upon the under Side whereof is a Ring projecting a ſmall Way above the Plain of the Plate, the under Edge of which Ring being turn'd very true and even, bears upon the Inſide of the bottom Plate n n, with oil'd Leathers between, to ſecure any Water or Air from eſcaping out of the Bathing Veſſel, which muſt be Wind and Water tight; this Cover or Valve Plate u u, may be fitted to open and ſhut by turning upon an Axis or Hinge, for to let a Perſon paſs in and out of the Bathing Veſſel, (a ſeparate View and Section whereof with the circular Motion deſcrib'd by the Valve or Trap-door u u, in opening and ſhutting may be ſeen by the two Sections, Fig. 11. and Fig. 12.) Upon one Side, and down towards the Bottom of the Bathing Veſſel, is ingrafted a Pipe D Z, which communicates with ſeveral other Pipes proceeding from different Origines; thus it communicates by means of the perpendicular Pipe H P, with a large Copper or Boyler H, kept fill'd with hot Water; as alſo with the Ciſtern C, fill'd with cold Water, by means of the Pipe C P; the ſaid Pipe D Z, communicates alſo with the hydraulick Engine a a a a, by means of two ſhort detach'd Branches, namely, s s, which denotes the ſucking Pipe, and F F, the forcing Pipe, (*vide* Plan Fig. 2.) which Engine having a Communication by means of the Pipe w w, with ſome Reſervoir or Well of Water, (which is not expreſs'd in this Draught) ſerves for to throw the Water either directly into the Bathing Veſſel through the Pipe D Z, or up into the Copper H, to be heated for bathing, or into the Ciſtern C, which ſupplies the Bathing Veſſel with cold Water; all which ſeveral Intentions become anſwer'd by opening and ſhutting the proper Cocks of the reſpective Pipes of Communication. Now the Copper H which furniſhes the Water for the Hot Bath, and likewiſe the Ciſtern C, which ſupplies the Water for the Cold Bath, ought both to be elevated and rais'd to ſuch a Height in reſpect of the Bathing Veſſel, that the Water may have a ſufficient Elevation and Command over the Bathing Veſſel, ſo as to be capable to fill the ſame immediately when wanted, the Water running directly out of the Copper or Boyler H, as alſo out of the Ciſtern C, into the Bathing Veſſel through the Pipe D Z, without paſſing through the hydraulick Engine a a a a, which Engine raiſes and forces the Water by a continued circular Motion of the Axis A A, to which there are fitted two Forcers working in one and the ſame Barrel a a a a, whereby the Water is kept flowing in a conſtant Stream through the Force Pipe, and that without the Uſe of any Valves, which are the chief and great Imperfection and Obſtruction in all the modern Water-Works; now as to the Structure, Compoſition and Mechaniſm of this hydraulick Engine, with the Manner of applying the ſeveral auxiliary Powers thereto, the ſame could not poſſibly be repreſented here any otherwiſe than in general by this Figure, and as I have already given a full and particular Deſcription, with Draughts and Models of all its ſeveral Members, together with ſeveral other new Machines, in a Treatiſe relating to Hydraulicks, to which I muſt refer for Brevity. Moreover this ſame Engine is fitted by virtue of its Structure, for forcing and condenſing Air, as well as for forcing and raiſing Water, and the ſame is here underſtood to ſerve indifferently either for forcing Water into the Bathing Veſſel, or for forcing and condenſing, or for rarefying and exhauſting the Air in the ſaid Bathing Veſſel as there is Occaſion; for which Reaſon I ſhall call it indifferently by the Name of the Hydraulick, or Pneumatick Engine, according as it is apply'd for forcing either Water or Air into, or out of the Bathing Veſſel; and when the Engine a a a a is uſed either for condenſing or rarefying the Air in the Bathing Veſſel, in that Caſe all the Cocks upon the ſeveral Water-pipes muſt be cloſe ſhut, and nothing but Air permitted to come into the Engine Barrel, which may be done by having a ſhort Pipe ſolder'd on either to the Bottom or Side of the Barrel, (which Air-pipe is not expreſs'd in this Draught, to avoid embarraſſing the Figure with a Multiplicity of Lines and Parts, that may be readily conceiv'd without any linear Repreſentations) the Air having free Acceſs and Communication with the Engine Barrel by the ſaid Air-pipe, is afterwards thrown forcibly out firſt thro'

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the Force or ejecting Pipe h d, into the Veſſel x x x x, which may be of Iron, Copper or Glaſs, out of which Veſſel it is further propel'd and forc'd into the Bathing Veſſel, through the injecting Pipe i p, which is provided with two Cocks, one withinſide, and the other withoutſide the Bathing Veſſel. Now in order to know at any Time what Quantity of Air is in the Bathing Veſſel, with the Degrees of its Denſity, Elaſticity and Preſſure, for that Purpoſe upon one Side of the Bathing Veſſel is fix'd a ſmall Veſſel e e e e, which may be of Glaſs or Iron, and fill'd with Mercury as high as the prick'd Line m m; upon the Surface of the Mercury let ſome other Fluid, as Water, be pour'd to the Height mark'd, by the other prick'd Line w w, this Glaſs Veſſel communicates with the Bathing Veſſel by the Pipe e s, into which Glaſs Veſſel is fitted a Glaſs Tube or Pipe b b, cloſe at Top, but open at the lower End, which is immerg'd into the Mercury, and to that Part of the Tube withoutſide of the Veſſel there is affix'd a Scale divided into a proper Number of equal Parts, more or leſs as there is Occaſion; which being done in Proportion as the Air in the Bathing Veſſel is more or leſs condens'd by the Pneumatick Engine a a a a, the Air in the Glaſs Veſſel e e e e, above the Surface of the Mercury, being at the ſame Time equally condens'd, will cauſe the Mercury to riſe to different Heights in the Tube b b, (which for better Diſtinction I ſhall call the Mercurial Gage Tube) which with the Scale annex'd thereto, will ſhow at all Times the true State of the Air in the Bathing Veſſel, with reſpect to its Denſity, Elaſticity and Preſſure, and how much the ſame is either condenſed or rarefied over or under the mean State of the Atmoſphere, which at a Medium is equal to counterpoize a Collum of Mercury of about twenty-nine Inches high. And in order to diſcover at all Times the Temper and State of the Water and Air in the Bathing Veſſel, as to the Degrees of Heat ariſing therein, for that End there is another ſmall Glaſs Veſſel r r r r, fix'd on to the Side of the Bathing Veſſel, with which it communicates by the Pipe t q; in this Glaſs Veſſel is plac'd a Thermometer t t, with a Scale affix'd thereto, ſerving to mark all the Gradations of Heat from that of the greateſt natural or artificial Cold, to that of boiling Water and upwards; which extream Degrees of Heat are not intended for the Practice of Bathing, but may be of good Uſe for trying ſome Experiments upon brute Animals, with a View to clear up ſundry Points relating to the Animal Œconomy; which Experiments may be commodiouſly made in ſuch a Veſſel with a proper Apparatus, *&c.*

7. All Things being thus diſpoſed in the Manner as hath been deſcrib'd in the laſt preceding Number, I come in the next Place to exemplify and explain the Practice and Uſe of this new bathing Machine. For this Purpoſe the Door or Valve u u, at Bottom of the bathing Veſſel being ſet open, (as is ſhewn by Fig. 11.) The Perſon taking hold of the End o of the Rope, the other End whereof is made faſt to a Ring or Eye-bolt r, fix'd withinſide at the upper End of the Veſſel, and thereby draws himſelf up into the upper Part of the Bathing Veſſel (which upper Part for Diſtinction I ſhall call the Air-Chamber) upon the Inſide whereof is fitted a Board s s (vide Fig. 1.) made for to turn by means of a Hinge with its Plane either perpendicular to the Side of the Veſſel, in which Poſition it ſerves as a Seat for the Perſon to ſit upon; or the ſaid Board may be plac'd with its Plain flat againſt the Inſide of the Veſſel, when there is Occaſion for more Room within the Veſſel. The Perſon being thus ſeated in the Air-Chamber, at the upper End of the Bathing Veſſel, waits for the coming in of the Water, during which Time he may amuſe and exerciſe himſelf with a Fleſh Bruſh, or the Board s s, whereon he ſits, may be made pendulous, inſtead of being fixed with a Hinge, and ſo contriv'd and pois'd by means of Springs, as to afford him an Opportunity of exerciſing himſelf upon this ſpringing pendulous vibrating Chair, as if he was riding in a Coach. Moreover, either at top, or upon the Side of the Bathing Veſſel, there may be fix'd a ſmall Piece of ſtrong Glaſs, by which the Inſide of the Veſſel may be illuminated, either by the Light of the Sun, or of a Candle, to ſhew the Perſon in the Bathing Veſſel what is neceſſary to be done, and to enable him to converſe with the Perſons attending withoutſide the Bathing Veſſel, *&c.* Now I will ſuppoſe the Perſon to bathe with cold Water, for that Purpoſe the Trap-door or Valve u u, being cloſe ſhut, let the Cock of the cold Water-Pipe c p, be ſet open, whereupon the Water will ruſh out of the Ciſtern c, through the Pipe c p d, directly into the Bathing Veſſel, which may be fill'd therewith to any Height requir'd, as ſuppoſe to the prick'd Line w i, ſo that when the Perſon comes to deſcend out of the Air-Chamber into the Water, and ſtanding upright therein, he may be wholly cover'd therewith, the upper Surface of the Water reaching juſt above the Top of his Head, as is ſhewn by the little Image or Picture within the Bathing Veſſel. But before the Perſon deſcends out of the Air-Chamber into the Water, the Cock upon the cold Water-Pipe being cloſe ſhut for to keep the Water at its intended Height in the Bathing Veſſel, let the Pneumatick Engine a a a a be now ſet to work, to condenſe the Air in the Air-Chamber, which may be done in any Proportion requir'd; the Air in the Air-Chamber being brought to have the juſt Degree of Denſity and Preſſure intended, and ſuch as is judged will anſwer beſt with the Intentions and Indications of Cure which the particular Caſe of ſuch Perſons may require; which Degree of Denſity, Elaſticity and Preſſure of the Air in the Air-Chamber, may be moſt exactly known by obſerving the mercurial Gage Tube b b, noting the Height of the Mercury by the correſponding Diviſions and Numbers of the annex'd Scale. Now as the Air becomes more or leſs accumulated and condens'd within the Air-Chamber, the ſame will communicate a proportional Preſſure to the Water in the Bathing Veſſel: Let us ſuppoſe then the Air in the Air-Chamber to be condens'd into half the Volume and Space which it would occupy and poſſeſs

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if only compreſs'd by the external Atmoſphere; which being done, let the Cock of the injecting Pipe I P be cloſe ſhut, to prevent any Air from eſcaping out of the Air-Chamber, whereupon the Perſon taking hold of the Rope R O, quits his Seat, and thereby lets himſelf down into the Water, ſo that when ſtanding upright therein, the upper Level or Surface of the Water mark'd by the prick'd Line W I, may juſt reach above the Crown of his Head. In which Caſe this Perſon will be very differently affected to what he would be if placed in the ſame Depth of Water, and expoſed only to the open unconfined Atmoſphere; ſo that ſuppoſing the Area of this Perſon's Body to be equal to fifteen ſuperficial Feet, and being placed with his Body erect in the Water, and taking one Part with another, ſuppoſe his Body to be immerged two Feet under Water, (equal to what it is in Bathing according as is now practiſed) the additional Preſſure which he will ſuſtain in this Caſe by Bathing in ſuch a Depth of Water, and expoſed only to the Preſſure of the Atmoſphere, will be equal to about 2280 Pounds Weight; whereas the additional Weight and Preſſure which he will ſuſtain by Bathing in the very ſame Depth of Water, but expoſed to the Preſſure of a double Atmoſphere, or of Air twice as denſe as common Air, as the Air in the Air-Chamber is ſuppoſed to be, will be equivalent to about 39900 Pounds Weight; which is almoſt twenty times the Quantity of Preſſure which he ſuſtain'd in the other Caſe; and conſequently as the Effects produc'd from ſuch additional Quantities of Weight and Preſſure thus laid on, and applied to the animal Machine, muſt ever be proportional to their Cauſes, in ſuch wiſe that the Effects and Alterations produc'd in the Perſon's Body by the Method of Bathing as in the firſt Caſe, (which is the ſame with that in Practice) will be only but about one twentieth Part ſo great as in the ſecond Caſe, according to this new mechanical Method of Bathing; ſo that in this Caſe only there is twenty Chances to one of Curing any Diſeaſe, that is curable by Means of applying univerſal Stimulation and Preſſure to the Body by this new Method, above what can be obtain'd from the preſent Practice of Bathing. So that when the Air in the Air-Chamber is of twice the Denſity of common Air, the Perſon when ſtanding, with the upper Surface of the Water at W I, juſt covering the Top of his Head, ſuſtains the ſame Preſſure as if he was immerg'd to the Depth of thirty-ſix Feet under Water in the open external Air; and if the Air in the Air-Chamber be render'd five Times denſer than common Air, the Perſon in the Bathing Veſſel will ſuſtain a Preſſure equal to what he would do, by being immerg'd to the Depth of one hundred and eighty Feet under Water, and expoſed only to the Preſſure of the external Air or Atmoſphere; ſo that the Quantity of Preſſure that the Perſon will be ſubject to in this Caſe, when the Air in the Air-Chamber is five Times as denſe as common Air, will be upwards of one hundred Times greater than what it ever is or can be according to the preſent Practice of Bathing; and as the Air in the Air Chamber admits of being condens'd in all poſſible Proportions and Degrees, ſo its Preſſure upon the Body may be render'd of all Quantities requir'd. And as the healing Virtue and Efficacy of the Bath conſiſts chiefly in its Weight and Preſſure, which in the preſent Practice is only of one limited definite Quantity, whereas according to this new Method the Degrees and Quantity of Preſſure may be varied in all Proportions, ſo as to be render'd a hundred or a thouſand Times greater than what it is or can be in the Method of Bathing now in Uſe; ſo that this new Method will extend and become applicable to one hundred or a thouſand different Caſes, whereas the Method now in Practice extends only to one ſingle particular Caſe or Degree of any Diſeaſe. Now on the other Hand, if inſtead of condenſing the Air in the Air Chamber, the ſame be exhauſted in part or in whole, according to any Proportion, by the ſame pneumatick Engine, which ſerves equally either for condenſing or rarefying the Air, in which Caſe if the Air be underſtood to be exhauſted one fourth Part, the Perſon when ſtanding upright as before in the Water, will ſuſtain five Times leſs Preſſure than what he would do in a common Bath: Again, if the Air in the Air-Chamber be render'd only one half as denſe as common Air, in that Caſe the Perſon in the Bathing Veſſel will ſuſtain about ten Times leſs Preſſure than what he would have done by Bathing in the like Depth of Water in the open Air. And if the Air be ſuppos'd wholly exhauſted (which extreme Caſe it may probably never be proper or neceſſary to try upon Mankind, whatever it may upon Brutes) in ſuch Caſe the Perſon would ſuſtain only one twentieth Part of the Preſſure that he would do in Bathing the ordinary Way. And after this Manner the additional Weight and Preſſure upon the Perſon's Body, may be not only augmented to all Degrees required above what it is in the ordinary Way, but be likewiſe diminiſhed below what it is the common Way, *&c.*

8. Having deſcrib'd the Uſe of this Machine as it ſerves for Bathing with cold Water, if now it was requir'd to be uſed for Bathing with hot Water; in that Caſe the Bathing Veſſel being emptied of all the cold Water, by letting it run out through the waſte Pipe L P, at Bottom of the Veſſel, and then upon turning open the Cock of the hot Water Pipe H P, the Bathing Veſſel will be immediately filled to the ſame Height as before with hot Water out of the Copper or Boyler H, and during the Time the Bathing Veſſel is thus emptying of the cold Water, and filling anew with hot Water, the Perſon may retire to his warm Air-Chamber, where, placing himſelf upon his pendulous vibrating ſpringing Seat ss, he may amuſe and exerciſe himſelf, as before deſcribed. And when the Bathing Veſſel is filled with Water to the Height intended, he may deſcend from his Seat into the ſame, by taking hold of the Rope R O, and letting himſelf down therein, where he may continue for any Time proper to anſwer any Intentions of Cure, or

as long as he pleaſes, and under any Quantity of Preſſure, and likewiſe under any Degree of Heat, as is judged moſt proper to anſwer the particular Indications of his Caſe. The proper and intended Degree of Heat, being to be regulated and known by obſerving the Thermometer TT; and the Degree or Quantity of Preſſure intended may be known or adjuſted by the Mercurial Gage Tube b b, with the reſpective Scales annexed thereto, as has been ſhewn in the foregoing Number, where the Perſon was ſuppoſed as making uſe of the Cold Bath; there being no other Differences in the two Ways of Bathing, but only in reſpect of the Qualities of Heat and Cold. And the Perſon, whether in uſing the Cold or Hot Bath whenſoever he has a mind, may immediately diſengage his Body from the Water, by retreating into the warm Air-Chamber, by taking hold of the Rope R O, wherewith he raiſes his Body out of the Water, and, ſeating himſelf upon his Springing-Chair, may regale himſelf with ſuch Exerciſe as that Machine may be made to afford, namely, that of Agitation and Succuſſion, like as riding in a Coach, or on Horſeback, *&c.*

9. Having thus found a Machine, whereby the humane Body may be made to receive an additional, univerſal, equable Compreſſion from without; and having ſhewn farther how this additional Preſſure may be varied, regulated and applied, in all poſſible Quantities that can be required to anſwer all Caſes and Intentions of Cure whatſoever. Now, to render this Method perfect, there remains one Caſe ſtill to be ſolved and anſwered, and that is, to contrive a Way whereby the Perſon, whilſt incloſed within the Bathing Veſſel, may enjoy a free and perfect Reſpiration. Now, in order to ſolve this Caſe and Problem, various Methods may be ſuggeſted, ſuch as the following. Firſt, then, ſuppoſe the upper Level of the Water in the Bathing Veſſel to riſe no higher than to the prick'd Line w 2, ſo that when the Perſon ſtands upright his whole Head may appear above or without the Water; in which Caſe, upon bending his Knees, and ſhortning his Body, he may bring his Head all under Water, and ſo receive the ſame Benefit therefrom as in the Caſe before, when the upper Surface of the Water was ſuppoſed raiſed as high as w 1, above the Perſon's Head when ſtanding upright therein; ſo that whenever he wants to take freſh Breath or Air, he muſt bring his Head above Water until he has expir'd the old, and inſpired a freſh Charge of new Air; which having done, he may dive, or bring his Head wholly under Water as before, until he wants to reſpire again, when raiſing his Head above Water he takes in a freſh Supply of Air out of the Air-Chamber as before, and ſo alternately and ſucceſſively for any Time requir'd. But as the Air in the Air-Chamber will become in Time effete and unfit for Reſpiration, partly on account of having abſorb'd ſo much of the Vapours and Steam ariſing from the Perſons Lungs and Body, that it can receive or exhale no more, and having its Spring and Elaſticity greatly alter'd and chang'd thereby, and by the Heat communicated thereto by the Perſon's Body. Now for to remedy this Inconvenience, for that Purpoſe upon the upper End of the Bathing Veſſel there is ſolder'd an Air Pipe y y, with two Cocks thereto, one withinſide, and the other withoutſide the Bathing Veſſel; if now the Perſon finds the Air becoming anywiſe troubleſome and unfit for Reſpiration, turns open the Cock of this Air-pipe, all the rarefied corrupted Air will ruſh out of the Air-Chamber and become diſcharg'd and exhaled into the Atmoſphere, and ſetting the pneumatick Engine a a a a to work, the Air-Chamber may be perfectly ventilated and purg'd of all the corrupt Air, and being again repleniſh'd with freſh Air, upon ſhutting the Cock of the Air-pipe y y, and continuing either to inject more Air, or to exhauſt and rarify the Air in the Air-Chamber as there is Occaſion, the Air may be brought to have the ſame Denſity, and Preſſure as before; which being done, let the Cock of the injecting Pipe I P be ſhut, for to prevent the Air from returning back out of the Air-Chamber, and then the Perſon in the Bathing Veſſel will have the Air-Chamber repleniſh'd with a freſh Stock of Air, and of the ſame Denſity Elaſticity and Preſſure as at firſt, and thus alternately and ſucceſſively for any Time requir'd. Another Method of providing for the Perſon's Reſpiration whilſt incloſed in the Bathing Veſſel, is after this Manner; let the lower Part of the Veſſel x x x x, which may be of Glaſs or Iron, be fill'd with Mercury, the upper Surface whereof is denoted by the prick'd Line m m, and upon the Top of the Mercury let ſome Water or other Fluid be poured to the Height mark'd by the other dotted Line w w; b b is a Glaſs Tube from ten to twenty Feet in length, or more upon Occaſion, the lower incurvated End whereof being open is immerg'd into the Mercury. If now the pneumatick Engine a a a a be ſet to work, the Air may be injected in any Quantity into the upper Part of the Veſſel x x x x through the Pipe d h, and the exact Degree of its Condenſation within the ſaid Veſſel will become known, by obſerving the Station and Aſcent of the Mercury in the Gage Tube b b, with its correſponding Scale; and as the other mercurial Gage Tube b b, within the Veſſel e e e e, upon the oppoſite Side of the Bathing Veſſel, ſhews the Degrees of Condenſation and Preſſure of the Air in the Air-Chamber; by Means of which two mercurial Gages, the Air in the Air-Chamber, and that in the Veſſel x x x x, may be brought to have either the ſame Degree of Denſity and Preſſure, or that of any other different Degrees, and in all Proportions requir'd. The Veſſel x x x x (which for better Diſtinction I ſhall name the Reſpiring Veſſel) is join'd on to the Side of the Air-Chamber, by a ſmall Pipe a P, to the inner End a whereof within the Air-Chamber, there is join'd the End of a flexible, membraneous, leather Pipe r a, (which I ſhall for Diſtinction call the Reſpiring Pipe) the other End whereof r, the Perſon holds in his Mouth, which End of the Pipe may be form'd and conſtructed, ſome-

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what reſembling the Reed or Pipe of a Hautboy, with two ſmall Plates that ſhall ſhut cloſe together by a Spring or Valve, or there may be a Protuberance or Swelling, o, upon the Pipe; within which is a Valve to be open'd by the Hand, ſo as to permit no Air to paſs in, or out, through the Reſpiring-pipe; but upon the Perſon's taking the End, r, of the Pipe into his Mouth, and pinching the ſame between his Teeth, or with his Hand ſetting open the Valve within the Protuberance, o, the Spring Valve commanding the Orifice of the Pipe becomes thereupon open, and upon his Inſpiring or Sucking, the Air will come in from out of the Reſpiring Veſſel, through the Reſpiring-pipe r a, and inflate his Lungs; and in performing the Act of Expiration, he may either eject the Air out of his Lungs into the Air-Chamber; or by having ſuch another flexible Pipe, as r a, to fix on to the ſhort Pipe 45, ſolder'd on to the Side of the Bathing Veſſel, by taking the End of which Pipe into his Mouth at every Expiration he may eject the Air out of his Lungs into the open Atmoſphere. The Suction or Reſpiring-pipe being thus conſtructed, that the End r, which the Perſon holds in his Mouth, keeps always cloſe ſhut up of itſelf by the Spring Valve, there is no Neceſſity for his keeping the End of the Reſpiring-pipe always in his Mouth, but only at ſuch Times as he wants to breathe or take freſh Air. It is however to be remark'd, that the Perſon muſt not reſpire or receive any Air by his Noſe, which for that End muſt be kept cloſe ſhut or ſtopt by a Spring Wire made to preſs outwardly upon the Alæ or Wings of his Noſe, or other ſuch like Contrivance and Device, of which there may be Variety: So that by this Method a Perſon may have the Air ſerving to his Reſpiration, during the Time he is in the Bathing Veſſel, render'd either exactly of the ſame Gravity, Denſity and Elaſticity with the Air in the Air-Chamber incumbent upon his Body, or of any other Degree of Denſity and Preſſure, as he finds ſuits beſt with the conſtitutional State of his Reſpiring Organs. Or the Perſon during the Time of Bathing may be put in a Condition for to reſpire or breathe with the external Air, to this Purpoſe there is a Pipe 45, ingrafted on to the Side of the Bathing Veſſel, upon that part of the Pipe withoutſide the Veſſel are ſolder'd two ſhort Branches 52, 53, upon each whereof is a ſmall Protuberance or Cylindrical Cavity e and r; in the firſt whereof is a Valve opening outwards, when puſh'd againſt by the Air paſſing out through the reſpiring Pipe into the Atmoſphere, but becomes ſhut when puſh'd againſt with a contrary Direction; in the other Protuberant Part r, is another Valve, which opens inwards to let Air come in through the reſpiring Pipe, but hinders any from paſſing outwards through the ſame; if to the inner End 4 of this reſpiring Pipe be join'd ſuch a flexible Pipe as r a, the Perſon will be thereby enabled to reſpire or breathe with the common external Air, for upon his pinching the End r of the reſpiring Pipe between his Teeth, and beginning to ſuck, the external Air will puſh open the Valve in the Appendage r, and coming in will expand and inflate his Lungs, the other Valve at e being then ſhut, and in the Act of Expiration the Valve in the Appendage e, will be thrown open, the other Valve at r being then ſhut, and thus alternately. But if the Perſon keeps the End of the reſpiring Pipe conſtantly in his Mouth, (which he may with as little Trouble as ſmoaking of a Pipe of Tobacco) there will be no Occaſion for either of the two ſhort Pipes or Appendages e and r, with the Valves therein; for in that Caſe the Air may be received and ejected through the open Pipe 45, without any ſuch Valves, ſo that by any of the aforeſaid Methods, the Perſon in the Bathing Veſſel, being furniſhed with ſuch a flexible reſpiring Pipe, may deſcend ſafely, and continue immerg'd wholly under Water for the Space of a Day or longer, if required, being thus provided with as free and perfect a Reſpiration, as if in the open unconfin'd Atmoſphere.

10. Among the many great Advantages to be obtain'd from this new Bathing Machine, there is the following of ſingular Efficacy in particular Caſes, which is this: The Bathing Veſſel being entirely emptied of Water, by ſetting open the Cock of the waſte Pipe L P, if the Perſon in the Bathing Veſſel be furniſh'd with a flexible leather Pipe made to ſcrew on to the End D, of the Pipe A D, withinſide and down towards the Bottom of the Veſſel, upon doing which, if the hydraulick Engine a a a a be ſet to work, by applying Men to the Levers or Capſtane Bars a a, and being ſupply'd either with warm Water from the Copper or Boiler H, or with cold Water out of the Ciſtern c, the ſame may be projected and thrown with great Velocity through the Pipe a D, and the Perſon in the Bathing Veſſel holding the membraneous, flexible, leather Pipe in his Hand, may direct the Stream either cold or hot, upon any particular Region or Member of his Body, and if the Orifice of the flexible Pipe be arm'd with a Braſs Plate or Socket, perforated with many ſmall Holes, the Stream of Water will thereby become divided into ſo many leſſer Streams or Jetdéaus; which Method of applying the Water to the Body, will in ſome Caſes produce a much better Effect, than by letting the Water fall or impinge againſt the Body in one ſingle undivided Stream; and as the Water is capable by ſuch an Engine of being projected with all Degrees of Celerity, through ſuch a leather Pipe, the ſame will prove of very great Efficacy in that reſpect in the Cure of many Diſtempers, as Tumors, &c. eſpecially thoſe retaining to the chronical Kind, by reaſon of the Stimulus, with the frequent ſtrong Vibrations, Tremors, Concuſſions, and Pulſations, that will become thereby produced, kept up, and propagated through the ſeveral ſmall Machinulæ and elaſtick linear Solids of the muſcular Fibres and Nerves; by having the Water projected and thrown againſt them alternately by Jerks and Strokes, and with all Degrees of Velocity and Impulſe. Which End and Intention can no ways be anſwer'd ſo well by the common Method of Pumping, by reaſon the Water not being thrown

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againſt the Perſon's Body with a ſufficient Impetus and Force, is not capable of exciting ſuch ſtrong and laſting Undulations and Oſcillations in the original elementary Solids, in order to diſlodge the cold ſtagnating Humours, and fit them either for Circulation, Tranſpiration, or Suppuration, which appear to be the chief Ends and Intentions propoſed by this particular Method of Pump-Bathing.

11. Now in order to render this new bathing Machine more compleat and univerſal with reſpect to its Uſe in the healing Way; with that View there is added thereto as a farther neceſſary Appendage, another Veſſel or Boyler v v v v, (it is however to be noted, that all the Uſes of this Veſſel may be anſwer'd by the other Copper or Boyler H, ſo that this other Copper is added only for the better Diſtinction and conceiving the ſeveral diſtinct Offices and Uſes of the Machine) this Veſſel is cloſe ſhut with a Cover at Top, upon one Side and towards the upper End is ingrafted a Pipe v P, with a Stop-cock; the other End P, is join'd to the Pipe D Z, by which it communicates with the Bathing Veſſel, the Uſe of this Veſſel being to generate and produce Vapours and Effluvia, either humid or dry, or both together, and that either from pure ſimple Water alone, or from Water mix'd and allay'd with any other Materials, Solids or Fluids, or both, furniſhed from the Animal, Vegetable and Mineral Kingdoms, in all Quantities and Proportions; or the Vapours and Effluvia may be produc'd from any ſingle Body, Solid or Fluid, or from any Number of the ſame united and combin'd together, in ſuch Quantities and Proportions as is judg'd will anſwer beſt to promote the Indications of Cure. The Ingredients whether Solid or Fluid, from which the Exhalations and Effluvia are to be produc'd, are underſtood to be plac'd at Bottom of the Steam Veſſel, as within the Space v v u u, the Materials whether ſolid or liquid, or both together, upon applying a proper Degree of Heat thereto, either by means of boyling Water, or a naked Fire, a Sand Heat, Attrition, *&c.* the ſame will emit various Quantities of Vapours and Steam of different Kinds and Qualities, according to the Degrees of Heat apply'd thereto; which Vapours will become elevated and rais'd to the upper Part of the Copper, between its Cover and the prick'd Line u u, which Steam or Halitus when accumulated and collected in a ſufficient Quantity, upon ſetting open the Cock of the Steam-pipe v P, the Vapours will ruſh through the ſaid Pipe into the Bathing Veſſel, which may be impregnated and fill'd therewith in any Quantity deſir'd; and in caſe the Steam hath not Force enough of itſelf to fill and ſaturate the Air in the Bathing Veſſel ſo ſtrongly therewith as requir'd, in ſuch Caſe the Steam or Vapours may be made for to paſs firſt through the Pneumatick Engine a a a a, by which it may be forcibly thrown and crowded into the Bathing Veſſel in any Quantity deſir'd, ſo as to render the Vapours of all Degrees of Strength, Denſity, Elaſticity, Spiſſitude and Preſſure; as alſo in reſpect of the medicinal Qualities and Virtues of the Ingredients from which they were produc'd and generated, ſo that the Air in the Bathing Veſſel ſhall be ſufficiently impregnated and abſorb'd with the Particles and Effluvia thereof; by which Means the ſame may be prepar'd and fitted, ſo as perfectly to anſwer all the curative Intentions which are very many and great, that may be derived from ſubmitting the whole Body to ſuch a general Fumigation and Irroration, by the Uſe of ſuch Vapour-Baths, both humid and dry, *&c.*

12. By the other vertical Section, Fig. 3. Plate 1. the very ſame Machine and Apparatus for bathing is ſhewn, with that of Fig. 1. before deſcrib'd, only with ſome Difference reſpecting the Situation, Diſpoſition and Arrangement of the Parts and Members thereof; the chief Differences are, that the Bathing Veſſel B B B B, which in Fig. 1. is ſhewn as ſtanding with its Axis perpendicular to the Horizon, is in this other Draught repreſented with its Axis parallel thereto; with a poſterior View or Section of a humane Body, lying extended at full Length upon one Side within the Veſſel, and covered either wholly under Water, the upper Surface whereof being in that Caſe denoted by the prick'd Line D O, or the Body may only be cover'd in Part with the Water, the upper Surface whereof being then ſuppos'd at the prick'd Line w w; r P is the Suction or reſpiring Pipe, by which the Perſon is ſupply'd with freſh Air of any Denſity, out of the reſpiring Veſſel x x x x, for to enable him to breathe withal, *&c.* And as all the ſimilar correſponding Parts of this Machine are marked with the like Characters, as in the other Draught of the Machine, Fig. 1. and which has been explain'd in the preceding Numbers, by referring whereto, what farther relates to the Underſtanding of this Draught will become readily known.

13. Now with reſpect to this new mechanical Method of Bathing, for farther Illuſtration of the Uſes and Benefit thereof, I ſhall here ſubjoin ſome general Remarks and Obſervations. Now the principal Property wherein the healing Virtue and Efficacy of the Bath conſiſts, abſtracting from its Operation conſider'd as a Stimulus, is the additional Weight and Preſſure that becomes thereby laid upon the Body, which like to a univerſal Bandage and equal Stricture ſerves to compreſs, contract and ſtimulate the whole Syſtem of the Solids, whereby if any Degree of Viſcidity or Lentor prevails in the Fluids, which is commonly the Caſe in moſt Diſeaſes, the ſame will become broke and diſſolv'd by the frequent ſtrong Vibrations and Oſcillations excited and produc'd throughout the whole elaſtick vaſcular Syſtem, whereby the Secretions will be increas'd, and Obſtructions in the Glands and Viſcera removed, the Solids receiving at the ſame Time a ſenſible Addition of Strength from their being contracted, and having their ſmall elementary compounding Fibres and Machinulæ brought into cloſer Contact and Union, by the Preſſure and Stimulation of the Water. But as has been already obſerv'd, the chief Property of the Bath, namely, its Weight and Preſſure,

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is reduc'd according to the preſent Practice of applying it, within very narrow Limits; thus for Example, a Perſon upon going into any common Bath can't place his Body therein, ſo as to receive any greater additional Preſſure therefrom, than what is equal at moſt to two perpendicular Feet of Water, nor can he well receive any leſſer Quantity, if he intends to bathe his whole Body, ſo that this eſſential principal Property of the Bath, conſiſting in its Weight and Preſſure, becomes hereupon limited to one certain definite Quantity only; no Wonder then that its great and extenſive Virtue and ſalutary Effects, have been hitherto limited and in a great Meaſure loſt alſo, as we find to be the Caſe at preſent. Now to illuſtrate and exemplify this Point farther, it will be ſufficient for that Purpoſe duly to conſider and weigh the following ſuppoſed comparative Caſe. Suppoſe then two Perſons, one of which is of a ſtrong robuſt athletick Conſtitution; and the other of a weak, relax'd infirm State, as to their Solids; now both thoſe Perſons upon going into the ſame Bath, muſt receive the like Preſſure and additional Weight therefrom (ſuppoſing their Bodies of equal Dimenſions) notwithſtanding one of them is, and may be in a Condition to ſuſtain twice the Quantity of Preſſure and Stimulation that the other Perſon can; and his Caſe will neceſſarily require it, ſuppoſing his Solids to have twice the Strength as to Reſiſtance, Coheſion and Elaſticity; let us again ſuppoſe that the Quantity of Preſſure, which both Perſons receive equally and alike upon going into the ſame common Bath, to be exactly fit and duly proportion'd in reſpect of the ſtrong Perſon, and that the ſtimulating Force of the Bath, in reſpect to the Degrees of Heat and Cold, is likewiſe well proportioned and ſuited to the conſtitutional State and Temperament of his Body; it muſt follow by neceſſary Conſequence, that the ſame Degree and Quantity of Preſſure, with the ſame Degree of Stimulation, can never be proper and duly ſuited to the other weak valetudinary Perſon; by reaſon ſuch over great Quantity of Weight and Preſſure join'd to a like diſproportionate Stimulation, muſt greatly weaken and deſtroy the Spring and Motive Force of the Solids, inſtead of contributing to reſtore and increaſe the ſame, which is what is chiefly intended by Bathing; ſo that in this Caſe the ſtrong Perſon will receive a real Benefit from the Bath, but the weak Perſon a real manifeſt Damage. But now in this Caſe it muſt be carefully remark'd, that the true Reaſon why the Bath proves beneficial to one of the two Perſons, and prejudicial to the other, is becauſe its Momentum, Force and Efficacy, that is its Preſſure and Stimulus, are both duly proportioned to the conſtitutional State of the Solids of the ſtrongeſt Perſon, but was not ſo in reſpect to the other Perſon, the Caſe being here exactly alike and parallel, with giving a Child the ſame Quantity or Doſe of ſome ſtrong Emetick or Cathartick as to a grown Perſon; the firſt it muſt of Conſequence greatly injure if not deſtroy, whilſt it may produce a good Effect upon the adult Perſon; and juſt after the ſame Manner may the cold and hot Baths be either over-doſed or under-doſed, and by that Means become either beneficial or prejudical accordingly. But to return to the above ſuppoſed Caſe of the valetudinary Perſon; now it is allow'd that Bathing would be of equal Advantage to him, as well as to the other ſtrong Perſon, could both the Preſſure and Stimulus of the Bath be duly and properly adjuſted and proportioned to the relative weak relax'd State of his Solids; but as this Intention can't poſſibly be obtain'd by any of the Ways of Bathing as now practiſed; from whence it follows, that as this principal eſſential Property of the Bath can't be varied from leſs to greater, and the contrary, but being always apply'd to all Perſons, and in all Caſes, according to one immutable certain Quantity, like to a Medicine always exhibited according to one ſettled Doſe, without any Regard to the different Ages, States and Conſtitutions of Perſons, whether old or young, ſtrong or weak, *&c.* from whence it neceſſarily comes to paſs, that the preſent Method and Practice of Bathing becomes not only limited as to its Operation and ſalutary Effects, but proves moreover oftentimes greatly prejudicial by being thus apply'd and adminiſtred like to an over or under Doſe of a Medicine. Now in what Manner this great Imperfection and Objection with reſpect to the Practice of Bathing may be remedied, I have endeavoured for to ſhew by this new Machine; according to which new Method of Bathing, as plainly appears from what has been ſaid in the foregoing Numbers, this principal and chief Property of the Bath as to its Preſſure, *&c.* may be varied from leſs to greater, and contrarily, according to all Degrees and Quantities that can be neceſſary to anſwer any Intention of Cure, whereby the Practice of Bathing will by this new Method become now the moſt univerſal Remedy, and deſervedly claim the firſt Rank and Place preferable to all other Medicines in the *Materia Medica*; being now render'd capable of being apply'd and exhibited like as other Medicines are, according to proper Doſes, Weight and Meaſure, ſo as to fit and ſuit exactly to the Caſe, Condition and conſtitutional State of every individual Perſon, in ſuch wiſe as fully to anſwer all the Indications that can be wanted either for preſerving Health or curing Diſeaſes.

14. The Practice of Bathing being thus retriev'd and reſcued from its preſent narrow State and Confinement, and from its being only a particular Remedy, operating with a definite limited Force and Virtue, is now render'd by this new Method an univerſal Remedy of general unlimited Efficacy in all Caſes wherein Bathing of any Sort can be proper and of Uſe, in ſuch wiſe, that where Bathing would only ſuit and fit well to one Caſe before, it may now be made to anſwer and be of Uſe in a hundred or a thouſand different Caſes; and conſequently where it ſerv'd to cure one Perſon, or one Caſe before, it will now ſerve to cure a Hundred or a Thouſand; and as ſuch may be juſtly reckon'd, as the ſame is now improv'd, as the moſt efficacious capital Remedy in Nature; and when properly and judiciouſly apply'd, will ſerve to produce

all the primary Intentions wanting in the Solids and Fluids towards the Cure of Diſeaſes; all which Intentions of Cure may be compriz'd in this general one, in Regulating the Momentum and Quantity of Motion in the Solids and Fluids, ſo as to preſerve a due Equilibrium between thoſe two principal antagoniſt Powers of the animal Machine, by adding or ſubſtracting Motion to, or from either, or both, as it is found neceſſary; and in Regulating the Determination of the Motion in either, or both, as it is found wanting; and whereas the cold and hot Baths, when properly apply'd, ſerve as the moſt effectual ſafe Means for communicating Motion and Exerciſe to the animal Solids and Fluids, upon which Account it is that they acquire a ſuperior Excellency and Power preferable to all other Remedies in the Cure of many Diſeaſes; for during the Time of Bathing the whole elaſtick vaſcular Syſtem being ſtrongly compreſſed by the Weight of the Water, which according to this new improv'd Method of Bathing may be apply'd in all Degrees and Quantities, and being ſtimulated by its Coldneſs at the ſame Time, has thereby a very great Quantity of Motion impreſs'd and communicated thereto; and by the alternate Oſcillations and reciprocal Pulſations, that become produc'd thereby in the Solids and Fluids, the whole animal Syſtem becomes thereby throughly and intimately exerciſed in all its Parts, from the Circumference to the Center, and from the Center back to the Circumference, *&c.*

15. After what Manner the Body is affected by Bathing, may be more readily conceived by adverting to the little Picture or Figure of a Perſon, repreſented by Fig. 1. as ſtanding erect and wholly immerg'd under Water, the external Surface of the Perſon's Body being expreſs'd and defin'd by two parallel concentrick Lines; the outermoſt being one real continu'd Line, but the innermoſt a prick'd or diſcontinu'd Line, ſo that ſuppoſing the Surface of the Perſon's Body before going into the Bath, to be coincident with the outermoſt real Line; upon coming out of the Bath, the external Surface of his Body will be contracted by the Preſſure and Stimulus of the Bath, and become coincident with the innermoſt dotted Line; and the intermediate Space between both Lines, ſerves to expreſs the Quantity of the Expanſion and Contraction of the Body, before and after Bathing; and during the whole Operation and Exerciſe thereof, the Body will continue to vibrate quickly and ſtrongly, inwards and outwards, between the ſaid two Lines, *&c.*

16. Moreover in this new Method of Bathing with hot Water, the ſame may be brought to any Degree of Heat from that of extreme Cold productive of Froſt, to that of the greateſt Degree of Heat conſiſtent and compatible with animal Life, all which Degrees of Heat may be exactly regulated by obſerving the Thermometer, which Inſtrument becomes for that Reaſon a neceſſary Appendage of the Bathing Machine. Moreover the Water ſerving for the Bath may be variouſly prepared, compounded and impregnated with the Particles of Bodies of all Sorts, Animal, Vegetable, Mineral, Aſtringent, Relaxing, Stimulating, Anodine, Emollient, Digeſtive, Deterſive, Sarcotick, Diſcutient, Odoriferous, Aromatick, *&c.* according to the various Caſes and Intentions to be purſued in the ſeveral States and Periods of healing Wounds, Ulcers, Tumours, Inflammations, Gangrenes, and all other cutaneous Diſeaſes. And beſides, a Bath thus conſtructed and managed, may for a ſmall Charge be fitted and prepar'd, ſo as to anſwer all the Ends of any of the moſt noted ſaline, chalibeat, and ſulphurous natural Baths, either here at Home, or Abroad, by mixing the Water of the artificial Bath with Salts and Sulphurs, *&c.* like an Homogeneous, and in the like Proportions, as they are found to be in the ſaid natural medicinal Water Baths.

17. Now as a farther Proof and Inſtance of the great Efficacy and healing Virtue of the Bath, we ſhall here briefly conſider the Hydrophobia or the Bite of a mad Dog, or any other Animal, which is accompanied with one of the moſt frightful indomitable Diſtempers incident to Mankind: Now, in this Caſe, all Phyſicians, both antient and modern, unanimouſly agree in adviſing the Cold Bath, as the moſt effectual Cure; and moreover it is alſo obſerv'd, that the common Practice of Bathing with freſh Water, is not ſo beneficial, as Plunging or Diving to a conſiderable Depth in Salt Water; now all the Advantage (which is both real and conſiderable) that can be rationally propos'd and expected from this Practice of Plunging or ſudden Immerſion, more than from going into a common ordinary Bath, can only conſiſt in the greater additional Weight and Preſſure, allowing ſome part of the Effect to be owing to the Surprize which the Perſon is put into upon this ſudden Immerſion, which Surprize operates as a Stimulus. But upon conſidering for how very ſhort a Time a Perſon can bear ſuch Exerciſe of Living under Water, this Remedy, however the moſt efficacious of any hitherto known, yet is found to fail and miſs of Succeſs, and that chiefly for the two following Reaſons, namely, the Want of a ſufficient Weight and Preſſure from the Water, (it not being practicable nor ſafe to place the Perſon at any great Depth therein) and from his not being in a Condition of holding out or continuing under the Operation and Influence of ſuch an additional Preſſure, for a Time reaſonable to effect and produce the Changes and Alterations neceſſary to ſubdue and expel the Poiſon out of his Body. But now both theſe material Objections are wholly remov'd by this new improv'd Method of Bathing, as deſcrib'd in the preceding Numbers, wherein it has been ſhewn how a Perſon may be made to ſuſtain any Quantity of Preſſure from the Water in the Bathing Veſſel, from that of one Foot, to that of a hundred or a thouſand perpendicular Feet of Water, if requir'd, and the Perſon put in a Condition withal to continue under the mechanical Effects of that Preſſure for any Time, that may be judg'd neceſſary for anſwering all the curative In-

tentions

tentions that can be produced or expected therefrom. And moreover, the Water in the Bathing Veſſel may be render'd not only of all Degrees of Saltneſs, &c. but the Perſon by letting himſelf drop or fall ſuddenly from off his ſpringing pendulous Chair, down into the Water, will thereupon receive all the farther good Effects and Benefit ariſing from the increas'd Saltneſs and ſpecifick Gravity of the Water, together with that produced by the Surprize and Fright, from this ſudden Immerſion, which operates firſt upon his Imagination, and by neceſſary Conſent has the Effect of a univerſal Stimulus, by bringing the whole Syſtem of the Nerves and Solids into a State of Contraction. What great and mighty Changes may then be effected by ſubmitting the humane Body, conſiſting of a Syſtem of elaſtick compreſſible Tubes and Fluids, to ſuch great and variable Quantities of Preſſure, and that for ſuch a Space of Time as is requiſite to obtain all the ſalutary Effects of ſo powerful and efficacious a Remedy, are ſo obvious and manifeſt from the Laws and Mechaniſm of the Animal Machine, as not to need being more particularly detail'd and inſiſted on. And I am humbly of Opinion, that by a judicious Uſe of this new mechanical Method of Bathing, join'd and aſſiſted by ſome other new mechanical Methods of applying the Air to the humane Body (as may be found deſcrib'd in the ſecond, third, fourth and fifth Chapters following) that the moſt obſtinate deplorable Caſes of this Diſtemper, even when arriv'd at its worſt and fatal Period and diſtinguiſhing Symptom the Hydrophobia, together with all other Diſeaſes of the like rebellious Diſpoſition, may be conquer'd and brought to capitulate and ſurrender. But it muſt be remember'd withal at the ſame Time, that all Remedies as are of ſuch ſovereign Virtue and Efficacy in the Cure of Diſeaſes, the very ſame by an injudicious ill-timed Uſe and Application, become as certainly the Inſtruments and Cauſes of many Diſtempers, oftentimes much worſe than thoſe they were intended to cure; however this Imperfection and Objection is no ways to be charg'd to Bathing any more than to other Remedies; but is wholly owing to Ignorance and Want of Judgment in directing the proper Uſe and Application thereof; the true Knowledge whereof requires the ſoundeſt Judgment, greateſt Experience, and moſt perfect Acquaintance with the Animal Œconomy; and this hath been the chief Reaſon why Bathing hath miſcarry'd in many Caſes, and thereby brought this moſt noble ſovereign Remedy ſo much into Diſuſe and Diſrepute.

18. And I farther humbly think it demonſtrable from the Laws of Animal Mechaniſm, that by this new Method of applying the cold and hot Baths, together with the Uſe of the Vapour-Baths, both humid or dry, ſimple or compound, with the Method of topical Baths, as deſcrib'd in the ſixth and eighth Chapters; which being join'd and aſſiſted by the other Methods of applying the Air, &c. to the humane Body, as may be found deſcrib'd in the ſecond, fifth, ſixth and eighth Chapters; that all the ſeveral Degrees, Stages and Symptoms of the venereal Diſtemper, with all other cutaneous Diſeaſes, even thoſe of the moſt untractable Diſpoſition, as the Leproſy, &c. may be more certainly, ſafely and ſpeedily cured, than by any other Remedies whatſoever. And however Mercury has obtain'd the Preference in the Cure of the above Diſeaſes, I am nevertheleſs to a Demonſtration perſuaded, that this liquid Foſſil conſider'd either as exhibited crude, or as it is variouſly prepar'd and transform'd by Chemiſtry, that neither it nor any Medicines of the mineral Tribe, and ſuch as have thus undergone and been put to the Rack, Torture and fiery Inquiſition, and are only the forc'd caſual ſportive Productions of ſtrong artificial Fires, ſuch as are the Medicines of the chemical Pharmacy, that the ſame were never deſign'd nor intended by the Author of Nature, as proper Remedies for curing the Diſtempers of Animal Bodies, as having no manner of Affinity, Congruity and Agreement with the Principles which compoſe Animal Bodies; which as they require to be repair'd and nouriſh'd by Principles homogeneous and analagous with thoſe from which they were originally form'd; ſo their Diſeaſes can only be radically cured by Principles contrary to thoſe by which they were produc'd. For had Mercury any ſuch real ſpecifick Virtue for the Cure of Diſeaſes, it may be reaſonably concluded, that Providence would have rendered the Generation and Growth of Mercury as common and eaſy to be come at, as are the other great cardinal Catholick Remedies of Nature, namely, Aliment, Water, Air, &c. which we find to be univerſally diſpens'd and diſtributed to all Mankind, and that pretty equally and alike; whereas we find Mercury but of rare Growth, and only the Produce of ſome remote barren Countries, and lodged deep in the Bowels of the Earth, as it were to keep Mankind from coming at the Knowledge thereof; I think therefore that it will be readily allow'd by every unprejudic'd diſintereſted Perſon, that neither Chemiſtry nor Mercury, which makes the chief Subject of that Art, tho' both muſt be allow'd to be of great and extenſive Uſe when apply'd to their proper Ends, that is, to the Improvement of the mechanical mercantile Arts, Manufactures and Trades, and alſo to natural experimental Philoſophy; yet neither the one nor the other have ever done, nor are ever like to do any real Service to Phyſick or the Practice of Healing, ſince they have been apply'd thereto, which is but of modern Date. And moreover all the chemical Proceſſes and Preparations of Mercury by Fire, appear rather to endow it with noxious than healing Qualities, as becoming thereby arm'd and abſorb'd with ſo much concenterated Fire and ſaline Spiculæ, &c. as to be render'd fitted like ſo many edg'd Tools to tear, rend and deſtroy the Texture of the Solids; and this we ſhall always find to be the natural Effect of all ſuch Medicines. And however, upon the Uſe and Application of Mercury in the aforeſaid Diſtempers, the Symptoms may be conquer'd, and the Lentor, Viſcidity and ſaline State of the Blood become attenuated

nuated and diſſolv'd, by the great ſpecifick Gravity, Subtility, Attraction and Momentum of the mercurial Particles, by which the ſaline venereal Particles being broke, attracted and abſorb'd, are carry'd out of the Blood along with the mercurial Particles, when render'd commiſcible with the Blood, either by internal or external Application. But now at the ſame Time it remains to be conſider'd, that thoſe very Properties whereby the Mercury becomes capable to produce thoſe good Effects upon the animal Fluids, namely, its ſpecifick Gravity, Fluidity, Attraction, Momentum, empowers it at the ſame Time to do a much greater Injury and Damage to the animal Solids, by diſſolving the Coheſion and Texture of the ſmall original Machinulæ, ſerving to compoſe the firſt elementary linear Solids and Fibres, and by dividing and ſetting them at too great a Diſtance from each other, muſt ſo much weaken the Attraction of Coheſion between them as to become ever after irreparable. The Truth whereof is abundantly confirm'd from daily Obſervation as Matter of Fact, that ſuch Perſons as have undergone ſuch mercurial Courſes, Salivations, *&c.* though they may find the Syſtem of their Fluids apparently mended thereby for a Time, yet will find the Syſtem of their Solids ever afterwards under a declining State; ſo that in reality all thoſe Reliefs obtain'd by the Uſe of Mercury, are not only tranſient, deceitful and apparent, but are moreover the Cauſe, and lay a ſure Foundation for future Diſeaſes, much worſe than thoſe they were deſign'd to cure. And thus it may be remark'd, that ſuch Perſons as have had their Conſtitutions thus rack'd with Mercurials generally fall into a waſting tabid State as to their Solids, whence Conſumptions, univerſal and partial Atrophies, Dropſies, *&c.* enſue as the natural Conſequence. And furthermore, that Mercury is really inimical to and incompatible with animal Life, is abundantly manifeſt from the deleterious fatal Effects which it is conſtantly obſerv'd to have upon ſuch as are converſant therewith, ſuch as the Perſons who are condemn'd for to work in the Mines, and in purifying the ſame; who all without Exception die in a ſhort Time, being generally ſeiz'd with univerſal Tremors, Palſies, Hecticks, Salivations, *&c.* all which ſerve plainly to diſcover its predatory deleterious Effects upon the animal Solids.

19. From what has been remark'd in the preceding Number, we may deduce this fundamental Rule and Caution for to direct to Practice; That as the Solids are the principal Part upon which the Stability, Health and Duration of the animal Machine chiefly depends; That in Curing the Diſeaſes of the Fluids, we don't at the ſame Time weaken and impair the Solids; which will be making the Remedy worſe than the Diſtemper, or removing one Diſeaſe to make way for another much worſe: The Diſeaſes of the Solids, which conſiſt chiefly in there being either too elaſtick and tenſe, or too weak and relax'd, being much more difficult to cure than thoſe of the Fluids. Many fatal Miſtakes and Miſcarriages may be met with in Practice by not duly adverting to this fundamental Rule, and particularly in the Cure of the venereal Diſtemper, and cutaneous Diſeaſes, *&c.* which are generally ſuppos'd to have their Origin from a depraved State of the Fluids, in the Cure whereof the Syſtem of the Solids is frequently ſpoil'd and deſtroy'd by nauſeous Loads of internal Medicines of all Sorts, Emeticks, Catharticks, Alteratives, Specificks, and eſpecially Mercurials, continued for a long Time to mend and correct the Errors of the Fluids, at the Expence and Damage of the Solids.

20. The humane Body may not improperly be conſider'd as a Cylinder, compoſed of an infinite Number of longitudinal and tranſverſal Tubes, fill'd with Fluids, all communicating with one another, as alſo with one remarkable large Veſſel open at both Ends, namely, the Stomach, with its Appendages the Oeſophagus and Inteſtines, placed about the Middle or Axis of this Cylinder. This being granted, as no Change can be produced in this Syſtem but by ſome Motion impreſs'd and communicated thereto, it remains to be determin'd, which appears the moſt natural, efficacious, ſafe, univerſal Method for communicating Motion and producing any general Change in ſuch a Syſtem of elaſtick compreſſible Veſſels and Fluids. Now there are two Ways for ſolving this Problem; the Firſt, and what is now moſtly practiſed, is by cramming down a Number of Medicines of all Sorts into this central Canal the Stomach, the Effects of which Medicines either upon the ſaid Canal, or the other Glands, can never certainly be determined. Or Secondly, whether all ſuch Changes and Intentions as may be wanting, may not be more certainly, ſafely and univerſally effected by applying an equable uniform Preſſure, *&c.* of a proper Quantity, and for a reaſonable Time, externally to this compreſſible vaſcular Syſtem, either by means of Air or Water. Now this latter Method is what I undertake to demonſtrate in the ſeveral Parts of this Treatiſe, as the moſt perfect and eligible; wherein I think I may appeal to the Example of Nature, in all the ſeveral Stages and Gradations of animal Life; beſides the irrefragable Teſtimony and Evidence of Experience and Facts; it being to this Principle only, that all the ſalutary Effects of that moſt noble Remedy the Bath are wholly owing.

CHAP. II.

General Obſervations relating to the mechanical Effects of the Air, conſider'd as apply'd and operating upon the whole external humane Body; with the Conſtruction and Deſcription of a new artificial Atmoſphere or Air-Bath, whereby the Air, that univerſal Cauſe and Inſtrument of animal Life, Health and Diſeaſes, may be made to operate upon the humane Body, with all its Properties and Qualities chang'd and regulated in all Degrees and Proportions, &c. whereby all the ſame curative Intentions and ſalutary Effects may be obtain'd, that can be had from Bathing either in cold or hot Water; together with many peculiar Advantages enſuing from this new Method, that can't poſſibly be obtain'd from the common Way of Bathing in Water, the Practice whereof may become wholly ſuperſeded by this new Air-Bath; which may with great Advantage be ſubſtituted in its Room, as being more univerſal, uſeful, commodious and applicable in moſt Caſes and Diſeaſes. Which Air-Bath affords all the Benefit that can be had from a Vapour-Bath, either humid or dry, in ſuch wiſe that it will prove the moſt univerſal, ſafe and ſovereign Method for the Preſervation of Health, with the Cure of Diſeaſes, &c.

1. BEFORE I proceed to deſcribe the Conſtruction and Uſes of this new Machine or Air-Bath, in order for to open up and prepare the Way for a more diſtinct clear Perception of its Uſes, I ſhall firſt briefly conſider ſome of the principal known Properties and Qualities of the Air, with their relation to, and mechanical Influence and Effects upon Animal Bodies.

2. The humane Body being a perfect pneumatico-hydraulick Machine, compoſed of two general Principles the Solids and Fluids; all the vital Motions and Functions of which complex Machine are effected and continued by three general principal Powers: The firſt, is the muſcular moving Force of the animal Solids; The ſecond, is the Preſſure, *&c.* of an elaſtick Fluid, as the Air or Atmoſphere, acting outwardly upon the whole external Body, as alſo upon the Lungs, and inwardly within the Cavities of the Thorax, Abdomen, Stomach, and inteſtinal Tube, *&c.* The third, is the animal Fluids. Now the Solids (by which I mean not only the Heart, with the arterial and venal Syſtems, but likewiſe all the Organs and Muſcles ſerving to Reſpiration), together with the Preſſure both of the external and internal Air, are the two joint proper moving Forces and Powers apply'd for circulating and giving Motion to the Fluids; which in this Caſe may be conſider'd as the Reſiſtance to be mov'd or ſurmounted. When therefore thoſe three Powers have their reſpective Forces and Momentums harmoniouſly adjuſted, allied and proportion'd to each other, all the vital Movements, Operations and Functions of the animal Machine will be regularly executed; but, on the contrary, when the ſaid Powers happen to be relatively diſproportionate to each other, its Motions will thereupon become diſturb'd and irregularly perform'd accordingly. And moreover as one of thoſe Powers, namely, the Air, is ever changing in its Properties and Qualities, the other two Powers, namely, the animal Solids and Fluids, or the whole animal Machine, will become thereby neceſſarily determin'd and ſubjected to the like perpetual Changes likewiſe, tending either towards Health or Sickneſs.

3. The Bodies of Animals being vaſcular compreſſible Machines, are, from their firſt Conception and Generation to their final Corruption and Diſſolution, to be conceiv'd as caſt or incloſed within a Mould or Caſe, either of Air alone, or of Air and ſome other Fluid: Thus the humane Body in its firſt Conception and antenatalitial State is incloſed in the uterine Fluids, as in a ſoft warm yielding Mould, until it has acquir'd ſufficient Firmneſs and Strength to bear the external Air; but from the Time of its Birth to its Death, it becomes immerg'd, cloſely wrap'd up and envelop'd round with Air as in a fluid elaſtick Mould, Vehicle, or univerſal Bandage. Now if we conſider the Properties and Qualities of this aerial Mould or Vehicle, together with thoſe of the humane Body inclos'd therein, we ſhall find that whatever Changes or Alterations are produced, and whether the ſame begin firſt in the circumſcribing Air-Mould, or in the Body contain'd therein, that the like equal Changes will be produc'd in both, and at the very ſame Time. Again, the humane Body with this its aerial Mould or circumſcribing Sphere of Air, are to be conſider'd as two oppoſite antagoniſt Powers or Muſcles, acting with contrary Forces and Directions upon one another, and whichſoever prevails, the other yields and gives way, both being eminently elaſtick. The humane Body conſiſting of an Aſſemblage or Syſtem of elaſtick, contractile and diſtractile Tubes, infinite in Number, through which the Blood, which is a very complex Fluid, evermore permanently warm in ſome Degree, and ſubject to be greatly rarefied and condenſed by Heat and Cold, continues for to circulate during Life. Again, this circumſcribing Mould or Sphere of Air, every where ſurrounding this animated Body, being likewiſe eminently endow'd with the Properties of Fluidity, Gravity, Elaſticity, Preſſure, Attraction, with the Qualities of Heat, Cold, Humidity, Dryneſs, Exhalations, Motion, *&c.* in reſpect to

all which Properties and Qualities it undergoes great, frequent, and oftentimes ſudden Changes from one Extream to another. The humane Body, with this its circumſcribing Mould or Vehicle of Air, being thus mutually and inſeperably allied and combin'd together, during the whole Period of its Exiſtence, the ſame becomes by neceſſary Conſent reciprocally affected with the Changes produced in each other, like as the Soul and Body mutually participate and become alike affected with the Changes and Alterations of each other. And thus, if the Air-Mould by what Cauſes ſoever be render'd heavier, the whole elaſtick Animal Syſtem incloſed therein, being preſs'd upon by a new additional Weight, will yield and give Way thereto, and by contracting itſelf inwards every Way towards its Center or Axis, will become reduc'd into leſs Space and Dimenſions. And, on the other Hand, as this Aerial Mould become leſs Denſe and Lighter, from what Cauſes ſoever, the whole elaſtick vaſcular Syſtem, by a contrary Niſus and Reſtitutive Force, will thereupon expand from its Axis or Center outwards into larger Dimenſions, until the elaſtick Power and Reſort of the Body, and that of its circumſcribing Air-Mould come to counterballance each other. Suppoſe again, that this Aerial Mould comes to have a greater Degree of Heat and Rarefaction communicated thereto from what Cauſes ſoever, whereby its Elaſticity and Preſſure being diminiſh'd, the animal Machine being in this Caſe leſs preſs'd upon, will have Liberty to dilate and unfold, and ſtretching its containing Mould outwards, will acquire larger Dimenſions, until that the Spring and Force of the Body comes to be counterballanced by the Reſiſtance of its Mould; as on the contrary, when the Air-Mould comes to be condens'd by Cold, *&c.* By its greater Stimulus, Stricture and Preſſure upon the Body the ſame will become reduc'd to leſs Dimenſions; the Air-Mould becoming at the ſame Time equally contracted in its Dimenſions: And thus, whatever Alterations are produc'd in this circumſcribing Air-Mould, either in Reſpect of its Gravity, Elaſticity, Heat, Cold, Humidity, Dryneſs, Motion, Attraction, Effluvia, *&c.* the like Alterations will be produc'd at the ſame Time in the animal Machine, both in the Solids and Fluids; and whether the Change be ſuppoſed to begin firſt in the Air-Mould, or in the animal Body incloſ'd therein, the Effect and Alteration will ſtill be equal, and produc'd at the ſame Time in both; the one becoming always neceſſarily contracted or expanded; heated or cooll'd; rarefied or condens'd, *&c.* equally, and at the very ſame Time with the other.

4. The Air then conſider'd, as endow'd with the aforeſaid variable Properties and Qualities, is the principal Agent and Inſtrument of Nature in all the Operations and Productions in and upon this terreſtrial Globe; and ſo great is the Neceſſity of having ſuch an elaſtick, changeable, fluid Mould of Air to envelope and ſurround every where the animal Syſtem, from the very firſt Time of its Conception and Exiſtence, to its final Diſſolution, in order to ſuſtain and keep the whole Syſtem together, and to excite, maintain, and keep up a conſtant Oſcillation, Motion, Heat, and State of Exerciſe in the animal Solids and Fluids, that without it no Animal nor Vegetable, *&c.* could ever be produced, live or grow; and it is by the Air, in Conjunction with the other elementary Principle Fire, that the Generation, Accretion and Corruption of all Bodies is effected and brought about. And the animal Machine, during the whole Time of exiſting and living, being cloſely embrac'd every where by this Aerial Mould, which, by compreſſing the ſame equally with a certain determinate, but variable Degrees of Preſſure, by which equable Reſiſtance and Preſſure the animal Solids and Fluids becomes not only ſuſtained thereby, as by a ſoft, univerſal, elaſtick Bandage, but have Liberty given them alſo to unfold, develope, and grow gradually; and, thus the animal Syſtem will continue to grow and increaſe in Bulk and Strength to a certain determin'd, limited State, and no further; and this State, reſpecting the Period and Termination of its Growth, depends upon the innate Degree of Coheſion, Strength and Firmneſs, wherewith the original, Elementary, Stamina and Solids were firſt endow'd; For as ſoon as the Preſſure and Reſiſtance of this Air-Mould, (when at its leaſt Quantity) becomes able to counterpoiſe the Spring and Force wherewith the animal Solids endeavour to expand and develope themſelves, then every Animal is arrived at its full State and Growth, it not being in the Power of humane Art to carry it on further, to any higher Degree of Perfection; and from this Period, when the animal Solids become unable to dilate and ſtretch out their circumſcribing Sphere or Air-Mould further, a full and final Stop becomes thereupon put to the further Growth and Elongation of the Solids; and from that Period of Time, the Force and Elaſticity of the Solids continually decreaſing, and the aerial Mould ſtill continuing to act thereupon with the ſame variable Degrees of Preſſure, *&c.* This elaſtick Fluid Air-Mould will ever afterwards be gaining the Aſcendent and Prevalence over the animal Solids, and will be continually reducing the ſame into a narrower Compaſs; all or moſt of the ſmall capillary Veſſels becoming impervious and obſtructed, and the whole nervous, muſcular, membranous Syſtem at laſt emaciated and reduced to an almoſt bony Rigidity; as may be ſeen in the Decline of Life and Approaches towards old Age; until the Preſſure and Reſiſtance of the Air-Mould puts a total Stop to the Circulation of the Blood, and to the Life of the Animal. Thus then we ſee how the animal Machine has its ſeveral Periods and States of increaſing and decreaſing, with its final Corruption and Diſſolution, all regulated and unalterably determin'd by this elaſtick changeable Fluid the Air.

5. Now, as the Air is thus ſo abſolutely neceſſary to the Exiſtence and Continuance of all Degrees of animal and vegetable Life; ſo on the other Hand, we ſhall find the ſame to be for the moſt Part the true general Productive Cauſe of all or moſt of the Diſeaſes incident to Mankind, *&c.*

That

That the Air is a Cauſe adequate and ſufficient of itſelf alone for producing all Manner of Diſeaſes, will readily appear from conſidering its Properties and Qualities, with their mechanical Effects and Influence upon animal Bodies; the Atmoſphere then being a Fluid eminently endow'd with Gravity and Elaſticity, the ſame becomes ſubject to perpetual Agitations and Changes of Ebbing and Flowing alternately, and that at the ſame Time, and from the very ſame Cauſes, whereby the Tides are produced in the Ocean; by which alternate Changes thus regularly produc'd each Day in the Atmoſphere, the Bodies of Animals immerg'd therein, muſt become ſubject to conſtant Periodical Changes and Alterations, and be variouſly affected thereby, as has been fully demonſtrated by the celebrated and learned Dr. *Mead*, in his Book *de Imperio Solis & Lunæ in Corpora Animalium*. Moreover, beſides the Alterations cauſed in the Atmoſphere by the joint Gravitation and Attraction of the Sun and Moon, the ſame has its Gravity and Preſſure very much alter'd by the Winds, with the Degrees of Heat, Cold, Humidity, *&c.* in ſuch wiſe, that the Air in the ſame Place will oftentimes differ one Tenth Part in Denſity and Weight; in which Caſe the Difference of its Preſſure upon a Perſon of an ordinary mean Size will be equal to 3600 Pounds weight; which great Differences of Preſſure muſt produce very great Differences in the Tenſion of the Solids, and Expanſion of the Fluids in a Humane Body; in the Caſe of a greater Weight, the Fibres being more ſtrongly brac'd, and the Fluids more condens'd. Moreover as Heat and Cold are two univerſal powerful Cauſes and Inſtruments of Nature; and as the Atmoſphere admits of great Variations in reſpect to thoſe two Qualities, and that oftentimes ſuddenly from one Extream to another, upon which Accounts it becomes capable of producing very great and ſudden Alterations in the Solids and Fluids of animal Bodies; which ſudden Tranſlations from one extreme State to the other, is generally the productive Cauſe of many great and epidemical Diſtempers. Again, the Atmoſphere, being conſider'd as always ſubject to great Changes, in Reſpect to the Degrees of Humidity and Dryneſs, becomes alſo upon that Account capable of producing very great Alterations in the animal Solids and Fluids, with Reſpect to their Tenſion and Relaxation. Again, as the Atmoſphere becomes agitated by Winds, Tempeſts, Earthquakes, Thunder, Lightning, ſubterraneous Fires, *&c.* it may from all thoſe Cauſes become capable of producing many morbid Impreſſions upon animal Bodies. Moreover, as the Atmoſphere may be conſider'd as a general Chaos or Menſtruum, abſorbed and impregnated with Effluvia and Vapours, continually riſing, exhaling and circulating therein, from all Kinds of Bodies, by the Action of the cœleſtial and ſubterraneous Heat, the ſame muſt alſo upon that Account become capable of producing very great and general Effects, and morbid Diſpoſitions in animal Bodies, according as it abounds more or leſs with animal, vegetable, ſulphureous, ſaline, and other ſuch heterogeneous Exhalations. The Bodies of Animals then conſiſting of a Congeries or Syſtem of elaſtick Veſſels, fill'd with Fluids ſubject to great Degrees of Rarefaction and Condenſation, the ſame muſt neceſſarily become ſubject to perpetual and great Alterations, by being always immerg'd into, and encompaſs'd round with ſuch an elaſtick Fluid Medium as the Air, ſubject to ſuch frequent, great and ſudden Mutations; in ſuch Manner that every the leaſt Change either in its Gravity, Elaſticity, Preſſure, Heat, Cold, Moiſture, Dryneſs, Motion, Effluvia, *&c.* produces a proportional Change and Effect upon the animal Machine, in like Manner as in a Barometer, Thermometer, and Hygrometer.

6. The Mechanical Effects of the Air upon animal Bodies as before deſcrib'd, may be illuſtrated and conceiv'd more readily by a Linear Repreſentation and Draught, ſuch as *Fig.* 1. *Plate* 1. wherein is ſhewn the Picture, Image, or Section of a humane Body, ſtanding erect and naked in the open Air, the contour and external Surface of the Body being defined and circumſcribed by two parallel concentrick Lines, the outmoſt whereof is one real continued Line, but the innermoſt is a prick'd or diſcontinued Line, which two parallel Lines are intended to repreſent the different Effects and Alterations produc'd in the Dimenſions of the Body, by the variable Properties and Qualities of the Atmoſphere. Thus, when the Air is lighteſt, the whole Body will thereupon dilate and expand its external Surface, becoming coincident with the outermoſt real Line; but when the Air is heavieſt, the whole Body will become condenſed and contracted in its Dimenſions, ſo that its external Surface may now be conceived as coincident with the innermoſt prick'd or dotted Line. And as the Gravity of the Atmoſphere is ever changing between thoſe two Extreams, the Body will be kept in a continual State of dilating and contracting, or vibrating and oſcillating, like to a Pair of Bellows, between the outermoſt real Line and the innermoſt diſcontinued one; and that from this one variable Property of the Air's Gravity alone; but if we take into the Account its other Properties and Qualities, which are alſo ever changing, as its Heat, Cold, Stimulation, Motion, Dryneſs, Humidity, Effluvia, *&c.* each whereof have a diſtinct, independent Action and Influence upon the Body, we ſhall find the ſame ſtill ſubject to much greater Changes, than what it is by means of the variable Gravity of the Air alone, according as more or fewer of the ſaid general Cauſes conſpire and co-operate together. By which we plainly ſee, that as all the Properties and Qualities of the Air are ever changing, the human Body can never be one Moment at Reſt, nor of the ſame Dimenſions, but is kept ever expanding and contracting, and in a State of perpetual Motion and Exerciſe, from the Time of its Conception, to its final Diſſolution; without which conſtant variable Motion and Exerciſe thus communicated to the whole animal Machine by the Cauſes aforeſaid, no Animal could ever be produced, live, grow, or have its Parts duly formed and ſhaped, ſo that the Air ſerves both as a univerſal Bandage, to ſuſtain the animal Solids from being

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deſtroy'd and broke to Pieces by the diſtending Force of the rarefied heated Fluids; and likewiſe as a univerſal Ferment, whereby both the Solids and Fluids are kept in conſtant Motion and Exerciſe.

7. The Air then conſider'd as operating continually with its aforeſaid variable Properties and Qualities, has ſo great and univerſal an Influence in the Production of Diſeaſes, that it were an eaſy Matter to demonſtrate (were it not too tedious here, and withal too evident) how all the general, original, morbid Conſtitutions and Diſeaſes, both of the animal Solids and Fluids, may be naturally produced therefrom. How greatly then does it concern every Perſon, but more eſpecially the Phyſician, carefully to obſerve and remark, when, and in what Degrees, and for what Continuance of Time, thoſe Alterations happen, with the Effects and Conſequences thereof upon animal Bodies. This Doctrine relating to the Changes, Alternations and Combinations of the Properties and Qualities of the Air, with their Effects upon humane Bodies, we find recommended by the beſt Phyſicians in all Ages, as the fundamental Rule of true rational Practice, and particularly the great *Hippocrates*, who tells us, that the Change of Seaſons are the moſt effectual Cauſes and Parent of Diſeaſes; and as daily Experience confirms the Truth hereof, it follows, that there is not any thing in Nature of ſuch Importance, both as to the Production, and likewiſe to the Cure of Diſeaſes, as a thorough Acquaintance and Knowledge of the different States and Conſtitutions of the Air; there being no Diſtemper but what may derive its Original from, or owe its Growth to the Changes, Alternations and Combinations of its ſeveral Properties and Qualities as aforeſaid. This Truth we find alſo confirm'd from the Teſtimony of that induſtrious and accurate Obſerver Doctor *Sydenham*, in his Hiſtory of Epidemick Conſtitutions of the Air; as alſo by Doctor *Wintringham*'s Epidemick Hiſtory of Diſeaſes in the City of *York*, from the Year 1715, to 1725. And this Doctrine we find farther confirm'd and proſecuted by ſeveral others, and particularly by a Society of Gentlemen of the Faculty at *Edinburgh*, who have for ſome Years kept a meteorological Regiſter or Journal of the Weather at the ſaid Place, with the reigning popular Diſeaſes conſequent thereupon. And if this laudable Plan and Deſign was but carefully proſecuted for a ſufficient Time, the Phyſiology of the Air, with the Diſtempers depending thereon, might be reduced to a Science, ſo as to be able to predict and foretel what Diſeaſes muſt follow from the different States and Conſtitutions of the Air, and Seaſons of the Year. But there is no Occaſion to appeal to thoſe, or any other Authorities, as the Truth hereof is obvious to every common Obſerver, how that certain Diſeaſes keep Time exactly as to their Appearance, Periods, and Diſappearance, and revolve as it were periodically, with the great cardinal Periods and Seaſons of the Year: And thus we find the Spring, Summer, Autumn, and Winter, each productive of ſuch Diſtempers, as may be naturally and evidently derived and produced from the reigning prevailing Conſtitution of the Air at thoſe ſeveral Seaſons, in reſpect to its greater or leſs Weight, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Motion, *&c.* and in the ſeveral other intermediate Seaſons, the Diſeaſes are only ſo many Gradations or different Degrees from thoſe, which prevail chiefly about the four cardinal Seaſons.

8. From ſo many Obſervations and Authorities, with many other Arguments that might be produced in Support of this Doctrine, it may be concluded for a certain Truth and phyſical Aphoriſm, That all or moſt of the capital Diſeaſes are produced immediately from the aforeſaid mechanical Properties and Qualities of the Air, with their ſeveral Alternations, Changes and Combinations; and as the Air is thus the productive Cauſe of all or moſt of the diſtinct original Diſtempers, ſo the ſame Air when judiciouſly apply'd and made to operate upon the Body with Properties and Qualities contrary to thoſe by which the ſaid Diſtempers were produced, will prove the moſt natural Remedy for Curing the ſame. For according to the old Maxim, *Sublatâ Cauſâ & tollitur Effectus*, or which comes to the ſame Thing, Diſeaſes muſt ever be cured by Cauſes contrary to thoſe by which they were produced. And thus, for Inſtance, if the Diſtemper be owing to the Air's being relatively too light; the changing it for one more heavy, either ſo by Nature, or Art, will prove the only natural, certain, ſafe Cure. But if the Diſeaſe be caus'd by the Air's being relatively too heavy, it muſt be chang'd for one more light, render'd ſo either by Nature, or Art, in order to obtain a perfect Cure. If the Diſeaſe be the Effect of the Air's being too rare, it muſt be chang'd for one more denſe and elaſtick. But if the Diſeaſe be occaſion'd from the Air's being relatively too denſe and elaſtick, it ought to be chang'd for one more rare. And if the Diſeaſe proceed from the Air's being relatively too hot, it muſt be chang'd for one more temperate and cool: And if to an Air too cold, it muſt be chang'd for one more warm. If the Diſeaſe be owing to the Air's being relatively too humid and damp, it ought to be chang'd for one more dry and ſerene. If the Diſtemper proceed from the Air's being impregnated with Effluvia or Vapours of any Kind, animal, vegetable, ſulphureous, ſaline, *&c.* it ought to be chang'd for one more pure, open, perflated and ſerene; or that is impregnated with Effluvia and Exhalations of a contrary Quality, in order to obtain a perfect Cure. And ſo for all other Alternations and Combinations of the Properties and Qualities of the Air.

9. The Air having then ſuch a conſtant neceſſary Influence and Dominion over the Life, Health, and Diſeaſes of Mankind, it is aſtoniſhing that the ſame is ſo little regarded and attended to in the Practice of Phyſick, this Neglect appears owing to two Reaſons: The Firſt is, that Phyſicians conſider the Air among thoſe Things which cannot be forborn, and which they have

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not in their Power to alter, change, direct and apply, as they do other Medicines, by exact Doſes, Weight and Meaſure. A ſecond Reaſon appears to be, that the Air being look'd upon as common and obvious to every Perſon's Obſervation, Phyſicians think their Judgment and Directions in this Reſpect, would be as little regarded, as it commonly is, although very unjuſtly, with reſpect to Aliment, wherein every Nurſe thinks her Judgment as good as the Phyſician's. But I ſhall ſhew both thoſe Reaſons to be wrong and ill grounded; and with reſpect to the firſt I ſhall endeavour to prove the contrary, by ſhewing that the Air may be apply'd and directed for to operate with all its Properties and Qualities either univerſally upon the whole Body, or topically and locally upon ſome Region or Member only, in the ſame Manner as other Medicines which are exhibited by exact Doſes, Weight, and Meaſure. So that as the Air is on all Hands allow'd for to be the general productive Cauſe of Diſeaſes, ſo the very ſame Air when apply'd and made to operate upon the Body with Properties and Qualities contrary to thoſe by which the ſaid Diſeaſes were produc'd (as I ſhall ſhew may be done in this, and the following Chapters) will become the moſt univerſal, ſafe and perfect Remedy for curing all the ſaid Diſeaſes. And as for the ſecond Reaſon before alledg'd, why the Air has been ſo little attended to in the modern Practice of Phyſick, the ſame is equally groundleſs and frivolous as the firſt, for as the Air is the primary productive Cauſe of Diſeaſes, as has been already ſhewn, and as the ſame Air is the moſt efficacious, univerſal Remedy for curing them, as I ſhall ſhew in the Sequel; conſequently there is no one Subject that will require ſo great a Strength of Judgment, and true experimental phyſical Knowledge, ſo as rightly to diſcern when, in what Quantities, and for what Continuance of Time, *&c.* to apply this Remedy to the Body, by cauſing it to operate thereupon with its Properties and Qualities chang'd and adjuſted in all Quantities and Degrees, as may beſt anſwer the Intentions of Cure; the Knowledge of which Particulars no one can ever be Maſter of, without a perfect Acquaintance with natural Experimental Philoſophy, the Phyſiology of the Air, and the Laws of the Animal Œconomy, *&c.*

10. Having ſhewn what great and univerſal Changes may be produc'd in the Animal Œconomy by the new Method of Bathing, as deſcrib'd in the firſt Chapter, which when properly apply'd will ſerve to effect all the principal Intentions that can be obtain'd from any other Medicines. Now as this great Efficacy of the Bath is chiefly owing to the additional Weight and Preſſure that becomes thereby laid upon the Body; there is however this great and unavoidable Inconvenience, attending the Uſe of the Bath, that in order to receive the Benefit from having ſuch additional Weight laid upon the Body, a Perſon muſt for that Purpoſe ſubmit his Body to be immerg'd in Water, either Cold or Hot; if in cold Water, he can't continue therein by reaſon of its diſagreeable Stimulus for a Time ſufficient to receive the Benefit and ſalutary Effects that may be propos'd and obtain'd from ſuch an additional Preſſure apply'd to his Body, and that for a longer Time. And if the Perſon commits his Body to hot Water, as the ſame cauſes ſo ſudden and great a Relaxation of the whole external Habit, with ſuch a plentiful Derivation of the Fluids outwards that he can't ſtay therein neither for any conſiderable Time, ſo as to receive all the Advantages that might otherwiſe be obtain'd, by continuing for a longer Time under the Effects of ſuch an additional Preſſure; for which Reaſons the healing Virtue and Efficacy both of the cold and hot Water Baths becomes in a great meaſure loſt and confined within very narrow Bounds.

11. If therefore a Method can be found for laying an additional Preſſure of any aſſign'd Quantity equally upon the whole Body, and putting the Perſon withal into a Condition to continue under the Influence and Effects of ſuch an univerſal equable additional Preſſure, for any Time requir'd to obtain all the Benefits propos'd thereby; ſuch a Method and Practice would be of infinite Uſe for preſerving Health, and curing of Diſeaſes. Now I humbly think that I have found ſuch a Method that will fully anſwer all the Ends and Intentions above propos'd; and that is by applying and making Uſe of Air inſtead of Water, for communicating this additional Preſſure to the Body. In what Manner this compreſſing Air-Bath or artificial Atmoſphere is to be conſtructed, may be readily underſtood by referring to the vertical Section Fig. 4. with the horizontal Section, Fig. 5. agreeing therewith in Plate 1. if compared with what has been ſaid in Numbers 6, 7, 8, 9, 10, *&c.* of Chap. 1. Thus the aerial Bathing Veſſel BBBB, (which is conſtructed in the ſame Manner with that deſcrib'd in the aforeſaid Numbers referr'd to) is repreſented with the Image Picture or Section of a humane Body ſitting therein (or ſtanding as there is Occaſion) aaaa is the Pneumatick Engine ſerving to condenſe or rarefy the Air in the Bathing Veſſel, until it is of the Denſity and Preſſure requir'd, and as is judg'd will ſuit beſt with the particular Symptoms and Indications of the Perſon's Caſe; ſo that by this Pneumatick Engine the Air in the Bathing Veſſel may be condens'd or rarefied, ſo as to make it operate upon the Perſon's Body with any Degree of Preſſure intended. And whilſt he is incloſed in the Bathing Veſſel or artificial Atmoſphere, may either reſpire with the common external Air, by holding the End of a flexible membranous leather Pipe ra in his Mouth, or he may breathe with the Air in the Bathing Veſſel, (without uſing any ſuch reſpiring Pipe as ra) which Air as it becomes render'd unfit for Reſpiration, by the Heat and Steam exhaling from the Perſon's Lungs and Body, may be let out thro' the Vent pipe yy, and when the Bathing Veſſel is thoroughly ventilated and purg'd of all the corrupt Air, the ſame may from Time to Time be repleniſh'd anew with freſh Air, of the ſame Denſity and Preſſure as at firſt, and ſo ſucceſſively, which State of the Air, as to its Denſity and Preſſure, may be exactly regulated by the mercurial gage Pipe bb, with its annex'd Scale. Or

the Perſon may be ſupply'd with Air for Reſpiration out of the Veſſel xxxx, join'd on to one ſide of the Bathing Veſſel, the Air wherein may be brought to have the ſame Denſity with that incumbent upon the Perſon's Body in the Bathing Veſſel, or any other Degree of Denſity as is found for to ſuit beſt with the State of his reſpiring Organs; all which ſeveral Parts and Appendages, belonging to the Bathing Veſſel, with their Uſes, will become readily underſtood by referring to the Deſcription of the like Bathing Veſſel in Numbers 6, 7, 8, 9, *&c.* of the Firſt Chapter; (which Bathing Veſſel was there intended to be uſed for Bathing with Water inſtead of Air) to which for Brevity I muſt here refer. Now the Perſon in this Bathing Veſſel or artificial Atmoſphere, may have the Air about him condens'd to any Degree requir'd, as ſuppoſe into double the Denſity of common Air, whereupon he will become ſubjected to an additional Preſſure equal to about 40,000 Pounds Weight, which Quantity of Preſſure is about twenty times greater than what any Perſon ever can receive by going into a common Water Bath; and this Condenſation of the Air in the Bathing Veſſel, may be carry'd ſtill higher, ſo as to be render'd three, four or five times denſer than the common external Air, in which Caſes the Perſon will become ſubject to as great a Preſſure from the Air, as if he was immerg'd to the Depths of 105, 140, or 175 Feet under Water, which is a Degree of Preſſure above a hundred times greater, or more than what can be obtain'd from the common Practice of Bathing; and conſequently where uniform Preſſure is of Uſe, this new Method of applying it to the Body by means of Air, will be a hundred or a thouſand times more ſucceſsful, than what the common Practice of Bathing with Water is; which additional Weight and Preſſure, as the ſame may be apply'd upon a Perſon's Body, in all Degrees and Quantities, the ſame will be capable, under a prudent and judicious Management, of producing the greateſt Alterations both in the animal Solids and Fluids, and thereby become the moſt univerſal Cauſe, Inſtrument and Remedy for Curing the Diſeaſes incident to humane Bodies.

12. If now the pneumatick Engine aaaa, be underſtood to be ſupply'd with two Pipes, each of which having a ſpiral Pipe or Worm joyn'd thereto, one of which Worms being put into a Veſſel with cold Water or Refrigeratory, and the other in a Veſſel of hot Water (neither of which two Worms, with their Veſſels, are ſhewn in this Draught, to avoid incumbering the ſame too much, and as they may be readily conceiv'd without) each of thoſe Worms has a Cock, whereby the Air may be let into the pneumatick Engine, either through the cold or hot Pipe or Worm, or out of both together: Thus upon ſhutting the Cock upon the Worm through which the hot Air is ſupply'd, and opening the Cock of the Worm, through which the cold Air is convey'd, the Bathing Veſſel may be kept from Time to Time ſupply'd with freſh Air, which by paſſing through the ſeveral ſpiral Convolutions of the Worm, which being placed in a Refrigeratory fill'd with cold Water, impregnated with Sea Salt, or with Sal Armoniack, the Air may be render'd very cold thereby even in the Height of Summer; and the other Worm being placed in a Veſſel of Water or Oil heated to all Degrees from a boiling Heat and downwards, the Air in paſſing through the ſpiral Revolutions of the Worm, may be made to receive different Degrees of Heat, ſo as in the Depth of Winter to be render'd as hot as in the Middle of Summer; ſo that the Perſon in the Bathing Veſſel may have the Air not only condens'd and made to operate with any Degree of Preſſure upon his Body, but have the ſame likewiſe fitted to act with all Degrees of Heat, from that which produces Freezing, upwards to the greateſt natural Heat of the Air in Summer, or even further upon Occaſion; all which Degrees of Heat thus communicated to the Air in the Bathing Veſſel or artificial Atmoſphere, may be exactly regulated and known by the Thermometer t t, with its annexed Scale.

13. By the foregoing Method this Air-Bath or artificial Atmoſphere, beſides the peculiar Property of having its Preſſure render'd vaſtly greater, and capable of being varied in all Degrees, above that of a common Water Bath: It has moreover this other Property in common with the Water Baths, of being render'd either cold or hot, and that in different Degrees, as is found to anſwer beſt with the Indications of Cure. Now there is but one other Property wanting to render this Air-Bath or artificial Atmoſphere poſſeſs'd of all the Properties and Qualities which the Water Baths have, either cold or hot; and that is the relaxing Quality reſiding in the Water: If now the pneumatick Engine aaaa, be ſupplied with a Quantity of Steam or aqueous Vapours, convey'd through a Pipe thereto from the Copper or Boyler vvvv, the ſaid Vapours may be thrown in any Quantity into the Bathing Veſſel, ſo as to communicate a ſufficient Degree of Heat and Moiſture to the Air incloſed therein; which Air-Bath or artificial Atmoſphere will become thereby endow'd with all the Qualities neceſſary to warm, moiſten and relax, as it ſhall be found wanted; ſo that this Air-Bath, beſides the Properties peculiar to itſelf alone, has moreover all the other Qualities which the common Water Baths, cold or hot, are poſſeſs'd of.

14. Hitherto we have conſider'd the Perſon in the Bathing Veſſel or artificial Atmoſphere as encompaſs'd round with condens'd Air, which by its additional Preſſure, and being render'd cold withal, will cauſe a general Derivation of the Fluids towards the internal Parts, as the Inteſtines, Viſcera, *&c.* ſo on the contrary, by exhauſting the Air out of the Bathing Veſſel in part, whereby the Preſſure upon the Perſon's Body being diminiſh'd, which will give Liberty to the external Blood Veſſels, *&c.* to evolve and dilate, and thereby cauſe a Revulſion of the Fluids from the central Parts, with a Derivation thereof to the external Surface of the Body.

15. There

15. There is moreover this very conſiderable Difference to be remark'd, between this new Air-Bath, and a Water-Bath, either cold or hot, namely, That let a Perſon place his Body in what Situation ſoever, and at what Depth under Water ſoever; yet as the Water is an unelaſtick incompreſſible Fluid, the additional Preſſure will not be apply'd equally to all Parts of his Body; the Parts having a greater or leſs Preſſure in proportion to their Depth under Water, the lowermoſt being more compreſs'd than the uppermoſt, which Inequality of Preſſure will always produce a very irregular and unequal Derivation and Revulſion of the Fluids. But in this Air-Bath or artificial Atmoſphere the Caſe is quite otherwiſe; for as the additional Preſſure is communicated to the Perſon's Body by means of Air, which being an elaſtick compreſſible Fluid ſurrounding the whole Body, the Preſſure will become thereby communicated and impreſs'd upon the whole external Surface of the Body equally and alike; ſo that the Derivation and Revulſion of the Fluids produc'd from this new Method of Bathing with Air, inſtead of Water, will be equable, regular and uniform.

16. Now in order to render this Air-Bath or artificial Atmoſphere more univerſally uſeful, there may be added thereto as a neceſſary Appendage the Copper or Boyler VVVV, which Veſſel is cloſe ſhut with a Cover at top, with a Pipe VP ſolder'd on upon one ſide, the End whereof V, opens into the Copper, and the other End P, into the Pipe DZ, the End whereof D, opens into the Bathing Veſſel: The Pipe DZ communicates alſo with the pneumatick Engine aaaa, by two ſhort Pipes ss, and FF, (*vide* Plan, Fig. 5.) now this Copper VVVV is deſign'd for producing Vapours or Effluvia from all Sorts of Bodies, Animal, Vegetable, Foſſil, Solids, or Fluids, ſerving for a Vapour Bath, either humid or dry; now we will firſt conſider the Uſes of this Machine as it ſerves for humid Vaporation or Irroration; for that Purpoſe the Copper being fill'd with the Ingredients from which the Vapours are to be generated, upon applying a proper Degree of Heat thereto, either that of Boyling Water, a Sand Heat, or by Attrition, Accenſion, *&c.* the Vapours will become raiſed to the upper Part of the Copper, and when collected in a proper Quantity, upon turning open the Cock of the Steam Pipe VP, the Vapours will iſſue at the Orifice V, and become diſcharg'd by the Orifice D, into the Bathing Veſſel, until they are diffus'd throughout the ſame, and fully abſorb'd and ſaturated therewith: Now the Materials from which thoſe Vapours are produced, may be any animal, vegetable Subſtance, or any kind of Fluid, ſimple or compound, that is capable of emitting humid Vapours; of which Sort are common Water, Milk, Wine, Vinegar, Spirit of Wine, Urine, *&c.* together with the Compoſitions of the Shops as Diſtill'd Waters, Tinctures, Eſſences, Elixirs, Decoctions, Infuſions, with all the Parts of Animals and Vegetables. The Vapours being thus rais'd in a ſufficient Quantity, either by Ebulition, Accenſion, or Attrition, *&c.* and from Ingredients well choſen and proper to the Caſe and Intention; if now the Vapours be deſign'd to be apply'd univerſally and immediately to the whole Body, in that Caſe the Perſon may ſubmit himſelf to the Influence thereof either ſitting or ſtanding with his Body naked; but if the Vapours are intended to be apply'd only to ſome particular Region or Part of the Body, in that Caſe the Perſon may be provided with a proper Covering, which like to a Caſe or Coat of Armour may fit cloſe and tight, ſo as to ſecure all the reſt of his Body from the Action of the Vapours, excepting the only ailing diſeas'd Part; and after this Manner the Vapours may be directed and apply'd for Fumigating any particular Part of the Body in the moſt advantageous Manner. Which Method of Fumigating the Body, either univerſally or partially, will be found exceeding uſeful for the Cure of many Diſeaſes and Ailments, and eſpecially for cutaneous and venereal Caſes and Diſorders; by Humecting, Relaxing, Diluting, Diſcuſſing, Attracting, Opening, Cooling, Warming, Inſpiſſating, Stimulating, Suppurating, *&c.* and moreover according to this Method of conſtructing and managing the Bath, a ſmall Quantity of Materials will be ſufficient to produce Vapours to anſwer all Intentions, by reaſon none of the Vapours are ſuffer'd to be loſt or run to Waſte; for when once the Air in the Bathing Veſſel is properly impregnated therewith, a ſmall Matter will ſerve to recruit the ſame, which can't be done ſo well any other Way, and in many Caſes not without great Charge when the Ingredients are ſcarce and bear a high Price.

17. Having ſhewn how this Air Bath may be fitted and made to ſerve for a humid Vapour-Bath; now the very ſame Machine and Apparatus will ſerve equally for a dry vapourous Bath; in which Caſe the Effluvia or Exhalations are to be raiſed from dry Medicines, (which is all the Difference between the two Baths) either by Accenſion, Attrition, or the Application of a naked Fire or intenſe Heat; which Effluvia or dry Vapours may be directed and made to operate either upon the whole external Body, or only upon ſome Region or Member thereof; as has been ſhewn in the preceding Number. Now the chief Ingredients for this Purpoſe are all dry Subſtances, Animal, Vegetable, Mineral, which being either volatile or inflammable, will emit dry Fumes or Effluvia; and the Materials ſerving to this End are very numerous, ſuch as Reſins, Gums, Gum-Reſins, dry Balſams, Spices, Aromaticks, Galbanum, Labdanum, Aſſa-fœtida, Caſtor, Styrax, Ambergreaſe, Tobacco, Camphir, Sulphur, Mercury, Cinnabar, Sal Ammoniack, Nitre, *&c.* the Ingredients being properly choſen for to anſwer the Intention, are to be put into the Veſſel VVVV, and committed to a proper Degree of Heat, until the Fumes and Effluvia are raiſed in a ſufficient Quantity, when upon opening the Steam Pipe VP, the Bathing Veſſel will become fill'd with the Effluvia, which may be apply'd to the Body as before directed; and if

the

the Effluvia have not Force enough to impregnate the Air in the Bathing Veſſel or artificial Atmoſphere ſufficiently, and to ſuch a Degree as may be deſir'd, in that Caſe the Vapours or Effluvia may be firſt drawn off from the Steam Veſſel vvvv, and made to paſs into the pneumatick Engine aaaa, out of which they may be forc'd into the Bathing Veſſel until the Air therein becomes ſaturated therewith in any Quantity requir'd; which Method of Fumigating the Body either univerſally or partially with dry Fumes or Vapours, produc'd from Ingredients well choſen and proper for the ſeveral general Intentions of Contracting, Relaxing, Reſolving, Diſcuſſing, Stimulating, *&c.* will prove of great Uſe in the Cure of many Diſeaſes, *&c.*

18. Moreover this new aerial Bathing Machine or artificial Atmoſphere, as the ſame has been deſcrib'd in the former Numbers, appears to have all the Properties neceſſary and requiſite to render it a commodious Machine for a Perſon to go through a general Diaphoreſis or Sweating Courſe, by placing the Perſon naked therein, and giving the Air in the Bathing Veſſel all the neceſſary Properties and Qualities, as to the Degrees of Heat, and its Impregnation with proper Effluvia and Vapours, *&c.* as are found to promote this general Intention and Evacuation by the cutaneous Glands; how this End may be beſt attain'd, may be underſtood by referring to the former Numbers.

19. The Perſon whilſt incloſ'd in this Air-Bath or artificial Atmoſphere, with the Air condens'd about him, if it be found neceſſary and the Caſe requires it, inſtead of Breathing the common external Air, he may be furniſhed with Air for Reſpiration of the ſame Denſity with that incumbent upon his Body, or of any other Degree of Denſity and Elaſticity as he finds ſuits beſt with his reſpiring Organs, by holding the End r, of a flexible membranous leather Pipe ra, in his Mouth, the other End whereof p opens into the reſpiring Veſſel xxxx, out of which he may be conſtantly ſupply'd with freſh Air, and of any Denſity, *&c.* requir'd. All which will become better underſtood, by referring to what has already been ſaid in the like Caſe in Number 9, of the Firſt Chapter. Now the Air both in the Bathing Veſſel, as alſo in the Reſpiring Veſſel, is brought to have the Degrees of Denſity, *&c.* propos'd, by the pneumatick Engine aaaa; which Engine in this Section, Fig. 4. with its correſponding Plan, Fig. 5. is repreſented as work'd by the Force of Men pulling of Ropes, w1, w2, paſſing round the Groove in the Wheel ww, upon the upper Part of the Axis aa, of the Engine; but in the other Draught of the ſame Engine, Fig. 1, 2, 3, 6, *&c.* the ſame is work'd by Men with Capſtane Bars fix'd into a Tympanum or Drum-head upon the upper End of the Axis aa; by either of which Methods a Power may be apply'd to the Engine, ſufficient to condenſe the Air in the Bathing Veſſel, as alſo in the Reſpiring Veſſel to any Degree of Denſity requir'd; and to know the State of the Air in the Bathing Veſſel, as alſo in the Reſpiring Veſſel, as to the Degrees of Denſity, Preſſure and Heat, there is for that Purpoſe a mercurial Gage bb, added to each Veſſel, with a Thermometer tt, annex'd to the Bathing Veſſel, and the like Inſtrument may be annex'd to the Reſpiring Veſſel alſo, and likewiſe there may be added a Hygrometer to both Veſſels, the Uſes whereof have been ſhewn before.

20. Now ſuch an Air-Bath or artificial Atmoſphere, as I have deſcrib'd in this Chapter, which admits of having its Properties and Qualities of Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Motion, Effluvia, *&c.* intended and remitted, regulated and adjuſted in all Degrees, Proportions, Alternations and Combinations, and which being apply'd and made to operate upon the whole external Body with all the ſaid Properties and Qualities duly fitted thereto, the ſame will prove the moſt perfect, ſafe, ſovereign Remedy and Means both for the Prevention, as well as the Cure of all Diſeaſes, produc'd by the relatively diſproportionate Properties and Qualities of the general Atmoſphere; for inaſmuch as this partial artificial Atmoſphere can at all Times, and for any Space of Time, and in all Places, have its Properties and Qualities chang'd and regulated in all Degrees, independently and contrary to thoſe of the general Atmoſphere, conſequently muſt prove the moſt natural perfect Method for Curing all the Diſeaſes produced thereby; ſo that this artificial Atmoſphere with its Properties and Qualities render'd thus changeable at Pleaſure, in all Degrees, at all Times, and for any Space of Time, and in all Places, may be conſider'd as a true and real, univerſal, mechanical, fluid Mould, Preſs or Mill, that may be ſet wider or cloſer, tighter or ſlacker to the Body, or render'd heavier or lighter, hotter or colder, moiſter or dryer, *&c.* according as will anſwer beſt with the preſent Caſe, Indications, and conſtitutional State of every Individual Perſon; either to contract or relax the Solids, or to grind, attenuate and aſſimulate the Texture of the Fluids coarſer or finer, *&c.* ſo that the Air being by this Method converted into an univerſal artificial Engine, Preſs or Mould, the ſame will thereupon become the moſt efficacious ſafe Means and Remedy in Nature, for attaining the two following cardinal primary Intentions, which virtually comprehend the whole Practice of Phyſick, and all that humane Art can do, either for Preſerving Health, or the Cure of Diſeaſes; and that is firſt, to contract and relax, or raiſe and lower the moving Force of the Solids, at proper Times, as is found neceſſary; ſo as to keep them in a due State and Plight for circulating the Fluids with a proper Velocity. And ſecondly, in keeping the Fluids of a proper Quantity, and ſuch as is duly proportion'd to the moving Force of the Solids; and likewiſe of a proper Degree of Fluidity and Tenuity, *&c.* In the due and regular Effection of which two general Intentions, conſiſts the whole Secret and Art of Health and Long Life; now for Illuſtration hereof I will produce the

following

following Caſe, ſuppoſe then a Perſon, labouring under a relax'd State of his Solids, which not having Force enough to ſubdue and circulate the Fluids with a ſufficient Momentum and Celerity, their Texture and Temperament will neceſſarily become vitiated and ſpoil'd, and acquiring too great Aſcidity, Lentor and Viſcidity, will lay the Foundation of Diſeaſes of the Chronical Kind; under which Predicament are comprehended all the Valetudinary, Hypochondriac, Hyſteric, Cachectic, and thoſe with relax'd Nerves, *&c.* making in the whole a very numerous Legion and Tribe (eſpecially in an Age of Intemperance and Luxury). Now as this general morbid Conſtitution (when the ſame is not hereditary) is the natural Effect of a light, warm, moiſt Air, to which its other Qualities may contribute very much, and likewiſe Errors in the other Non-Naturals; now the proper Intentions of Cure in this Caſe is plain, being always contrary and oppoſite to the Diſeaſe, namely, for to contract, brace, and wind up the Spring of the Solids, and to attenuate and diſſolve the Cohefion, Crudity, and glutinous Quality of the Fluids; now the moſt perfect ſafe Method to effect both thoſe two curative Indications in the Solids and Fluids; which two Intentions are of all others the oftenеſt wanted, and the moſt difficult of all, eſpecially what relates to the Solids, to be thoroughly and perfectly effected; now thoſe two Intentions I propoſe may be beſt obtain'd, by ſubmitting the Patient's Body at certain Times to a proper additional Quantity of Preſſure, which may be laid thereupon in any Quantity, and for any Space of Time requir'd; and for this Purpoſe the Perſon is to be incloſed wholly within a proper Veſſel or Machine, (as may be found deſcrib'd in this and the firſt Chapter) and have the Air condens'd therein, and refrigerated at the ſame Time, until it operates with ſuch a Degree of Preſſure and Cold upon his Body, taking Care alſo that its other Qualities be ſo regulated and proportioned, as is moſt proper for his Caſe and the Intention here propos'd; by which univerſal, equable, uniform Preſſure, which may be thus apply'd to his Body in all Degrees, and as often, and for as long a Time as is requir'd, the whole ſolid vaſcular Syſtem, with the contain'd Fluids, will undergo an univerſal Squeeze, Syſtole and Contraction, and be render'd more denſe, compact and elaſtick, and relatively ſtronger, whereupon the original elementary Machinulæ and Fibrilæ of the Solids being brought into cloſer Union and Contact, and being kept in that State of Approximation for ſome Time by continuing the Preſſure upon the Body, the Attraction of Cohefion will thereupon have Liberty and Time to exert itſelf, whereby the ſmall Fibrillæ will become mutually and ſtrongly link'd and cemented anew together, and all the Solids become invigorated and have their Elaſticity and Motive-Force reſtored and increas'd, and thereby better fitted to ſubdue and circulate the Fluids, which at the ſame Time by this univerſal Contraction and Compreſſion, communicated to the whole Body by this artificial Atmoſphere, will have their Lentor and Viſcidity broken and diſſolv'd, and by circulating through the whole vaſcular Syſtem, now under a general Contraction, the ſame will become triturated, and render'd fitter for the ſeveral Uſes of the animal Œconomy; whilſt at the ſame Time all the Flood-gates of the Veſſels that were before clogg'd and barr'd up, will now be thrown open, Obſtructions in the Glands remov'd, and all the natural Secretions and vital Motions reſtored to their proper Standard Meaſure, *&c.* And by repeating the Operation of going into this artificial Atmoſphere, at proper Intervals, and continuing therein for a reaſonable Time, ſuch Perſon will receive thereby a laſting perfect Cure, with the joint Aſſiſtance now and then, of the other new mechanical Methods of applying the Air to the Body, as may be found deſcrib'd in the ſeveral following Chapters, obſerving always a proper Regimen as to Diet, and the other Non-Naturals, which muſt ever be duly minded let the Means and Methods of Cure be what it will. Now ſuppoſing the Perſon's Caſe to be the contrary to what it was ſuppos'd before, and that his Solids are too tenſe and elaſtick, in which Caſe the Fluids being mov'd with too great Celerity, will become heated, rarefied, and alcaline, and thereby diſpoſe the Body to acute inflammatory Diſtempers; if now this artificial Atmoſphere have its Properties and Qualities regulated and adjuſted in a contrary Manner to what they were in the former Caſe and Intention, by rendering the Air therein comparatively light, warm and moiſt, the ſame will ſerve as effectually for relaxing the too great Rigidity and moving Force of the Solids, as it ſerv'd to contract and augment the ſame in the firſt Caſe wherein they were ſuppos'd to be over-relax'd, *&c.* ſo that every Time ſuch Perſon goes into this artificial Atmoſphere, his Body becomes really and actually new-faſhioned and molded, this artificial Atmoſphere ſerving as a true and real Fluid-Mould and Bandage in reſpect of his Body, and according to the Degrees of its Denſity and Preſſure, *&c.* above or below that of the general Atmoſphere, ſo will the Dimenſions of his Body every Way, and in every Part, be rendered greater or leſs proportionally; by which Means we become provided with a much more perfect, ſafe, univerſal Method for obtaining thoſe two capital Intentions of contracting and relaxing, or of raiſing and lowering the motive Force of the Solids, and for regulating the Quantity and Qualities of the Fluids, with the Secretions depending thereon; than from the common Methods now in Practice, by frequent repeated Doſes of Emeticks, together with the Cortex, Cold and Hot Baths, and other tedious Courſes of Alteratives, Specificks, with Loads of nauſeous Medicines, and for moſt Part quite oppoſite to the true Intention of Cure; the Effects of all which internal Medicines are not only tranſient and uncertain, but oftentimes of fatal Conſequence; and moſt commonly, tho' they may remove the preſent Symptoms, yet lay a Foundation for future Evils much worſe than thoſe they were deſign'd and ſeem'd to relieve. Now Emeticks in common Practice are fam'd to be the moſt efficacious Remedies, and to produce the

greateſt and quickeſt Alterations, but then this their Effect is wholly owing to the univerſal Shock, Contraction and Stimulation which the whole animal Syſtem becomes ſubject to during its Operation, and not to any ſpecifick, occult, transforming Powers or Virtues in the Medicine itſelf; which ſame Effect, as has been ſhewn, may be much more effectually and ſafely obtain'd by applying a proper Quantity of Preſſure to the Body by the Air. Moreover the Operation of Emeticks is ſo violent, that few Perſons are willing to undergo the Fatigue and Exerciſe thereof, and are in many Caſes not practicable without great Danger; and beſides, the Operation thereof being but of ſhort Duration, its Effects ſoon wear off, and the Diſeaſe returns with freſh Vigour if Recourſe be not had to the ſame violent fatiguing Exerciſe. And however the aforeſaid two general Intentions may be effected by a judicious Application of the Cold and Hot Bath, with other proper Exerciſe, *&c.* eſpecially when uſed according to the new Methods deſcrib'd in the firſt Chapter; nevertheleſs there are many Reaſons and Caſes, which render the effecting of the aforeſaid general Intentions by means of the artificial Atmoſphere or Air-Bath, properly prepar'd and regulated as before explain'd, as infinitely the beſt, moſt efficacious, ſafe and univerſal Method, inaſmuch as it may be apply'd to all Perſons, young or old, ſtrong or weak, at all Times and Seaſons, and for any reaſonable Time requir'd; whereas the Cold Bath by reaſon of its too ſtrong and ſudden Stimulus becomes improper for the Old, Infirm, and ſuch as have unſound Viſcera, internal Tumors, Ulcers, Hemorrhages, *&c.* And beſides, the Exerciſe of the Cold Bath is too fatiguing and diſagreeable to moſt Perſons to purſue the ſame regularly; all which Inconveniencies will become avoided by having the ſaid Intentions effected by ſuch an artificial Atmoſphere; the Air being the natural Element to which the humane Body is ever inſeparably related and accuſtomed from the firſt to the laſt of its Exiſtence; neither will a Perſon in going into this artificial Atmoſphere or Air-Bath, be oblig'd to change or take off any of his Cloaths, and thus he may go into the ſame as often and for as long a Time as his Caſe requires, or as he finds Benefit thereby, with as little Trouble as in going into his Cloſet or Study, and the Machine may be ſo contriv'd as to give him an Opportunity of exerciſing himſelf, either in Reading or Writing, or rather with ſome mechanical Exerciſe to communicate Motion to his Body, which will be more proper during his Abode within the artificial Atmoſphere or Air-Bath. And moreover when this additional Preſſure is communicated to the Body by means of Air, the Preſſure becomes apply'd to all Parts of the Body equally and uniformly, which can't be done with Water, as being an unelaſtick incompreſſible Fluid.

21. Now the true Secret and Art for Preſerving and Prolonging Life, conſiſts chiefly in keeping the Solids from Unfolding and Developing too quick, by Contracting, Bracing and Winding up their Springs at proper Times as they want, and in keeping the Fluids of a proper Quantity and Qualities; now the only beſt Method for attaining both thoſe Intentions, is by applying a proper Quantity of Preſſure, *&c.* to the Body by means of Air, in the Manner before explained: The Truth and Efficacy of which Method we have yet farther confirm'd and eſtabliſh'd from conſidering, that the Inhabitants of cold Countries are generally ſtronger, and longer liv'd, than thoſe of warm hot Countries: Now this Effect is wholly owing to the Difference in the Properties and Qualities of the Air, as to its Gravity, Preſſure, Heat, Cold, Humidity, Dryneſs, *&c.* Thus in the northerly Regions, the Air being generally denſer, heavier, colder, and damper, by its greater Preſſure and Stimulation upon the Body, it keeps the Solids from Unfolding too faſt, wherein Longævity alone conſiſts; whereas in the ſoutherly Climates the Air being generally rarer, lighter, and hotter; by all which Properties it contributes greatly to accelerate the Growth, Elongation and Expanſion of the Solids, whereby all Animals and Vegetables arrive much ſooner at their full Growth, and final Diſſolution and Death.

22. After being taught by the Obſervations, Experience and Authorities of ſo many Ages, that the Air is the principal Cauſe of animal Life, Health, and Diſeaſes, is it not ſurpriſing, that this great univerſal Inſtrument and Remedy of Nature's Appointment, ſhould be ſo much neglected, and ſo little regarded, as it is in the preſent Practice; and that no Attempts have hitherto been made to reduce the ſame into Uſe and Practice, for the general Benefit and Health of Mankind, whilſt we are induſtriouſly ranſacking all Nature, and analyſing every inſignificant Drug, in Search of new Remedies. Thus with what unwearied Study and Application has Mercury been tortur'd and transform'd into all Shapes, in hopes of finding ſome Catholicon or Panacea, but all in vain and to no Purpoſe; for let Mercury be transform'd what Way ſoever, the ſame, with all other Remedies of the foſſil Tribe, will ever remain in its own Nature inimical to, and incompatible with the Structure, Mechaniſm and Health of animal Bodies; whilſt at the ſame time we have wholly neglected enquiring what Advantages may be produ'd from the mechanical Properties and Qualities of the Air, Nature's great and univerſal Inſtrument and Remedy, with the beſt Methods for obtaining the ſame; which when properly apply'd, according to the new Methods deſcrib'd in this Treatiſe, will afford the moſt perfect Means for Prolonging Life, and the Cure of Diſeaſes.

23. Now the mechanical Effects of the Air upon the humane Body, when thus apply'd thereto by proper Machines, as before deſcrib'd, may be more readily underſtood, when illuſtrated by a linear Repreſentation and Draught, ſuch as Fig. 4. Plate 1. already referr'd to; wherein is exhibited the Image, Picture or Section of a humane Body, the external Contour or Surface

whereof

whereof is circumſcribed and defined by two parallel concentrick Lines, the outermoſt whereof is one real continued Line, but the innermoſt is a prick'd or diſcontinued Line; which two Lines ſerve to expreſs and exhibit the different Effects, Alterations and Changes produc'd in the Dimenſions of the Body, when ſubmitted to the Operation, Exerciſe and Diſcipline of the artificial Atmoſphere, already deſcrib'd in this Chapter. Thus, before that a Perſon enters into this artificial Atmoſphere, ſuppoſe the real abſolute Dimenſions of his Body to be defin'd by the outermoſt parallel compound Line, this Perſon upon going into this Machine or artificial Atmoſphere, and continuing therein for a reaſonable Time, and having the Air therein condens'd, and otherwiſe properly prepar'd (as hath been already explain'd) upon coming out of the Machine, his Body will be reduced to a leſs Bulk, the abſolute real Dimenſions whereof may be properly expreſs'd by the innermoſt parallel prick'd Line. And according as the Air in the Machine is render'd more or leſs denſe, or hath its other Properties and Qualities intended or remitted, ſo the Dimenſions of the Perſon's Body before, and after his undergoing the Operation and Exerciſe of this artificial Atmoſphere or Air-Bath, will be greater or leſs proportionally. Thus, ſuppoſe a Perſon in the Morning, or at any other Time of the Day, or Night, when judg'd neceſſary, ſubmits his Body for a reaſonable Time to the mechanical Diſcipline and Exerciſe of ſuch an artificial Atmoſphere, properly prepared and proportion'd in reſpect of its Denſity, Preſſure, Heat, Cold, *&c.*, he will find himſelf thereby greatly refreſh'd, invigorated, and much better diſpoſed and prepared to ſuſtain the Exerciſe of the Day, be what it will, either of the Body, or intellectual Faculties. The Rationale and Mechaniſm by which all thoſe ſalutary good Effects become produced being obvious, upon conſidering that the animal Body upon being thus ſubmitted to a proper additional Preſſure, *&c.* the whole Syſtem of the Solids being thereby brought into cloſer Union and Approximation, the Attraction of Coheſion between the ſmall Machinulæ and Fibrillæ which compoſe the Solids, will become thereby augmented, and their Elaſticity and Spring increaſed, whereby they will be enabled not only to ſhake off and diſlodge any foreign unaſſimulable Particles, that may have intruded themſelves into their Pores and Interſtices, and thereby clogging and impeding their natural Vibrations, but become render'd better able withal to attenuate, circulate, and ſecrete the reſpective Fluids, which will likewiſe become condens'd and reduc'd into leſs Bulk proportionally, at the ſame Time.

24. We ſee then that the ſeveral Properties and Qualities of the Air, when judiciouſly apply'd by proper Machines to the Body, furniſhes us with the moſt efficacious, perfect, univerſal Means for effecting that primary capital Intention of conſtringing and relaxing, or raiſing and lowering the moving Force of the Solids, whereby we may keep the ſame at all Times regularly and duly wound up like as we do a Clock or Watch. That this Practice muſt be right and attended with the aforeſaid Advantages, requires no other Proof than that of its being perfectly agreeable with the eſtabliſh'd Order and Method of Nature, the Air being ordain'd and endow'd with the aforeſaid variable Properties, on purpoſe to regulate the animal Solids, by contracting and relaxing, or raiſing and lowering their moving Force, alternately and ſucceſſively, as hath been deſcrib'd in the 2d, 3d, 4th, and 5th Articles of this Chapter, *&c.* For which Reaſons ſuch a Machine and Apparatus, (the Charge whereof being withal but inconſiderable) will become the moſt uſeful valuable Piece of Furniture for all Noblemen's and Gentlemen's Houſes, and likewiſe for all Hoſpitals, Infirmaries, and other publick Places, where People reſort for Health, *&c.*

25. The Machine and Apparatus deſcrib'd in this Chapter, will ſerve equally for bathing either with cold or hot Water, and for performing and procuring all the Operations with the Benefit and Advantages enſuing therefrom, as explain'd in the firſt Chapter; and with ſome further ſmall Additions, will ſerve likewiſe for performing all the new mechanical Operations and Exerciſes, and attaining all the ſalutary Uſes and Advantages accruing from thence, as deſcrib'd in the third Chapter, *&c.*

CHAP.

CHAP III.

General Obſervations upon the mechanical Effects produced in the Blood, by its becoming ſubject conſtantly to the joint Action and Mechaniſm of the Lungs and Air, wherein the principal Uſe of Reſpiration is briefly conſider'd; together with another new and important Office aſſign'd thereto. Wherein alſo is deſcrib'd the Conſtruction, Application and Uſe of an artificial Atmoſphere, whereby the Air may be made to operate upon the Lungs, with its Properties and Qualities ſo chang'd, proportion'd and adjuſted, as ſhall ſuit beſt with the conſtitutional State of the reſpiring Organs in every individual Perſon, whereby all ſuch Diſeaſes as owe their Original to a faulty, imperfect Reſpiration and Sanguification, (which is the true productive Cauſe of moſt Diſeaſes) may be ſafely and certainly cured, &c.

1. THE Air being the univerſal Inſtrument and Principle upon which the Generation, Growth and Corruption of all Animal and Vegetable Bodies abſolutely depend, to anſwer which great Ends, the ſame is endow'd with all the mechanical Properties and Qualities requiſite thereto; as Fluidity, Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Attraction, Stimulation, Motion, *&c.* by virtue whereof it is capable of producing the greateſt Alterations in Animal Bodies. Now there are two principal Ways whereby Providence applies this moſt active univerſal Fluid for bringing about the ſeveral progreſſive States, Periods and Revolutions of Animal and Vegetable Life.

2. The firſt notable Operation of the Air, is that which it exerts upon the whole external Body, with reſpect to which it may be conſidered as a variable elaſtick Mould, or univerſal Fluid Bandage, by the changeable Properties and Qualities whereof the Bodies of Animals are kept in a continual fluxionary State of Exerciſe, Motion and Reſt; and the Ballance of Life kept always librating between Health and Sickneſs. As has been more fully demonſtrated in the Introduction, and likewiſe in the preceding Chapter, *&c.* wherein alſo has been deſcrib'd the Conſtruction of an artificial Atmoſphere, whereby all the Inconveniencies and malignant Impreſſions ariſing from the Influence of the Air conſidered as operating upon the whole external Body, may be prevented and remedied, *&c.*

3. The ſecond important Operation of the Air, is that upon the Blood in the Lungs of born Animals, and this is the principal Scene wherein the good and bad Effects of the Air are moſt eminently manifeſted and diſplay'd, as having the whole circulating Maſs of Blood conſtantly and ſucceſſively brought thither and ſubmitted to the joint Operation and Mechaniſm of the Lungs and Air. So that as the Air, when its Properties are duly proportioned to the conſtitutional Structure of the reſpiring Organs, becomes the principal Inſtrument of animal Life and Health; ſo on the contrary, when the ſame Properties of the Air become, from what Cauſe ſoever, relatively diſproportionate to the organical Structure of the Lungs, it becomes the moſt general productive Cauſe of all the capital Diſeaſes incident to Animal Bodies. Theſe Conſiderations furniſh'd me with an Opportunity to think of a Method how an artificial Atmoſphere may be conſtructed, whereby the Properties and Qualities of the Air may be intended or remitted in all Degrees, Proportions, Alternations and Combinations, ſo as to ſuit exactly with the conſtitutional State of the Lungs in every individual Perſon.

4. The Solution of this moſt noble Problem I propoſe for the Subject of this Chapter, having firſt previouſly ſuggeſted ſome occaſional Obſervations that occurr'd to me in thinking of this Subject, relating to the Nature and Uſe of Reſpiration, with the mechanical Effects produc'd in the animal Fluids by the joint Action of the Lungs and Air; wherein I ſhall deſcribe the two principal Ends and Uſes of this compound Organ, the latter of which Uſes being wholly new, is only propos'd as highly probable, and as a proper Subject for future Enquiry. And next propoſe ſome new mechanical Methods for conſtructing this artificial Atmoſphere to be apply'd to the Lungs, in like Manner as that deſcrib'd in the ſecond Chapter, is apply'd to the whole external Body.

5. Notwithſtanding all the modern Diſcoveries and Improvements in Anatomy, experimental Natural Philoſophy, Mechanicks, Hydraulicks, Pneumaticks, ſupported by Mathematicks, our Knowledge of the Animal Œconomy, and Laws by which the Microcoſm is govern'd is ſtill very imperfect, and from an unaccountable Vanity and Infatuation we appear to have attain'd to a much greater Certainty, and better Acquaintance with the Laws and Ordnances by which the Microcoſm or ſolar Syſtem is regulated. I am however far from thinking the Contemplation of any Province of Nature, and particularly Aſtronomy, as not highly deſerving our Attention and Study; all that I intend hereby is, that the Knowledge of our own Being (according to the old oracular Injunction, *Noſce te ipſum*) ought to claim a Preference to any other, as being a Subject ſtill very far from being exhauſted, and abounding with a much greater Variety of uſeful curious Enquiries, and ſuch as require the deepeſt Reſearches and utmoſt Efforts of the humane Underſtanding of any other whatſoever. And thus we find that moſt of the capital Operations of the

Animal

Animal Machine are as yet but imperfectly known, as appears from the different Opinions of Authors thereupon, ſo that neither the Operation of Animal Digeſtion, Chyleſication, Sanguification, Secretion, Nutrition, muſcular Motion, with the true Laws of the Circulation of the Fluids, nor the Uſes of the Air in Reſpiration; are yet truly and certainly known.

6. The Doctrine and Theory of Reſpiration not being yet fully determin'd, notwithſtanding the many labour'd Syſtems and Hypotheſes that have been advanc'd thereupon, Authors being ſtill greatly divided in their Opinions, and the Diſpute not yet certainly decided; this being the preſent State of the Caſe, I take it for granted, that no Perſon ought to be deterr'd from offering his Sentiments thereupon, either from a Conſciouſneſs of his own Inabilities, or the Unſucceſsfulneſs of thoſe who have gone before; being taught both from Scripture Authority, as well as by Experience and Obſervation, That the Battle is not always to the Strong, nor the Race to the Swift, *&c.* To which I think it may be farther added, that the moſt uſeful Inventions (by which I mean ſuch as are of real, practical, general Uſe) do not always fall to the Lot of Perſons of the moſt extenſive ſpeculative Knowledge, but more frequently to Perſons of greater Practice and Experience, tho' with comparatively leſs inlarg'd intellectual Faculties. And ſhould what is offer'd as new upon this doubtful Subject, amount no farther than to a Degree of Probability and Veriſemblance, it is but reaſonable to hope the ſame will not be condemn'd, before being duly weigh'd in the juſt Ballance of Reaſon and Experience, and found to bear the Mark and Criterion either of Truth or Error.

7. But to return from this Digreſſion to the Subject in hand; with reſpect then to the Operation and Uſe of the Air in Reſpiration, with its Effects upon the animal Fluids in the Lungs, which being an Organ of a very compound Structure and Operation, ſome of the ſubordinate ſecondary Uſes whereof are well known as being ſelf-evident, ſuch as its being inſtrumental in forming the Speech, and miniſtring to the Action of Suction, as alſo to the Senſe of Smelling, by conveying and applying the odorous Effluvia to the olfactory Nerves: But as to the primary Uſe of the Air, whereby it becomes ſo abſolutely neceſſary to the Life, and Growth of Born Animals, this important Article is ſtill but imperfectly known, the true and perfect Knowledge whereof would be of infinite Uſe to diſcover both the original Cauſe, and Seat of Diſeaſes, with the moſt perfect Methods of Curing them. For as the Stomach and Lungs are the two principal Organs of Force in the animal Machine, for ſubduing and preparing the Fluids for their reſpective Offices, ſo that moſt Diſeaſes take their firſt Original and Growth from a Defect in one, or both the ſaid two Organs, ſo that was the true Mechaniſm and Operation thereof once fully known, with their Diſeaſes or Diſorders, and whether the Defect be in both, or only one of the ſaid Organs, with the Time when they firſt happen, and by what Cauſe the ſame was produced, this would lay a ſolid Foundation for a more perfect and ſucceſsful Practice in the Cure of moſt Diſeaſes.

8. In order then to diſcover the true End and Uſe of the alternate Syſtole and Diaſtole of the Lungs in Reſpiration, it will be neceſſary to obſerve the ſeveral Stages, Periods and Progreſs of the animal Fluids, from their firſt Change and Preparation in the Stomach, until they arrive at the right Auricle and Ventricle of the Heart, and to conſider what further Alterations the ſame muſt and ought neceſſarily to undergo, before it is ſent to the left Ventricle, in order to be detach'd to the ſeveral Parts of the Body for the Offices of Circulation, Sanguification, Secretion, Nutrition, muſcular Motion, *&c.* In the firſt Place then, the Animal Machine conſiſting of two general Principles, the Solids and Fluids; now the Solids by their continual Motion, Friction, Attrition, and from the Reaction of the circulating Fluids, do neceſſarily ſuffer a conſtant Waſte and Expence, and require as conſtant a Supply and Repair, which is wholly furniſhed from the Fluids: The Fluids alſo, by what is thus ſupply'd for the Nutrition of the Solids, become alſo under a like Neceſſity with the Solids of receiving a continual Supply of freſh Matter, which Supply is furniſhed from the Aliment, which being firſt duly mix'd with the Saliva, and other proper Liquors in the Stomach, is by its muſcular Action, aſſiſted by the alternate Syſtole and Diaſtole of the Diaphragm, and abdominal Muſcles, together with the expanſive Force of the incloſed Air, triturated, diſſolv'd and analiz'd; and being from thence protruded into the inteſtinal Tube, where mixing with the Bile and pancreatick Juices, has its Texture farther broken, elaborated and exalted, and being by the periſtaltick Motion of the Inteſtines, together with the included Air, objected and preſented to the Orifices of the lacteal Veſſels, becomes abſorb'd and attracted into the ſame, through which capillary Tubes it is further propell'd, and being collected into one common Receptacle, is from thence tranſmitted, together with the Lympha, wherewith it is here plentifully ſupply'd to dilute the ſame, through the thoracik Duct to the right Ventricle of the Heart, to be there mix'd with the Blood returning from all Parts of the Body by the Vena Cava; now as the Blood returning from all Parts of the Body is render'd vapid, viſcid and effete, having loſt moſt of its ballamick, nutritive Parts, which have been apply'd towards the Nutrition and Repair of the Solids, and as the Blood muſt alſo become more viſcid, groſs and coheſive in circulating through the Veins with the diverging Syſtem of the Arteries, together with what it has loſt by the ſeveral glandular Secretions; upon all which Accounts the refluent Blood muſt have its Texture decompounded, and require to be anew repair'd, attenuated and analiz'd, and likewiſe to be ſupply'd and mix'd with a Quantity of freſh

new Matter or Chyle, before it is fit to be ſent out again to carry freſh Nutrition to the Parts, and to continue the Circulation; and for this End it is made for to circulate and return ſucceſſively to the Heart, to be thus cohobated and mix'd with the freſh Chyle conſtantly flowing in there out of the thoracik Duct; now as the Blood requires to have its compounding Principles intimately mix'd and blended with the Chyle before it is fit to convey proper Nouriſhment to the Solids, this Mixture and Cohobation is firſt of all but very imperfectly perform'd in the right Auricle, and then in the right Ventricle of the Heart; but as this Mixture of the Blood with the Chyle can never be ſufficiently and perfectly effected by the Force and muſcular Action of one ſingle large Veſſel or concave Muſcle, as that of the right Auricle and Ventricle of the Heart, in order then to anſwer this important End and Intention, there was an abſolute Neceſſity for having the animal Machine furniſh'd with another more appropriate Organ peculiarly fitted for to anſwer that Purpoſe, ſuch as are the Lungs, which by virtue of their ſpecial Mechaniſm and Structure are in all Reſpects moſt perfectly fitted for performing this moſt eſſential Office. This therefore appears to be the final End and principal Deſign of this moſt admirable Organ, which from its Organization and Uſe may be call'd a perfect pneumatick Engine, and ſerves like to a Mill or Preſs for to grind, attenuate, intimately mix and aſſimulate the Principles of the Blood, with thoſe of the Chyle together, ſo as to form one ſmooth, balſamick, nutritive Fluid of a ſimilar, homogeneous, uniform Texture in all its Parts, in ſuch wiſe that the Particles of the Blood, Chyle and Lympha ſhall be every where perfectly compounded together, whereby the ſame becomes endow'd with all the neceſſary Qualities of a Fluid moſt perfectly mix'd, compounded and aſſimulated, and thereby fitted for ſupplying Nouriſhment to all Parts of the Body equally and alike; this therefore I take to be the firſt principal obvious End and Uſe of Reſpiration, or of the joint Operation of the Lungs and Air; and in conſequence hereof it may be obſerv'd, that whenſoever Reſpiration is not duly perform'd, neither the Offices of Sanguification, Circulation, Secretion, Nutrition, *&c.* upon which the Health of the animal Machine wholly depends, can ever be well executed. So that to this one Cauſe alone of a defective imperfect Reſpiration, join'd to the Diſorders and Defects of the Stomach (as deſcrib'd in the ſeventh Chapter) moſt if not all Diſeaſes may be referr'd as their proper original Source and Seat. For ſuppoſing a Perſon to have the Syſtem of his Solids and Fluids originally ſound and well conſtituted, ſuch a Perſon can only become diſeas'd from what he takes by way of Aliment, by its being diſproportionate either in Quantity or Quality, or both, to the digeſtive Power of the Stomach and the other Glands and Viſcera, which we may call the Errors or Diſeaſes of Digeſtion; or the ſame individual Perſon may become ſubject to Diſeaſes of all Kinds, from the mechanical Effects of the Air, conſider'd as operating with a Momentum and Force relatively diſproportionate either to the conſtitutional State of his whole Body, but chiefly and principally of his reſpiring Organs; for if the Properties and Qualities of the Air be not duly proportion'd relatively to the organical Structure of this Perſon's reſpiring Organs, the Conſequence will be an imperfect Reſpiration, whereby the Blood not having its compounding Principles duly aſſimulated and mix'd, the Work of Circulation, Sanguification, Secretion, Nutrition, *&c.* depending thereupon, cannot be duly perform'd; from whence, as from another fruitful Source and Original, Diſeaſes of all Sorts may be produc'd. That a defective Reſpiration is of itſelf alone a Cauſe ſufficient to produce all Kinds of Diſeaſes, is a Truth abundantly manifeſt; for if the reſpiring Organs, from any Cauſe whatever, either from their being of too lax, tenſe, and rigid Structure, or from the State of the Air, being either relatively too heavy, or too light, hot or cold, moiſt or dry, or impregnated with Effluvia of any Sort, *&c.* become incapacitated for executing this their principal Office of triturating, diſſolving, and intimately mixing the Blood, Chyle, and Serum, *&c.* together, when the Blood comes to be projected out of the left Ventricle of the Heart into the Aorta, and thence diſtributed through the diverging Syſtem of the Arteries to all Parts of the Body; now the Chyle not being perfectly mixed with the Blood in this Caſe, the ſame as being the lighteſt Fluid and having the leaſt Momentum, will become determined and forced towards the Sides of the Veſſels, whilſt the Blood being more denſe and heavy will keep moving along the Axis of the Veſſels, whereby the Chyle which contains the Matter for Nutrition, will be diſtributed unequally to the ſeveral Parts, and being withal crude, viſcid and coheſive, for want of a due Comminution in the Lungs, the ſame will become directed unequally to the ſeveral Glands, Viſcera, *&c.* producing univerſal and particular Obſtructions, Atrophies, Dropſies, Cahexies, Fevers, with all ſorts of Diſeaſes; ſo that when the conſtituent Principles of the Blood are not kept duly attenuated and compounded together by the Action of the Lungs and Air, the Fluids muſt of Courſe degenerate and verge towards a diſtemper'd State, becoming either too viſcid and crude, or too much rarefied, alcaliz'd and diſſolv'd in their Craſis and Temperament; the former acid State being the Original of ſuch Diſtempers as retain to the chronical Kind, as the latter alcaline State is of the acute Kind, and in proportion as the Fluids become diſeas'd, the Solids which derive their Nutrition therefrom, muſt by Conſent participate the ſame Fate; ſo that the whole animal Syſtem both Solids and Fluids muſt hereupon become ſubject to Diſtempers of all Kinds, which though proceeding from this one general Cauſe alone of a defective Reſpiration, yet will appear ſpecifically differenced by various Phenomena, Symptoms and Circumſtances, as if they were really produced by different diſtinct Cauſes, according as the ſeveral

Glands

Glands and Viſcera are more or leſs diſpoſed to receive and retain the firſt Impreſſions and Attacks of the morbid Fluids.

9. As the Operation and Effects of Reſpiration extend not only to the Region and Cavity of the Thorax, but likewiſe to that of the Abdomen, with all the Organs, Viſcera and Veſſels contain'd therein, it muſt therefore have ſome important Uſe and Effect within the Region of the Abdomen alſo, as Nature never does any Thing in vain; we obſerve then that the Cavities of the Thorax and Abdomen are both ſubject at the ſame Time to an alternate Syſtole and Diaſtole, or Contraction and Dilatation, we have already conſider'd what Effects this alternate Motion muſt produce in the Blood, as it circulates through the Lungs, in which Operation the Air by its alternate Injections and Ejections into and out of the Lungs, in the Acts of Inſpiration and Expiration, may be conſider'd as a Fluid, Piſton, or Peſtil acting by ſucceſſive Strokes upon the Blood in the pulmonary Veſſels, which may be conceiv'd as a Mortar or Kneading Trough, wherein the Blood is kept conſtantly pounded, kneaded and aſſimulated. Now as the Air within the Cavity of the Abdomen acts after a ſimilar Manner upon the Food in the Stomach, and upon the Chyle, *&c.* in the chylopoietick Organs, as the Air does upon the Blood in the Lungs, for which Reaſon we are to conſider the Operation of Reſpiration as one principal Agent and Inſtrument in the Work of Digeſtion, or the firſt Reduction and Preparation of the Aliment in the Stomach, *&c.* Thus the Air included in the Abdomen, and that in the compound alimentary Tube together with the Food, *&c.* are as two antagoniſt Powers ſerving to counterballance each other, as alſo the external Air, ſo that in each Act of Expiration the Air in the Cavity of the Abdomen and alimentary Tube becomes condens'd, by the Contraction and Compreſſion of the Diaphragm and abdominal Muſcles, as in every Act of Inſpiration the Air becomes rarefied by the Dilatation of the ſaid Cavity; by which alternate Condenſation and Rarefaction of the Air in the Cavities of the Thorax and Abdomen, all the Organs, Glands, Viſcera and Veſſels in both Cavities become ſubject to a like alternate Syſtole and Diaſtole, by which alternate Pulſation thus continually communicated to the Stomach and chylopoietick Organs, the Food is kept in a conſtant Agitation, and becomes beat, diſſolv'd and broken as it were with a Peſtle in a Mortar, the Air performing by its alternate Condenſation and Rarefaction the Office of a Peſtle, and the alimentary Tube, *&c.* that of a Mortar; the Chyle being likewiſe by the ſame Cauſe impell'd and propagated through the lacteal Veſſels and thoracik Duct to the Heart. And thus not only the Stomach and chylopoietick Organs, but all the other Viſcera and Glands ſituated in the Regions both of the Thorax and Abdomen, as the Heart, Liver, Spleen, Kidneys, Urinary Bladder, Womb and its Contents, as alſo the Trunks of the Aorta, and Vena Cava, and by Conſequence the whole vaſcular Syſtem, with the contain'd Fluids, become all ſubject to the like alternate Syſtole and Diaſtole communicated to them all at the ſame Time by the alternate Condenſation and Rarefaction of the Air within the ſaid two Cavities, at every Inſpiration and Expiration.

10. Notwithſtanding that famous Muſcle the Heart, be commonly reputed the principal ſole Machine for effecting the Circulation of the Fluids, this Organ, however does no wiſe appear to be a Power and Cauſe adequate and ſufficient for ſuch an Effect, and for overcoming ſo great a Reſiſtance; but what Force is wanting in the Heart and Arteries for this Purpoſe, we ſhall find abundantly ſupply'd by the Organs of Reſpiration, which conſidering the extenſive Operation and Effects thereof, with the great Apparatus of mechanical Powers and Muſcles that are employ'd therein, and receive Motion thereby; the ſame may be very juſtly named the *Primum Mobile*, principal Spring and moving Force of the Microcoſm or animal Machine, and upon which all the other Movements, with the Circulation of the Blood chiefly depends; ſo that I think we need not ſcruple aſcribing this as another primary Uſe of the Organs of Reſpiration, namely, of their ſerving as a principal Auxiliary Power, together with the Heart, for effecting and continuing the Circulation and Diſtribution of the Fluids. And from thence we may juſtly conclude, That the two great catholick Operations of Digeſtion and Reſpiration, or Aliment and Air, with Exerciſe or Motion, are the true general, original Principles whereon animal Life and Health depend, and from the Errors and wrong Uſe, whereof moſt, if not all Diſeaſes are produc'd; and by which alone they are to be cured; ſo that there is no Occaſion of multiplying the Catalogue of Diſeaſes *in infinitum*, and endeavouring to account for their Production, by a like infinite Chain of unintelligible, remote Cauſes, according to the modern Practice, to the great Confuſion of Phyſick; when it is demonſtratively evident, that all the original, diſtinct, morbid Conſtitutions and Diſeaſes, may be, and really are, produc'd from the obvious, ſelf-evident, mechanical Effects of Digeſtion, and Reſpiration, or Aliment, Air, with Exerciſe or Motion.

11. That the End and Uſe of Reſpiration is not as many Authors maintain, for to ſupply the Blood with freſh Air, is, I think, pretty manifeſt, the Blood rather appearing to want ſome of the Air, wherewith it is always more or leſs replete and abſorb'd, rather drawn off and diſcharg'd out of it, than to have more added to it. As I ſhall ſhew in the Sequel; and as to the Caſe of Animals dying in Vacuo, or in an exhauſted Receiver; as alſo when made to breathe the ſame individual Air, this does not appear to be from a Want of Air, or any nitrous Particles, not being tranſmitted and convey'd to the Blood, but from the Circulation becoming in both Caſes entirely ſtopp'd in the Lungs, by the great Reſiſtance and Compreſſion upon the Blood Veſſels of the Lungs, which become collaps'd and contracted in the firſt Caſe; and in the ſecond

Caſe

Caſe ſo greatly expanded by the internal Air in the Blood (now becoming greatly rarefied and heated, the external Air not permitting it now to exhale fait enough) and being ſtrongly compreſs'd outwardly by the external Air becoming now alſo greatly heated and rarefied, by being abſorb'd with the Steam and Vapours iſſuing from the Animals, Body and Lungs, ſo as to arreſt and put an entire Stop to the Circulation of the Blood through the pulmonary Veſſels, whereupon the Death of the Animal muſt neceſſarily enſue in both Caſes.

12. Now with reſpect to the Uſe that has been aſſign'd to the compound Operations of the Lungs and Air, as Experiments in Matters of this Nature, carry a much ſtronger Conviction and Evidence than bare Arguments, and abſtract Reaſoning alone, for this End the following Experiment is propoſed, which if practicable, will ſerve as an Experimentum Crucis, both to eſtabliſh and confirm what I have already advanced, with what I have farther to add as to the Uſes of Reſpiration, which is this, ſuppoſe the Pulmonary Artery of any adult healthy Animal, could be brought to communicate with the pulmonick Vein, by an anomolous Canal or Iſthmus, like to what is obſerved in the Fœtus, ſo that all the Blood was made to flow directly out of the Artery into the Vein, without ſuffering any to paſs through the Ramefications of the ſaid two Veſſels within the Cellular Subſtance of the Lungs, by cauſing the Pulmonary Artery and Vein, as ſuppoſe of a Dog, to communicate by means of an artificial Pipe inſerted between both. Now I will ſuppoſe this Experiment to be actually made, whereupon I will venture to advance the following Poſitions. Firſt, That the Animal if it is not kill'd under the Operation, will continue to live, and the Circulation with the other vital Functions and Motions be carry'd on as before, this being ſuppos'd to be true in Fact, the following controverted Points will be clearly made out, namely, that Reſpiration or the alternate Dilatation and Contraction of the Lungs, is not intended for conveying freſh Supplies of Air, or Nitre, or both, to the Animal Fluids in order to preſerve Life, foraſmuch as this Animal is ſuppoſed to live, and to have all the vital Motions and Actions perform'd, altho' totally depriv'd from receiving any freſh Supplies either of Air, or nitro-aerial Particles, by the Lungs, as having in this Caſe none of the Blood circulating therein. *Secondly*, ſuppoſing the Animal to ſurvive the Operation, yet it muſt neceſſarily, and that in a ſhort Time, become arreſted with great and mortal Diſtempers, for as the Blood of this Animal having its natural Courſe through the Lungs interrupted, and being now made to circulate only through the Heart, with the Ramefications of the Aorta and Vena Cava, the conſtituent Principles thereof muſt be very imperfectly attenuated, compounded and aſſimulated, by the muſcular contractile Force of the Heart, and that of the arterial and venal Syſtems, for want of the joint and principal Operation of the Lungs and Air thereupon; whereby the Craſis, Texture, and Temperament of this Animal's Blood becoming entirely diſſolved and decompounded, the ſame will be render'd ſoon unfit for the Offices of Circulation, Secretion, Nutrition, *&c.* and thereupon become diſpos'd to coaleſce and form large Moleculæ, producing univerſal and particular Obſtructions, Tumors, Ulcers, Cancers, Inflammations, Atrophies, Dropſies, Pollipuſſes, Fevers, *&c.* ſo that this Animal muſt of Neceſſity, and that within a ſhort Time become affected with moſt or all the ſaid Diſeaſes, and die; now as the Death of this Animal is purely owing and produced from the Blood's not having its compounding Principles duly attenuated and combin'd together, for want of the joint Operation and mechanical Effects of the Lungs and Air thereupon, this will ſerve plainly to demonſtrate, that the principal End and Uſe of this moſt wonderful Organ is intended principally for the Purpoſe aforeſaid, for grinding, attenuating and intimately combining the conſtituent Principles of the Blood together. And the Reaſon of the Fœtus living without the actual Uſe and Exerciſe of its own Lungs, is, that during the Time of Geſtation, the Fœtus being to be conſider'd as a temporary Appendage ingrafted on to the Mother's Body, and being ſupply'd and nouriſh'd with her Blood, which being conſtantly ſent to, and return'd from the Fœtus, like as it is to and from the Parts of her own Body, in order to be anew attenuated, repaired and manufactured by the Mother's Lungs.

13. Having ſhewn the firſt obvious principal Uſe of Reſpiration to conſiſt in diſſolving, attenuating and combining the Principles of the Blood together, the Texture, Craſis and Temperament whereof becoming ſpoil'd each Time, it circulates through the diverging and converging Syſtems of the Arteries and Veins, requires to be anew compounded and repaired, by undergoing the mechanical Operation and Effects of the Air, by Means of the Pneumatick Engine or Mill, the Lungs. Having alſo ſhewn a ſecond obvious principal Uſe of Reſpiration, to conſiſt in its ſerving as a joint auxiliary Power and Force to aſſiſt the Stomach and chylopoietick Organs in the Analyſis and Preparation of the Aliment, *&c.* a third principal Uſe is its being a Power jointly with the Heart for continuing the Circulation of the Fluids. I come now in the next Place to offer what appears to me to be another new principal Uſe of that complex Organ the Lungs, having firſt premis'd the following Remarks and Obſervations.

14. Firſt, The animal Fluids are formed, and conſiſt chiefly of elementary Water, in which the Particles of the ſolid Aliment are diſſolv'd and abſorb'd, which after having undergone various Digeſtions and Solutions, firſt in the great concoctive Gland, the Stomach, and being afterwards ſufficiently ſubdued, attenuated and analiz'd, chiefly by the Action of the Air and Lungs, and by circulating through the vaſcular and glandular Syſtem, forms and conſtitutes that complex Fluid the Blood.

15. Secondly,

15. Secondly, beſides the foreſaid two Principles of elementary Water, and Earth or ſolid Aliment, concurring to the Formation of the Blood, there is likewiſe a certain Quantity of elementary Air requiſite to maintain and keep up a proper Degree of Rarefaction, Tenuity, Oſcillation, and Heat in the animal Fluids, and alſo to preſerve a due Ballance and Counterpoiſe with the external Air or Atmoſphere.

16. Thirdly, There is alſo a certain Proportion of elementary Fire or Heat requiſite thereto, which being as an univerſal Menſtruum and Ferment in reſpect of terreſtrial Bodies, the ſame ſerves to maintain and keep the Animal and all other Fluids in a proper Degree of Heat, Tenuity, Oſcillation, and Fluxility, without the continual Preſence and Action whereof, jointly with the Air, the ſame would be reduced to a State of abſolute Reſt and Solidity.

17. Fourthly, the four elementary Principles aforeſaid, being mutually and harmoniouſly allied and combined together in juſt Quantities and Proportions, the animal Fluids may be then ſaid to be healthy and well conſtituted, but when the natural Vinculum and Union becomes broken, and the Equilibrium chang'd between the ſaid Principles, by any one of them becoming either deficient or redundant, in that Caſe the Fluids will at the ſame Time begin to verge towards a diſtemper'd State.

18. Fifthly, Water as well as all the animal Fluids, may be conceiv'd to ſerve as a Menſtruum in reſpect of Air, and reciprocally Air, may be conceiv'd as a Menſtruum in reſpect of Water, and all the animal Fluids; there being always a certain Quantity of Air lodged and arreſted within the Pores and Interſtices of Water, and all the animal Fluids, under all the Changes which they undergo in the Courſe of the Circulation and during the Life of the Animal.

19. Sixthly, The oftner and longer the Fluids circulate through the vaſcular Syſtem, they become more attenuated, heated, rarefied and alcaline, by which means the impriſon'd abſorb'd Air, (as the Particles of the Blood become more analiz'd and rarefied, the Attraction of Coheſion among the Particles will be render'd weaker, by their being ſet at a greater Diſtance from each other) being now at greater Liberty, and becoming more heated and rarefied withal, muſt have its Elaſticity thereby increaſed, and by evolving its Spring muſt produce too great a Rarefaction in the Blood; in which Caſe this very Air that before was ſo abſolutely neceſſary for diſſolving the Texture of the Aliment, and render it commiſcible with the animal Fluids, and for maintaining them in a proper State of Tenuity, Heat and Fluxility; by having its Elaſticity thus increas'd by the Attrition, Heat and frequent Circulation of the Fluids, becomes in this Caſe, and in this rarefied State and Quantity, really prejudicial and noxious, and muſt become quickly fatal to the animal Machine, by putting an entire Stop to the Circulation of the Fluids, being now replete with ſuch a Quantity of rarefied hot Air, occaſioning an univerſal Expanſion, Compreſſion and Reſiſtance to the circulating Blood, throughout the whole Series of the Veſſels, Viſcera and Glands. This heated rarefied Air, as the ſame becomes thus too much accumulated, muſt therefore have ſome proper Emunctory or Spiracle for diſcharging the ſame out of the Fluids, in like Manner, and for the ſame Reaſon, as all the other Parts and Principles ſeperated from the Blood have, when of no farther uſe to the animal Œconomy; for diſcharging the Blood of which uſeleſs noxious Parts, the animal Machine is every where furniſhed with appropriated Glands for that Purpoſe, ſerving as Drains or Sewers for carrying off all ſuch Parts from the Blood, the further Retention whereof would be prejudicial; and thus the renal Glands ſerve to draw off the ſaline Particles, abſorb'd and diluted with a conſiderable Quantity of the aqueous Part; and in like manner the cutaneous Glands ſerve to diſcharge the ſulphureous volatile Alcaline Particles, and ſuch as have undergone the utmoſt Degrees of Tenuity, Digeſtion and Exaltation out of the Blood, *&c.* And thus we ſee the abſolute Neceſſity of having the animal Machine provided with ſuch glandular Strainers for diſcharging the ſuperfluous excrementitious Parts out of the Blood, in order to continue and perpetuate its vital Motions.

20. Allowing the foregoing Reaſoning to be true, namely, That the Air that is arreſted, abſorb'd and diſſolv'd within the Pores of the animal Fluids, will, by the frequent Circulations, with the Attrition and Heat conſequent thereupon, become more and more rarefied, whereby acquiring a greater expanſive centrifugal Force, it will throw open its Priſon, and enlarge its Bounds, and cauſe the Fluids to rarefy and expand; whereupon the Blood requiring more room to move in, muſt greatly diſtend the whole vaſcular and glandular Syſtems, and by laying too great a Preſſure and Reſiſtance thereon, more than what the Elaſticity and moving Force of the Solids are able to ſubdue and overcome, will endanger the putting an entire Stop to the Circulation, if this rarefied Air and windy Flatus is not quickly and duly diſcharged in proper Quantities out of the Blood. It follows therefore by neceſſary Conſequence, that the animal Machine muſt be, and actually is furniſhed with ſome proper Organ, Gland or Spiracle, for ſecreting and diſcharging this rarefied heated Air out of the Fluids, as the ſame becomes too much accumulated therein: This being granted for true, the next Point is to determine which appears to be the moſt natural, ſimple, plain and obvious Drain and Emunctory, and what Mechaniſm and Apparatus is moſt proper to conſtitute an Organ or Gland for ſeperating this noxious windy Halitus and rarefied Air, and detaching the ſame out of the animal Fluids, in proper Quantities, and as it becomes neceſſary.

21. Now the Air which is thus intimately imbib'd and abſorb'd in all the animal Fluids throughout all the Stages of its Circulation, can never be carry'd off, or ſecreted from the Blood purely and by itſelf alone, under the Form of perfect elementary Air; for in ſuch caſe it muſt be ſuppoſed to be firſt amaſs'd and collected into a Body, ſo as to form ſeperate Air-bubbles within the Veſſels; which Caſe can never happen in a natural State, without being attended with the moſt fatal Symptoms, and bringing on immediate Death. This Air therefore muſt always be underſtood to be ſeperated and carry'd out of the Blood, not purely *per ſe*, but as being abſorb'd, wrap'd up and envelop'd with an aqueous Vapour or Halitus, as its proper Menſtruum and Vehicle, and under Favour and Cover whereof it becomes fitted for making its Eſcape through the Membranes of the Lungs. For it is to be obſerved, that Air when thus abſorb'd and diſſolv'd within an aqueous Menſtruum and Vehicle, will paſs therewith through the animal Membranes, which pure Air by itſelf alone could not do. And thus we find the like Neceſſity of an aqueous Menſtruum, for ſeperating and diſcharging the animal Salts out of the Blood, which Salts could never be ſecreted or drawn off purely and ſimply by themſelves, by any animal Mechaniſm, or Glandular Structure whatſoever, without being firſt well diluted, diſſolv'd, ſheath'd and abſorb'd in an aqueous Menſtruum.

22. Moreover the greateſt Part of the animal Fluids conſiſting of Water, there is but one Organ in the Body, whoſe Office has hitherto been reputed to ſerve chiefly for ſeperating the aqueous Part in any ſenſible Quantity, and that is the Kidneys, which ſerve to ſecrete the Saline Particles, diſſolv'd in a conſiderable Quantity of the aqueous Part; the renal Glands however do not appear ſufficient and adequate for ſeperating all that is neceſſary of the watery Part of the Blood, and beſides, there is no other Organ or Place whereat the Remainder can be ſo conveniently ſeperated and diſcharg'd as by the Lungs, which are conſtructed with all the neceſſary Apparatus and Properties requiſite for that Purpoſe.

23. Now in Relation to this laſt new principal Uſe of Reſpiration, I humbly propoſe it as my Opinion and Conjecture only, not being able for want of proper Experiments, Facts and Obſervations, to carry this Point to any higher Degree of Evidence and Proof, than that of the greateſt Probability and Veriſemblance; namely, That the Lungs, beſides the firſt principal Office aſſign'd them before, of grinding, attenuating, and keeping the compounding Principles of the Blood perfectly mix'd, blended and aſſimulated equally together, have moreover this other important principal Uſe and Office of ſeperating and diſcharging the Air, or at leaſt ſuch a Part thereof out of the animal Fluids, the farther Retention whereof would be prejudicial, by being too much rarefied and heated in the Courſe of Circulation. The Lungs therefore I conceive to be a perfect Gland and Organ, peculiarly fitted by Virtue of its Organization and Mechaniſm, by which the Air in the animal Fluids, as the ſame comes to be too much accumulated, rarefied and heated, and thereby render'd noxious and incompatible with Animal Health, is ſecreted and diſcharged thereout, being abſorb'd and envelop'd with an aqueous Vapour, in order to refrigerate and condenſe the Blood, and give it room to ſubſide and circulate with more Freedom, and leſs Reſiſtance within the ſeveral Series of Veſſels; as becoming hereby more denſe, and taking up leſs Space, by having the redundant rarefied Air extracted and detatch'd out thereof. And for this End the Lungs appear to be conſtructed with a peculiar Apparatus, and with all the requiſite Properties that concur to the Compoſition of the other Glands, and that in a much more eminent Degree, whereby they become fitted in a ſpecial Manner for performing this new and moſt important Office here aſſign'd to them. Now for to anſwer this great End, we find the whole Syſtem of the circulating Fluids is made for to move conſtantly and ſucceſſively through this Organ, being brought thereto by the pulmonary Artery, and carried off therefrom, after it has had the ſuperfluous rarefied Air extracted thereout, by the pulmonary Vein; this Organ being likewiſe furniſhed with Nerves like as the other Glands, and the Aſpera Arteria or Trachea, may be conceiv'd as its excretory Duct, through which this heated rarefied Air is continually reaking and breathing under the viſible Form of an aqueous Vapour or Halitus, the external Air or Atmoſphere ſerving as a proper exhaling Medium for to convey the ſame out of the Lungs, in like Manner as the Smoak is diſcharg'd through the Funnel of a Chimney, in order to ventilate and preſerve the Life of Fire, without which the ſame would become quickly oppreſs'd, ſuffocated and extinguiſh'd.

24. Some Authors maintain, that the principal Uſe of Reſpiration, is for to ſerve as a Refrigeratory for to cool the Blood as it circulates through the Lungs: This, tho' not the principal End, may well enough be admitted as one of the ſecondary ſubordinate Uſes and Deſigns of this very complicated Organ. This Opinion however is not the ſame with that which I propoſe and intend to eſtabliſh here; for according to the Opinion of thoſe Authors, the Blood becomes cool'd only by the Application of the cold external Air to the Veſicles and Blood Veſſels of the Lungs; whereas what I here mean and intend, is, that the Blood becomes cool'd, condens'd and ventilated, not only by the Application of the external Air to the Blood Veſſels expanded throughout the whole veſicular Area of the Lungs, but chiefly and principally by having a certain Quantity of the internal elementary Air ſeperated and diſcharg'd out of the Fluids, by the Glands and Pores of the Lungs, together with a proper Quantity of the aqueous Part of the Blood, as may ſerve to abſorb and envelope the ſame, and under Cover whereof it procures a Paſſage and

Eſcape

Eſcape through the membranous Subſtance of the Lungs, and becomes exhaled into the external Air or Atmoſphere in every Act of Expiration; juſt in like Manner as the ſaline Particles are ſecreted by the renal Glands, by the Mediation and Favour of the ſame aqueous Fluid, which ſerves as a common Menſtruum to diſſolve and ſheath the ſame, and thereby fit them for paſſing the renal Glands, without obſtructing, lacerating and ſtimulating them.

25. Moreover the Lungs being ſo wonderfully framed, that their internal Area, when fully inflated, is of equal or rather greater Extent than the whole external Surface of the Body, and as the whole Maſs of Blood is made for to circulate through the pulmonary Veſſels, infinitely divaricated through ſo large a Surface; the Blood in circulating through the Ramifications of the pulmonary Artery, being to be underſtood as moving through a Syſtem of diverging Veſſels, the Point of Divergence being at the right Ventricle of the Heart, or where the pulmonary Artery enters undivided into the Lungs, but the Blood in circulating through the Branches of the pulmonary Vein, moves in a Syſtem of Veſſels converging towards the left Auricle of the Heart, or where all the Branches of the pulmonary Vein become collected into one large Trunk. All which Circumſtances and Diſpoſition appears ſtrongly to corroborate and favour the Deſign of letting the Air in the Blood, as the ſame becomes too much rarefied and heated, have an Opportunity of making its Eſcape thro' the Pores and exhaling Veſſels of the Lungs; which Seperation of the aerial, combin'd with the aqueous Particles of the Blood, could not have been executed by any other Organ, not even the cutaneous Glands, which have been hitherto reputed as the only proper Organ for performing this Office; being firmly of Opinion, that the cutaneous Glands in their natural healthful State, are chiefly and only deſign'd for ſecreting and diſcharging the ſulphureous, volatile, oleaginous, alcaline Particles, and ſuch as have undergone the ultimate Analyſis, and higheſt Degree of Exaltation and animal Digeſtion: And beſides, as has been before remark'd, was the aqueous Parts of the Blood, with the Air abſorb'd therein, ſuffer'd to exhale and tranſpire conſtantly through the Glands of the Cutis, the Extremities of the Nerves miniſtring to Senſation and Feeling, which are plentifully diffus'd over the whole external Body underneath the Cutis, would become ſo ſoaked and relaxed thereby, as to be render'd incapable of receiving and communicating thoſe quick undulatory Vibrations and tonick Motions, neceſſary for conveying the diſtinct Impreſſions and Ideas of ſenſible Objects to the common Senſorium. And moreover the Membrana adipoſa, which is expanded over the whole Body under the Cutis, appears to be appointed deſignedly to ſerve as a Defence and warm Covering to ſecure the Nerves from receiving Damage and Injury this Way, by cutting off all Communication, whereby no ſuch aqueous Particles are permitted to paſs either out of the Body, or into the ſame, by way of the Cutis; for as this cellular Membrane is plentifully fill'd with animal Oil and Fat, the Particles whereof attracting each other more ſtrongly than they do thoſe of Water, for which reaſon they are endow'd with a repelling Force in reſpect to the Particles of Water, and conſequently in a natural healthful State will never admit of any aqueous Particles to paſs either out, or into the Body, by any exhaling or inhaling Veſſels in the Cutis. And moreover the internal Membranes and Veſicles of the Lungs being always kept warm and moiſt, by a Quantity of warm Air and Vapours that is left remaining in the Lungs after every Expiration, the Pores and perſpiring Veſſels thereof are kept ever ſupple, open, and in a proper exhaling Condition, for the rarefied aqueous Particles, with the heated noxious Air abſorb'd therein, for to breathe and tranſpire out thereat; where being receiv'd into the denſer, cold, external Air, the ſame ſerves as a proper exhaling Medium for carrying the ſame out of the Lungs at every Expiration. Moreover as the internal Area of the Lungs is of greater Extent than the whole external Cutis of the Body, and as the internal Membrane of the Lungs is always kept warm and moiſt, and in a fit perſpiring State and Diſpoſition, and as the whole ſanguinary Maſs is made to circulate ſucceſſively through the pulmonary Veſſels, infinitely ramefied and divaricated throughout the membraneous Subſtance of the Lungs; upon all which Accounts the Lungs appears to be deſign'd and much better fitted for making a larger Diſcharge from the Blood than the cutaneous Glands, and that eſpecially in the more northerly cold Climates, where the Pores and exhaling Veſſels of the Cutis are more obſtructed by the greater Denſity, Cold and Humidity of the Atmoſphere, than what it is in the more Southerly warm Countries. From which Conſiderations I am farther inclined to think, that the Quantity of Matter that has hitherto been aſcrib'd and plac'd to the Account of inſenſible Perſpiration, by the cutaneous Glands, is not really near ſo much (eſpecially in cold Countries) as has hitherto been commonly computed, and that the far greater Part of that Matter ought rather to be charg'd and aſſign'd to the Lungs, as being continually and very ſenſibly tranſpiring from its whole internal membranous Subſtance; the Lungs being an Organ in all Reſpects much better fitted for making rather larger Secretions than what the cutaneous Glands are.

26. Moreover ſome Experiments that have been made with a View to clear up the Theory and Doctrine of Reſpiration, appears ſtrongly to corroborate the Truth of what has been here advanc'd upon this Subject, namely, that the ſecond principal Uſe of the Lungs is for to ſerve as a ſpecial Gland and Organ, by which the Air, that is intimately abſorb'd within all the animal Fluids, when the ſame becomes unduly heated and rarefied by the frequent Circulations and Attrition of the Fluids, is ſecreted and diſcharg'd out of the ſame, together with the rarefied aqueous Particles

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and Vapours which ſerve as a proper Medium for conveying the ſame through the exhaling Veſſels of the Lungs. And thus it has been found upon Experiment, that Air cannot be injected by the Trachea or Aſpera Arteria, neither into the pulmonary Artery nor Vein; and that Water, wherein there is always a Quantity of Air abſorb'd, being injected into the Pulmonary Artery, paſs'd into the Trachea, which Air alone alſo did; but Water being injected into the pulmonick Vein, being puſh'd with great Force, paſs'd with much Difficulty at laſt into the Trachea.

27. It has been already obſerv'd, that when the great concoctive Gland, the Stomach and chylopoietick Organs are in a fit Condition for performing their firſt Office of diſſolving and preparing the Aliment, in the Performance of which compound Operation, the reſpiring Organs, as alſo the Diaphragm and abdominal Muſcles, by reaſon of their alternate Compreſſion or Syſtole and Diaſtole, are to be conſider'd as principal auxiliary Powers. And when the reſpiring Organs are in a Condition to execute duly their next ſubſequent Office of farther triturating, diſſolving and mixing the Blood and Chyle together, that ſuppoſing the other Viſcera and Glands ſound, ſuch a Perſon will enjoy all the Advantages of a perfect Sanguification, Nutrition, Secretion, with all that is neceſſary to perfect Health. But whenever any of the ſaid two Organs are deficient, then the Fluids will become corrupt and diſeas'd, and gradually communicate the like Diſorders to the Solids. Now as the joint Action of the Lungs and Air upon the Blood, has ſo eſſential and neceſſary a Connection with the Life of Animals, that they can't live one Minute without, from whence it is manifeſt what great Changes may be produced thereby both as to the Production, and the Cure of Diſeaſes.

28. With reſpect then to the firſt principal Uſe of Reſpiration, let us ſuppoſe a Perſon to have the Syſtem of his Solids and Fluids perfectly ſound and healthful, yet if his reſpiring Organs be not rightly conſtituted, being either of too relax'd and weak, or too tenſe and elaſtick a Structure; or be any how obſtructed or contracted; or even ſuppoſing his Lungs to have all the Advantages of a perfect Structure, yet if the Air be either too heavy, or too light; too denſe or rare, too hot or cold, too humid or dry; too much abounding with Effluvia and Exhalations of any Sorts, *&c.* relatively with reſpect to the reſpiring Organs of this Perſon, in all or any of the ſaid Properties; the joint Action and Effects of the Lungs and Air upon the Blood of this Perſon will become defective, whereupon the Blood, Chyle and Lympha, *&c.* not being perfectly elaborated, attenuated and aſſimulated, the ſame will become unfit for the Offices of Circulation, Secretion and Nutrition, whence muſt follow Diſeaſes of all Sorts, as univerſal and particular Atrophies, Conſumptions, Aſthmas, Dropſies, Cahexies, Obſtructions of the Glands, with Tumors, Ulcers, and cutaneous Diſtempers of all Kinds, ſcrophelous, ſcirrhous, cancerous, ſcorbutick, œdematous, inflammatory, *&c.* from whence it is evident that from a defective Reſpiration with reſpect to this its firſt principal Uſe, all the capital Diſeaſes may be naturally and neceſſarily produc'd.

29. Moreover with reſpect to the laſt new principal Uſe of Reſpiration; let us ſuppoſe a Perſon's Lungs, from what Cauſes ſoever, whether it be owing to their own peculiar Structure, or from the Properties of the Air being relatively diſproportionate thereto; or from the particular State and Conſtitution of the Blood; to be render'd incapable of performing what I have before ſuppos'd and aſſign'd as their ſecond neceſſary and eſſential Office, namely, of ſecreting and diſcharging the Air out of the animal Fluids, as the ſame becomes too much heated and rarefied by the frequent Circulation and Attrition of the Fluids; now from a Defect in the Performance of this new principal Operation of the Lungs, Diſeaſes of all Sorts may be produc'd, and particularly Fevers of all Kinds; the Origination, Increaſe, State, Decreaſe, with their Termination and Criſis, as alſo their ſeveral Characteriſticks, Symptoms, Specifications, *&c.* may be much more naturally and neceſſarily produc'd, and more rationally accounted for from this Cauſe and Principle, than from any other of the many labour'd Hypotheſes that have been invented, but without any good Foundation for that Purpoſe. And thus for Example, ſuppoſe the State of the Blood, from what Cauſes ſoever, to be ſuch, that the Serum and Craſſamentum are ſo cloſely united and combin'd together, that they will not readily ſeperate and part from one another, in conſequence whereof a general Obſtruction and Reſiſtance to the Circulation will be occaſion'd throughout the ſeveral Series of Veſſels, with a diminiſh'd Secretion in the Glands, and particularly in the Lungs, (a laborious and diſturb'd Reſpiration being ever a neceſſary Symptom of ſuch a State of the Fluids) ſo that the rarefied hot Air contain'd in the Blood can't be extracted and diſcharg'd thereout in ſufficient Quantity by the Lungs, for Want of a proper Quantity of the ſerous or aqueous Part, which in this Caſe, by reaſon of its diminiſh'd Quantity, increas'd Viſcidity, and cloſe Vinculum and Union with the Craſſamentum, will not readily ſeparate and part therefrom; and being withal incapable by reaſon of its Viſcidity, of exhaling through the Membranes of the Lungs, ſo that this internal Air in the Fluids being thus unduly retain'd and accumulated for Want of the ſerous or aqueous Part, which is its proper Vehicle and Menſtruum for conveying the ſame out of the Blood through the Pores and Membranes of the Lungs; and this internal Air becoming more and more accumulated and rarified, and the Fluids expanded thereby, the whole vaſcular ſolid Syſtem will thereupon be brought to labour under a general Stimulation, with the Symptoms and Phænomena attending upon Fevers of all Kinds, and be put to the Neceſſity of exerting an univerſal Effort and Struggle to overcome and ſubdue this Lentor and Reſiſtance in the Fluids; from which Con-

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flict and Struggle between the vaſcular glandular Syſtem, and the rarefied viſcid flatulent Blood, either the Lentor of the Fluids will become diſſolv'd, whereupon the Flood-gates of the ſeveral Glands that were barr'd up and obſtructed by the viſcid, hot, flatulent rarefied Fluids, being now ſet open, and the ſeveral Secretions coming to be perform'd in their natural Order, and particularly that of the internal Air being now diſcharg'd in due Quantities by the Lungs, the Vinculum and too cloſe Union of the Serum and Craſſamentum being now diſſolv'd; whereby the Blood being now freed from this hot, windy Flatus and rarefied Air, will thereupon ſubſide and circulate with greater Freedom, whereupon a perfect Criſis will enſue, the Fever vaniſh, and Health be reſtored. But on the contrary, if the Lentor be ſo great, univerſal, and deeply fix'd, as not to yield to the Efforts and Niſus of the Solids, then all Things will go on from worſe to worſe, until Death gives a final Quietus thereto. And thus from this Cauſe alone, Fevers of all Kinds may be produc'd, which will receive their peculiar Specifications, Appearances, Symptoms, States, Periods, *&c.* according to the Force and Momentum of the productive Cauſe, and as the ſeveral Glands and Viſcera are more or leſs diſpos'd to receive and retain the Impreſſion and Determination of the morbifick Fluids, *&c.*

30. Having ſhewn that the Atmoſphere, conſider'd as operating continually by its variable Properties upon the Blood in the Lungs, is the general productive Cauſe of Diſeaſes, ſo on the contrary, the ſame Air when apply'd and made to operate upon the Blood in the Lungs, with Properties and Qualities contrary to thoſe by which the ſaid Diſtempers were produc'd, will become the moſt natural perfect Method for curing the ſame; and this we obſerve from daily Experience to be true in fact, how that by a Change of Air only, Diſeaſes become certainly, ſafely and radically cured, that could never have been effected without, by all the Aſſiſtance of Art and Medicines in Nature; thus for Inſtance, if the Air of any Place be comparatively too light, with reſpect to the conſtitutional Structure of the reſpiring Organs of any particular Perſon, upon his continuing in that Air, however healthfully conſtituted he may be in all other Reſpects, will become gradually diſeas'd from this very Cauſe alone. Now there is no other poſſible Cure for ſuch a Perſon but a Change of Air, either by going into ſome other Place or Country where the Air is generally obſerv'd heavier, or to have the Air where he lives render'd heavier by Art. But if the Perſon's Diſeaſe be owing to the Air's being relatively too heavy; it muſt be chang'd for an Air that is lighter, either ſuch by Nature, or Art. If the Perſon's Diſeaſe be the Effect of an Air relatively too hot, it muſt be chang'd for one more cool and temperate, either ſuch by Nature, or Art. But if the Diſeaſe proceed from the Air's being relatively too cold, the only Cure is an Air more hot, render'd ſuch either by Nature or Art. If the Diſeaſe be produc'd from the Air's being too humid and damp, the ſame muſt be chang'd for one more dry, ſerene and warm, ſuch either by Nature or Art. If the Diſtemper be occaſion'd from the Air's being relatively too dry and cold, the ſame muſt be chang'd for one more moiſt and warm. If the Diſtemper proceed from the Air's being impregnated with Vapours or Exhalations of any Kind, Animal, Vegetable, Mineral, in order to obtain a perfect Cure it muſt be chang'd for an Air that is more open, pure, ſerene and perflated, and that is either free from ſuch foreign Effluvia and Exhalations, or impregnated with Effluvia with contrary Properties, *&c.* And ſo for all other Alternations and Combinations of the ſeveral Properties and Qualities of the Air, conſider'd as operating either ſingly or jointly, and that in all Degrees and Proportions. And thus we ſee that the Air, which is the general Parent and productive Cauſe of Diſeaſes, becomes alſo the only perfect, ſafe, certain Remedy for curing the ſame, when it is apply'd and made to operate with Properties and Qualities contrary to thoſe by which the ſame were produc'd, the Truth whereof is fully eſtabliſh'd by the old phyſical Maxim; that all Diſeaſes are only to be cured by Cauſes contrary and oppoſite to thoſe by which they were produc'd, *&c.*

31. The Truth of the foregoing Propoſitions is abundantly evident and demonſtrable, from obſerving only the different States and Changes which the animal Machine undergoes, by the different Properties of the Air in the ſeveral Seaſons of the Year; thus in Summer the animal Solids being much relax'd, and the Fluids render'd viſcid, rarefied and alcaline, by the great Heat, Rarefaction and diminiſh'd Preſſure of the Air, People become in that Seaſon, eſpecially towards the latter End thereof, greatly diſpos'd and ſubject to Diſeaſes of the inflammatory acute Kind. But in the Winter the Air operating upon the Body with contrary Properties to what it did in the Summer, being now more heavy, denſe, elaſtick, cold, humid, *&c.* by which the animal Solids become ſtrengthned and contracted by the greater Preſſure and Denſity of the Air, with the ſtimulating Force of the Cold, by which contrary Effects of the Air upon the Body during the Winter Seaſon, many Diſeaſes, eſpecially of the inflammatory acute Kind, and ſuch as are the Produce of the Summer Seaſon or Air, become either perfectly cured, or at leaſt undergo a general Remiſſion. So that the Winter Seaſon may not improperly be conceived as a State of Reſt, wherein the animal Machine has its Solids and Springs wound up, ſtrengthned, and repair'd for the enſuing Summer, which may be conceiv'd as a State of Motion and Exerciſe, wherein the Solids are relax'd, waſted and expended; and thus theſe two oppoſite extreme Seaſons of the Year, and different States of the Air, ſerve to counterballance the Effects of each other; the Winter ſerving to cure the Diſeaſes occaſion'd by the Properties and Qualities of the Air in the Summer, as on the contrary the Summer ſerves to cure ſuch Diſtempers as have been occaſion'd by the different Pro-

perties of the Air in the Winter. Juſt in like Manner, and for the ſame Reaſon and Neceſſity with the alternate ſucceſſive Changes of Day and Night; the Night (like to Winter) by the contrary different Properties and Qualities of the Air, to that of the Day, (which may be compared to Summer) ſerving to counterballance the Effects of the Air in the Day, and likewiſe to allow a proper Time of Reſt and Relaxation to the animal Solids to become repair'd, nouriſh'd and wound up for the Exerciſe of the enſuing Day. As on the other hand, the different Properties and Qualities of the Air in the Day-time, together with the Exerciſe and Motion, ſerve to counterpoiſe the Effects produc'd by the different Properties of the Air in the Night. And thus the Night ſerves to cure the Diſeaſes occaſion'd by the Influence of the Air and Exerciſe in the Day-time; as the Day ſerves to cure the ill Effects produc'd from the Properties of the Air, and Reſt, during the Night. And as the Properties and Qualities of the Air in the other two intermediate Seaſons, of Spring and Autumn, differ only in Degrees from that of the two extreme Seaſons of Summer and Winter; ſo the Effects or Diſeaſes produc'd in the two intermediate Seaſons, will differ only in Degrees from thoſe in the two extreme Seaſons.

32. As the Air is ever changing in reſpect of its Gravity, Heat, Cold, *&c.* it thereby acquires and maintains an abſolute univerſal Dominion and Empire over all terreſtrial Bodies; and the human Body being of all others the moſt exquiſitely framed, becomes the moſt ſenſibly affected by its Influence. Now as there is an almoſt infinite Diverſity in the Structure and Organization of the reſpiring Organs in different Perſons; it is impoſſible that the Air of any Place or Country, let the Degrees of its Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, *&c.* be what it will, ſhould exactly ſuit, fit, and have the ſame Effects upon all alike; and although it may agree well enough with the Generality of the Inhabitants, yet there are many who muſt ſuffer greatly therefrom: This unavoidable Inconvenience is however admirably and wiſely provided for and ballanc'd, by the Atmoſphere's being render'd thus ſubject to continual Mutations, as to all its aforeſaid Properties and Qualities; upon which Accounts it becomes much better fitted for the Purpoſes of Reſpiration, with all the other various and different Offices and Degrees of animal Life, than if it had been permanently poſſeſs'd with the aforeſaid Properties and Qualities in one and the ſame invariable immutable Degree; for was the Atmoſphere always of one unalterable fix'd State, all Perſons of what Make and Conſtitution ſoever, without Exception, would be quickly arreſted with Diſeaſes and unavoidable Death. But as the Atmoſphere is continually changing with reſpect of its Properties, the ill Effects or Diſeaſes, which it may produce by a Change either of one or all its Properties for any one Space of Time, will become again remedied and cured by a contrary Change of the very ſame Properties at another Time. Thus, for Inſtance, if either the Body or reſpiring Organs have too great a Preſſure laid upon them, as the Atmoſphere becomes heavier, ſo as to be anywiſe incapacitated for their reſpective Functions; upon the Atmoſphere's becoming lighter, they will be reſtored to perfect Freedom and the full perfect Exerciſe of their reſpective Offices. And if either the Body or Lungs be too much relax'd by the too great Lightneſs, Warmth, and Humidity of the Air at any one Time or Seaſon; they will again become contracted and render'd more elaſtick and compact, as the Air becomes heavier, cooler, and dryer, at another Time and Seaſon. Again, if the Lungs ſuffer and are impeded in their Operation from any prevailing Fogs, Effluvia and Exhalations, they will become again reliev'd, as the Air becomes more ſerene, perflated, and free of ſuch foreign Mixtures; and the contrary, and thus ſucceſſively: So that by means of the above variable State of the Air, the Ballance between Health and Sickneſs is kept continually vibrating, either to one Side or the other, during the whole Period of Life. And this ſeems to be the final End and Deſign of Providence, in rendering the Atmoſphere endow'd with ſuch variable Properties and Qualities, whereby it ſerves as a perpetual Cauſe and Inſtrument for communicating Motion and Exerciſe, and thereby ſerve to maintain and keep up a continual Syſtole and Diaſtole propagated univerſally throughout the Bodies of Animals and Vegetables, and without which, Life in no Degree could ſubſiſt, *&c.*

33. Suppoſing the Air of any Place or Country to be ever ſo good with reſpect to the Generality of the Inhabitants, there will however (as has been before obſerv'd) be many who muſt ſuffer greatly therefrom, by reaſon of the Properties and Qualities of the Air being relatively diſproportionate to the Structure and Conſtitution of their reſpiring Organs. If therefore a Method can be found for conſtructing an artificial Atmoſphere, whereby the Air which a Perſon is to breathe withal may be render'd poſſeſs'd with ſuch Degrees of Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Effluvia, *&c.* juſt as he finds ſuits and agrees beſt with the preſent State of his reſpiring Organs; it is thereupon propos'd, that all ſuch Diſeaſes which are produced from an imperfect Reſpiration and Sanguification conſequent therefrom, (which has already been ſhewn to be the general Source and productive Cauſe of all or moſt of the capital Diſtempers) and where the Lungs are yet ſound and uncorrupted, will become perfectly, ſafely, and certainly cured thereby.

34. I come now, in the next Place, to deſcribe the Solution of this moſt noble, uſeful Problem, relating to the Conſtruction of an artificial Atmoſphere to be apply'd to the Lungs; (in like Manner as that deſcrib'd in the Second Chapter, is apply'd to the whole external Body) wherein I ſhall exemplify and ſhew, how the general Principles before laid down, relating to the mechanical

chanical Effects of the Air upon the Blood in the Lungs, may be reduc'd into Uſe and Practice; which will afford the moſt perfect, ſafe, univerſal Method both for Preſerving Health and the Cure of Diſeaſes. Now for underſtanding the Conſtruction, Application and Uſe of this new artificial Atmoſphere, ſerving for the Benefit of Reſpiration; for this Purpoſe, *vide* Section, Fig. 1. Plate 2. wherein let BBBB be a Cylindrical or ſquare Veſſel of Tin, caſt Braſs, Iron, or Glaſs, which muſt be Air tight; either upon one End, or Side whereof, there is fix'd a ſmall pneumatick Engine zzzz, (ſuch as has been deſcrib'd in the two Firſt Chapters) or in lieu thereof a Syringe may ſerve upon Occaſion; this pneumatick Engine communicates with the Veſſel BBBB, by the Pipe IP; the Axis dd of the Engine may be plac'd either parallel or perpendicular with the Horizon; by turning the Axis round either with a Winch or with horizontal Levers like as a Capſtane, the Air may be thereby either condens'd or rarefied within the Veſſel BBBB to all Degrees requir'd, and the Degree of the Air's Denſity and Preſſure within the Veſſel, may be exactly known by obſerving the mercurial Gage Tube bb, (placed in the Veſſel with Mercury eeee) with its annexed Scale; the upper Surface of the Mercury being denoted by the prick'd Line mm, upon which is pour'd ſome other Fluid, as Water, to the Height ww; upon one ſide of the Veſſel BBBB, (which for better Diſtinction I will name the reſpiring Veſſel) there is joyn'd a Pipe rP, which I ſhall name the reſpiring Pipe, one End whereof P opens into the reſpiring Veſſel, upon the End or Middle whereof is a Protuberance or Swelling, o, within which is a Valve opening outwards, which may be open'd and ſhut by means of a Spring, which the Perſon is to preſs or puſh with his Finger, as often as it is requir'd to let Air paſs out of the reſpiring Veſſel. Or if the End r of the reſpiring Pipe which the Perſon holds in his Mouth, be form'd ſomewhat reſembling the Reed or Pipe of a Hautboy, with two thin ſmooth Plates made to joyn cloſe by Help of a Spring, ſo as to permit no Air to paſs inwards or outwards through the Reſpiring or Suction Pipe rP; but upon the Perſon's taking the End r of the Pipe in his Mouth, and pinching the ſame between his Teeth, the Spring Valve commanding the Orifice of the Pipe will open, and upon his Sucking or Inſpiring, the Air will come out of the reſpiring Veſſel and expand or inflate his Lungs, and upon his quitting hold of the End r, of the reſpiring Pipe, the ſame will ſhut cloſe of itſelf by the Spring Valve; and after the Perſon has expired or ejected the Air out of his Lungs into the external Air or Atmoſphere, he returns again to the reſpiring Pipe, and taking the End thereof in his Mouth, receives thereby a freſh Charge of Air out of the reſpiring Veſſel or artificial Atmoſphere as before; and thus he may continue to do alternately or ſucceſſively for any Time requir'd, with as much Eaſe and as little Trouble as Smoaking of a Pipe of Tobacco. All Things being diſpos'd in the Manner here deſcrib'd, the Perſon taking the End of the reſpiring Pipe in his Mouth, let either the Perſon himſelf, or an Aſſiſtant for him, taking hold of the Winch dx, apply'd to the Axis of the pneumatick Engine zzzz, continue either to take out, or throw in Air into the reſpiring Veſſel, through the injecting Pipe IP, until the Air therein has acquir'd that Degree of Denſity and Preſſure, as the Perſon finds ſuits beſt to the preſent State of his reſpiring Organs, or as is judg'd will anſwer beſt for effecting the Alterations and curative Intentions propoſed. And having thus upon Trial found the preciſe exact State of Air, as to its Gravity and Preſſure, which enables him to reſpire with the greateſt Eaſe and Benefit, let him obſerve to what Diviſion or Number the Mercury is rais'd within the Gage Tube bb, and by obſerving to keep the Air in the reſpiring Veſſel always to this ſtandard Degree of Denſity, he will thereby become furniſhed with an artificial Atmoſphere for to breathe withal, and render'd at all Times, or for as long as he finds Benefit thereby, of one uniform Degree of Gravity and Preſſure, and moſt exactly prepar'd and fitted, ſo as to ſuit and agree the beſt and eaſieſt poſſible with the preſent conſtitutional State of his reſpiring Organs. So that if the Perſon takes but Care only to inject as much Air into the reſpiring Veſſel, as he draws out of the ſame by the reſpiring Pipe, at each Inſpiration, (which will require no great Trouble nor Force to effect) which he may know by obſerving to keep the Mercury rais'd to the proper ſtandard Height in the Gage Tube; by which Means the Air in the reſpiring Veſſel or artificial Atmoſphere, will be kept always ſweet, pure and freſh, as well as of a uniform equal Gravity and Preſſure; and by placing the reſpiring Veſſel higher or lower upon a proper Stand or Frame, the Perſon may thereby uſe it either Sitting, or Standing, as is moſt convenient. It is however to be remark'd, that the Perſon in uſing this artificial Atmoſphere, muſt not breathe or receive any Air by his Noſtrils, which muſt be kept cloſe ſhut, by means of a Spring Wire, or ſuch like Contrivance, apply'd outwardly and made to preſs the Wings of his Noſe cloſe together.

35. By the mechanical Method here deſcrib'd, a Perſon may have the Air he is to breathe withal, ſo prepar'd and fitted in reſpect of its Gravity, Elaſticity and Preſſure, ſo as to agree the beſt poſſible with the organical Structure of his reſpiring Organs, let the ſame be ever ſo particular. So that if the Perſon's Lungs, *&c.* be of a relax'd weak Texture, as not to bear with an Air very heavy and elaſtick, in ſuch Caſe he may prepare and fit his artificial Atmoſphere for to operate with a proper Weight, Denſity and Preſſure accordingly; and on the contrary, if the Lungs be of a ſtrong, firm, denſe Texture, ſo as to require a more than ordinary Degree of Gravity, Elaſticity and Preſſure in the Air to produce a full Inflation of the Veſicles, and to give full Liberty to the pulmonick Blood Veſſels to dilate, and give more room for the Fluids

to

to circulate therein; ſo alſo in this Caſe, he may have the Air in the reſpiring Veſſel render'd moſt exactly of a Force, as to its Gravity, Spring and Preſſure ſuitable and fitting thereto.

36. Having ſhewn how the Properties of the Air, namely, its Gravity, Elaſticity and Preſſure, may be apply'd and made for to operate upon the reſpiring Organs, with all aſſignable Degrees; now as to the Qualities of the Air relating to Heat and Cold; it will be eaſy to conceive how thoſe two general Intentions of heating and cooling the Air in the reſpiring Veſſel, may alſo be obtain'd to any Degree requir'd, by many artificial Contrivances, as ſuppoſe the pneumatick Engine zzzz, to be ſupply'd with Air by two Pipes, to each whereof is join'd a ſpiral Pipe or Worm, one of which is plac'd in a Refrigeratory or Veſſel with cold Water, and the other in a Veſſel with hot Water, (neither of which Worms are expreſs'd in this Draught to avoid embarraſſing it with too many Lines) each of thoſe Worms muſt have a Cock to let the Air into the Engine, either through the hot or cold Pipe, or out of both together; thus upon ſhutting the Cock through which the hot Air is convey'd, and ſetting open the Cock of the Pipe by which the cold Air is furniſh'd; the reſpiring Veſſel may be kept from Time to Time ſupply'd with freſh Air, which in paſſing through the ſeveral ſpiral Convolutions of the Worm, plac'd in the Veſſel of cold Water, which may be impregnated with Sea Salt or Sal Armoniack, the Air in the Receiver may be render'd of various Degrees of Cold, ſo as in Summer to be render'd as cold as in Winter. And the other Worm being plac'd in a Veſſel with boiling Water or Oil, the Air in paſſing through it may be made to receive different Degrees of Heat, ſo as to be render'd as hot in the Depth of Winter, as it is in the Middle of Summer. By which Method the Air in the reſpiring Veſſel or artificial Atmoſphere may be prepar'd for to operate upon the reſpiring Organs, with all proper Degrees of Heat and Cold, as well as Gravity and Preſſure. Which Degrees of Heat may be varied from that which produces freezing or lower, upwards to the greateſt natural Heat of the Air in Summer, or higher upon Occaſion; all which ſeveral Degrees of Heat thus communicated to the Air in the reſpiring Veſſel, may be exactly known and regulated, by obſerving the Thermometer T T, with its annexed Scale; and when the Perſon upon Tryal and Experiment finds what Degree of Heat in the Air, agrees beſt with his reſpiring Organs, let him remark the Diviſion or Number to which the Fluid ſtands rais'd within the Tube of the Thermometer, and by taking Care to keep the Fluid always elevated to the ſame Height in the Tube, he will thereby know that the Air of the artificial Atmoſphere has its proper intended Degree of Heat, by which Means the Perſon will become ſupply'd with Air to breathe with, and fitted exactly as to the Degrees of Heat, as ſuits beſt with the preſent Temperament and State of his Lungs, *&c.*

37. Now in order to render the Air of this artificial Atmoſphere of a proper Temperament as to the Degrees of Humidity. To anſwer this Intention, the reſpiring Veſſel muſt communicate with another Veſſel or Copper vvvv, by means of the Pipe v D, which Copper being fill'd with pure Water as high as the prick'd Line u u, by applying a proper Heat to the Copper ſufficient to raiſe Steam or Vapours therefrom, which being collected in the upper Part of the Copper, upon opening the Cock of the Steam-pipe v D, the Vapours may be let into the reſpiring Veſſel, until the Air therein is ſufficiently impregnated therewith, and to know the Degrees of Moiſture in the Air within the reſpiring Veſſel, there may be a Hygroſcope apply'd either within-ſide or without ſide the reſpiring Veſſel for that Purpoſe. And if in caſe the external Air or general Atmoſphere, from which the reſpiring Veſſel is ſupply'd, be either naturally from the Situation of the Place, or accidentally render'd too moiſt, many Ways may be uſed to render the Air of this artificial Atmoſphere of a proper Temperament as to Dryneſs; ſuch as cauſing the Air before it enters into the reſpiring Veſſel for to paſs through warm dry Spunges, or other ſuch like Subſtances fit to abſorbe and imbibe the Moiſture of the Air, or the Air may be made to paſs through warm dry Pipes plac'd in hot Sand or Bricks, before it is receiv'd thro' the Pipe w P into the pneumatick Engine, to be injected into the reſpiring Veſſel; with many other ſuch like Devices and Contrivances too tedious to be here more particularly detail'd.

38. By the Methods propos'd in the foregoing Numbers it is evident, that a Perſon may be ſupply'd with Air for Reſpiration, endow'd with all poſſible Degrees of Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs; and moreover when the Caſe ſo requires, the Air in the reſpiring Veſſel may be impregnated with Vapours or Effluvia, either humid, or dry, produced from Materials of all Sorts, animal, vegetable and mineral; the Ingredients whether ſolid or fluid are to be put into the Copper vvvv, and upon applying a proper Degree of Heat thereto, either by Ebullition, Accenſion, Attrition, *&c.* the Vapours will become rais'd to the upper Part of the Copper, and upon turning open the Cock of the Steam-pipe v D, the Vapours will paſs through it into the reſpiring Veſſel, and when the Perſon finds the Air to be ſtrongly enough impregnated therewith, upon ſhutting the Cock of the Steam-Pipe, no more Effluvia will be permitted to come into the reſpiring Veſſel until they are wanted; and which will anſwer beſt in moſt Caſes is, for to have the Vapours thrown in by little at a Time ſucceſſively, juſt as faſt as they become expended, and not all at once; and for this End the Steam-Pipe muſt be made to communicate with the pneumatick Engine by the Pipe c c c P, whereby the Vapours are conducted firſt into the Engine, out of which it is thrown gradually, being mix'd with the external Air, into the reſpiring Veſſel; ſo that by this Method a Perſon may have the Air he is to breath with render'd poſſeſs'd with the Effluvia and Exhalations of all Sorts of Bodies, as are judg'd to be any Ways ſubſervient

for

for to anſwer any curative Intentions with reſpect to the reſpiring Organs; either for contracting, relaxing, ſtrengthning, heating, cooling, humecting, drying, reſolving, fumigating, &c. in the like Manner as has been ſhewn in the two firſt Chapters, with reſpect to the external Body. So that by having the Air in the reſpiring Veſſel thus properly medicated and balmified, with Vapours, Odours and Effluvia from all Kinds of proper Subſtances and Ingredients, a Perſon may be put in a Condition in the Middle of Winter, for to breathe the ſame benign, pure, tepid, dry, ſalubrious Air, impregnated and aromatiz'd with the ſame ſanative balſamick Particles, as he could do by going into the fineſt Flower-Garden in the Summer Seaſon; which Method of fumigating the Lungs with Air thus artificially prepar'd and medicated, will be of great Service in curing many of the Diſeaſes of this moſt noble capital Organ.

39. Moreover, in order to give the Perſon all the Benefit that can be derived from the Air, at the ſame Time as he breathes with an Air thus artificially prepar'd, medicated, and fitted in all Reſpects ſo as to agree with the preſent State of his Lungs, he may have his whole Body at the ſame Time ſubmitted to the Operation of another artificial Atmoſphere, by incloſing his Body in the Veſſel BBBB (as is ſhewn by the other vertical Section, Fig. 2. Plate 2.) which Veſſel with its Apparatus is conſtructed in the ſame Manner with that deſcrib'd in the ſecond Chapter. The Perſon either ſitting or ſtanding within this Veſſel, may have the Air incumbent upon his Body render'd of what Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, &c. as is judg'd will anſwer beſt with the Symptoms and Indications of his particular Caſe; at the ſame Time as the Air in the reſpiring Veſſel xxxx, is fitted and prepar'd ſo as to agree exactly with the State of his Lungs. In this Draught the Air incompaſſing the Perſon's Body within the Veſſel BBBB, has its Properties and Qualities fitted and adjuſted with reſpect to its Denſity and Preſſure, &c. by means of the pneumatick Engine aaaa, but the Air in the reſpiring Veſſel xxxx has its Properties adjuſted and regulated by the other pneumatick Engine zzzz; however any one of thoſe two Engines may ſerve for both Purpoſes. So that by this Method a Perſon may have the Air duly fitted and prepar'd for to operate at the ſame Time both upon his Body, and reſpiring Organs, and that with all Degrees of Gravity, Elaſticity, Heat, Cold, &c. as ſuits beſt with the Intentions of Cure in both.

40. By the Methods here deſcrib'd of artificially preparing, medicating and accommodating the Air with reſpect to all its known Properties and Qualities, and of applying and cauſing the ſame to operate jointly or ſeparately, and with ſuch a proper Degree and Quantity of Force, as ſuits relatively beſt with the conſtitutional State and Structure of the reſpiring Organs in every individual Perſon, let the ſame be weak or ſtrong, young or old, &c. (providing they have no original wrong Conformation or hereditary morbid Impreſſions) from which it is propos'd the only natural, perfect, ſafe, univerſal Method will be obtain'd for the Cure of all Diſeaſes which proceed from an imperfect Reſpiration and Sanguification, or from the Lungs and Air not having their relative Properties and Forces duly proportion'd to each other. It being abſolutely impoſſible ever to expect a perfect Cure of the Diſeaſes proceeding from this Cauſe (and to which moſt of the capital Diſtempers owe their Original and Growth) by any other Medicines or Means in Nature, but only by ſuch or the like proper Methods of applying the Air to the reſpiring Organs, in the Manner as before deſcrib'd, join'd and aſſiſted with the other new Methods of Health contain'd in the other Chapters of this Eſſay. And this we find confirm'd from daily Experience, how that Perſons labouring under Aſthmas, Conſumptions, Agues, Atrophies, Cahexies, Hecticks, Dropſies, relax'd Solids, &c. with ſuch other Diſeaſes as derive their Origin from a defective Reſpiration and Sanguification, become very ſenſibly affected by the different Gravity, Denſity, Preſſure, Heat, Cold, Humidity, &c. of the Atmoſphere; now there is no abſolute Relief to be found againſt thoſe Changes in the Properties of the Air; for let a Perſon change his Habitation to any Part of the Earth, he muſt ſtill expect to meet with the ſame changeable Atmoſphere, although in ſome Countries, eſpecially towards the Equator, the Air in reſpect of ſome of its Properties, is not ſubject to ſo great and ſudden Alterations, as in more northerly Climates, yet even this material Inconvenience, and which admits of no Relief any other Way, may notwithſtanding become perfectly remedied by this new Method, for ſuppoſe a Perſon to be aſthmatick, by means of this new reſpiring Machine he can bring the Air to be of ſuch a Diſpoſition and Temperament in reſpect to all its Properties, as ſhall exactly fit and ſuit beſt with the preſent State of his reſpiring Organs; and when upon Trial he has brought it to ſuch an exact Adjuſtment and Standard, he may continue and keep it ſo for as long as he pleaſes, or finds Benefit thereby; and when he finds his reſpiring Organs grow ſtronger, and that they require and can bear with an Air endow'd either with a greater or leſs Degree of Gravity, Heat, Cold, &c. he can prepare and render this artificial Atmoſphere poſſeſs'd with thoſe Properties and Qualities accordingly, &c.

41. Moreover we find a Change of Air to be the only true natural perfect Cure in Caſes of Conſumptions, Agues, Aſthmas, Cahexies, &c. and the Reaſon why it miſſes, is chiefly for want of knowing what Properties and Qualities the Air ought to have, which ſhould be always contrary to thoſe by which the Diſeaſes was produc'd; and thus the changing of a damp, cold, light, foggy Air, for one more heavy, dry, warm, ſerene and perflated, will do more towards the Cure of ſuch Diſeaſes, when occaſion'd from thoſe or the like Conſtitutions of the Air, than all

the Remedies in Nature. But whereas moſt People's Condition and Circumſtances will not allow them to change their Habitation, or go into other Countries, where the Air is reputed more ſalubrious, now all thoſe Intentions may be anſwer'd, and in many Reſpects more univerſally and better, than can be done in any Part of the Earth; for as has been ſhewn before, by this new Method the Air which a Perſon is to breathe withal, may be not only endow'd with all the requiſite Properties and Qualities that ſuits beſt with the State and Structure of his reſpiring Organs, but this Air or artificial Atmoſphere when thus prepar'd and adjuſted, may be kept poſſeſs'd with the very ſame Properties, and in the very ſame Degrees, for any Space of Time requir'd, and that in all Seaſons of the Year, Spring, Summer, Autumn and Winter, all equally alike; which is a very momentous important Point gain'd hereby; in that this univerſal Remedy of Nature's Appointment, can have its Properties and Qualities chang'd and alter'd at Pleaſure, and fitted for operating with all Degrees, Quantities, Proportions, Alternations and Combinations, both upon the whole external Body, as alſo upon the whole Syſtem of the Fluids in the Veſſels of the Lungs, and this at all Times and Seaſons, and in all Places, and with reſpect to all Perſons whatever. And beſides the Air which the Perſon thus breathes with, may be aromatiz'd and impregnated with Effluvia produc'd from Earths, Vegetables, *&c.* brought from ſuch Countries as are eſteem'd the moſt healthful, whereby the ſame may not only be render'd an univerſal Bath for Irroration and fumigating the Lungs, but be made for to reſemble the Air of any particular Place or Country, with reſpect to the extraneous Effluvia and Exhalations wherewith it is ſaturated, ſuch as that of *Montpelier*, or *Italy*, &c. ſo that without going to either, a Perſon may by this Method be put in a Condition of enjoying all the ſame good Effects and Benefit from the Air here at Home, by having the ſame thus artificially prepar'd, medicated, aromatiz'd, and balmified, *&c.* as has been ſhewn in the preceding Numbers.

42. It is not here propos'd nor intended that a Perſon can apply or make uſe of ſuch an artificial Atmoſphere conſtantly; it will be ſufficient if the ſame be uſed at proper Intervals, and for a reaſonable Time, like to any other Kind of Exerciſe or Regimen, preſcrib'd either for the Preſervation of Health or the Cure of Diſeaſes; and being thus duly and regularly purſued, will not fail in due Time to effect a perfect Cure of all the aforeſaid capital Diſeaſes.

43. Moreover as the Lungs are a compreſſible, vaſcular, elaſtick Machine, and the whole Syſtem of the Fluids is made to circulate ſucceſſively through the ſame, wherein they become in a manner fully expos'd and laid open, under Cover only of innumerable fine tranſparent flexible elaſtick Tubes, to receive the ſalutary Effects and Operation of the Air; for which Reaſon this Organ the Lungs, appears to be much the moſt natural proper Place to begin at, in order to cure the Diſeaſes of the Fluids; and it ſeems ſurpriſing to me that no Attempts of this Kind have hitherto been made for improving ſo valuable an Opportunity and conſtant Acceſs as is hereby afforded us of coming at the whole Maſs of Blood; the All-Wiſe Author of Nature having plainly ſhewn and pointed out to us, that the Deſign and final End of inſtituting this compound Organ or Machine the Lungs, was for to prepare, repair, and preſerve the Fluids in a fit State and Condition for performing their reſpective Offices, and as ſuch appears from the Appointment of Providence, to be the moſt proper Place and Organ to begin at in order to effect a perfect Cure of all the Diſeaſes relating to the Fluids, to which we can have a conſtant, immediate and full Acceſs at all Times as they circulate through this complex Organ, without taking ſuch a long, uncertain, remote round-about Way for effecting thoſe Changes in the Fluids, by means of Medicines exhibited internally, and convey'd thereto by way of the Stomach (according to the preſent Practice) the Effects whereof are always uncertain, and oftentimes fatal and dangerous; whereas all the ſame curative Intentions may be much more ſafely and certainly effected, only by cauſing the Air to operate upon the reſpiring Organs, with its Properties and Qualities ſo regulated and adjuſted, as will beſt anſwer to produce the Effects and Intentions wanted, as has been ſhewn in the former Numbers.

44. As we are taught by Experience and Obſervation, to regard the Air at all Times as Nature's great Inſtrument for regulating animal Life and Health, ſo we muſt not forget at the ſame Time to be upon our Guard, as it is alſo the moſt ſubtil Agent and productive Cauſe of Diſeaſes. Now there are two principal Ways whereby we receive both its good and bad Effects; the firſt is by its general Action upon the whole external Body; and the ſecond is by its Operation upon the reſpiring Organs, wherein both its good and bad Effects are chiefly manifeſted. Now in the ſecond Chapter I have ſhewn a Method whereby all the ſalutary good Effects, ariſing from its general Operation upon the whole external Body may be obtain'd, and all its bad Effects remedied and prevented, by means of an artificial Atmoſphere properly prepar'd with reſpect to all its Properties and Qualities, and made to operate with a proper Force upon the external Body, whereby all the curative Intentions both of the Solids and Fluids may be moſt effectually obtain'd. And in this Chapter I have deſcrib'd a Method, whereby all the good Effects produc'd by the Operation of the Air upon the reſpiring Organs may be obtain'd, and all its bad Effects cured and prevented; by means of another artificial Atmoſphere properly prepar'd, and made to operate with a due Force upon the Lungs; by which Means that natural Organ and Engine the Lungs, will be rendered an artificial pneumatick Engine, as being now brought under the Management and Direction of humane Art, in ſuch wiſe that it may be regulated, adjuſted and

fitted like as a Corn-Mill, whereby all the Intentions wanting in the Fluids may be moſt perfectly obtain'd, as they may be ground coarſer or finer, and have their Texture, Craſis and Temperament repair'd, mended and manufactur'd at Pleaſure. So that theſe two new general Methods of applying the Air to the whole external Body, and reſpiring Organs, will afford the moſt perfect univerſal Means for preſerving Health, and curing all Diſeaſes, that are curable, both of the Solids and Fluids.

45. The Lungs have already been conſider'd and compar'd to a Pneumatico-Hydraulick Engine, whereby the animal Fluids are conſtantly elaborated, ground, mix'd and aſſimulated, *&c.* Now as there is an univerſal Analogy to be obſerv'd throughout the whole Creation and Works of Nature; and as humane Art is no other than copying, aſſembling and diſpoſing of Things in Imitation of Nature; for farther Illuſtration of this Point, let us conſider a little more particularly the Analogy and Reſemblance between this compound Engine of Nature, the Lungs, and that of a Windmill or any Engine apply'd for forcing Water by the Power of the Wind, or of the Air in Motion. Now there are only two Ways whereby the Motions of ſuch an Engine can be truly regulated; that is, by placing the Sails either ſpread fully open, or contracted in a proper Poſition and Degree of Obliquity to the Current and Stream of the Air; or by intercepting Part of the Wind by the Interpoſition of ſome Body, and cauſing it to act more or leſs upon the Sails; the firſt is the Method now in Uſe, but the latter, tho' not without its Advantages, hath never that I know been put in Practice. Now to bring this Compariſon home to the Lungs, the Powers employ'd in the Motions of this compound Organ or Engine, are the Air, together with the organical Structure and muſcular contractile Force of the pulmonary Veſſels, and the other Muſcles ſerving to Reſpiration: Now there is but one Way whereby we are allowed Acceſs, or can pretend to regulate and govern the Motions of this compound Engine of Nature; for as it is not in our Power to alter or mend the original Structure and Mechaniſm of the Lungs and reſpiring Organs, as we can do that of an artificial Engine; we have only one Way left whereby to regulate its Motions, and that is by accommodating and fitting the Air with all its Properties, and cauſing them to operate with a proper Momentum and Force thereupon; and as this laſt Method may be done by proper Machines, conſequently we may regulate and govern the Motions of this compound Organ or Engine, after much the ſame Manner as we do that of a Windmill; for as by placing the Sails either ſpread open or contracted in a proper Degree of Obliquity to the Wind, we can either accelerate and retard, or augment and diminiſh its Motions, with the Effects depending thereon; even ſo in like Manner by applying the Air with its ſeveral Properties and Qualities, and cauſing it to operate with a proper Force and Momentum upon the Lungs and reſpiring Organs, we can either accelerate, retard, augment and diminiſh their Motions, with the Effects produc'd thereby in the animal Fluids, as they circulate ſucceſſively thro' the Lungs; the Effects of which Motions extend not only to the Region of the Thorax, with its Contents, but to that of the Abdomen alſo, with all the Viſcera, Organs, Glands and Veſſels, *&c.* contain'd therein.

46. Now in order to illuſtrate by a linear Repreſentation and Draught, the Effects and Alterations that may be thus produc'd by the Air and its Properties, when apply'd by proper Machines, and in proper Quantities and Proportions, to the Lungs; I have for that Purpoſe, in the Picture or Figure of the humane Body, in Fig. 1, and 2, Plate 2, repreſented the external Surface of the Thorax and Abdomen, (both which Regions, *&c.* are ſubject to the Influence and Dominion of Reſpiration) as defined by two parallel Lines, the outermoſt whereof being a real one, but the innermoſt a prick'd or dotted one; and the Interval or Space between the ſaid Lines, ſerves to denote and expreſs how much the Motions of the reſpiring Organs, with the Cavities and Contents of the Thorax and Abdomen depending thereon; may be expanded or contracted, accelerated or retarded, augmented or diminiſhed, *&c.* and that in all Degrees and Quantities, as will anſwer beſt with the preventive, preſervative, and curative Indications, *&c.*

47. That the ſeveral new mechanical Practices and Methods deſcrib'd in this Chapter for preſerving Health, and the Cure of Diſeaſes, are juſt, true and reaſonable, and muſt be attended with all the Advantages that have been aſcrib'd thereto, requires no other Proof or Demonſtration, than that of their being perfectly conformable to the eſtabliſh'd Order and ſettled Methods which Nature purſues for attaining the ſame Ends. If any think this Method of practiſing, arguing, and demonſtrating, grounded on an Analogy and Conformity with the eſtabliſh'd Order and Laws of Nature, as not concluſive and ſufficient, they are at full Liberty to produce a better, if they can.

CHAP IV.

General Reflections relating to the mechanical Effects and Influence of the Air upon Animal Bodies, conſider'd under the Head of Exerciſe; wherein is deſcrib'd the Conſtruction and Uſe of a new Machine and Method of applying the Air to the humane Body in ſuch a Manner, as to become the moſt perfect and ſalutary of all Kinds of Exerciſe; as alſo the moſt efficacious univerſal Remedy for the Cure of moſt of the capital Diſeaſes incident to Mankind.

1. HAVING in the ſecond Chapter, with the other Parts of this Eſſay propos'd and deſcrib'd a new Method for conſtructing an artificial Atmoſphere, whereby the mechanical Properties and Qualities of the Air may be directed and made to operate upon the humane Body, with all Degrees of Force, and in all Alternations and Combinations. Having alſo in the third Chapter deſcrib'd another new Method whereby the Air may be apply'd and made to operate upon the reſpiring Organs, with its Properties and Qualities intended and remitted in all Degrees, and Proportions, either jointly or ſeparately. By a judicious Uſe of which two new Methods it is propos'd, that the moſt perfect, ſafe, univerſal Practice may be eſtabliſh'd for the Cure of Diſeaſes. I ſhall come now in the next Place to propoſe another new mechanical Method of applying this great univerſal Cauſe and Inſtrument the Air, to the Body; from the Effects and Influence whereof many ſingular Advantages will be obtain'd, as being the moſt perfect of all Kinds of Exerciſe for preſerving Health and Cure of Diſeaſes. But in order to open up and prepare the Way for the more readily and diſtinctly apprehending the Reaſon, Effects, and Benefit thereof, ſhall premiſe the following Obſervations.

2. Among all the Non-Naturals and Means of Health, none contribute more thereto, than Air, and Exerciſe or Motion; now the real End, Effects and Deſign of all Exerciſe of what Kind ſoever, is to communicate a proper Quantity of Motion to the animal Solids and Fluids, to contract, brace and ſtrengthen the former, and diſſolve, attenuate and keep the latter in a due State of Tenuity, Heat and Fluxility, for performing the Offices of Circulation, Secretion, Nutrition, *&c.* Now to this one general Head of Exerciſe, or communicating Motion to the Solids and Fluids; all Medicines, Methods and Means for preſerving Health and curing Diſeaſes, may be truly and properly referr'd, as the ſame can have no other End or Intention, nor capable of producing any Effects, other than what reſult from the Quantity of Motion impreſs'd and communicated to the animal Solids and Fluids, with the Direction and Determination of that Motion. Now the Methods for communicating Motion or Exerciſe to animal Bodies are of various Sorts, either natural or artificial; under the firſt Head may be reckon'd Aliment, Walking, Fire, Air, Paſſions, *&c.* and under the ſecond Claſs may be refer'd all Medicines and Means either for preſerving Health, or the Cure of Diſeaſes, as Bathing, Riding, Emeticks, Catharticks, Dieureticks, Sudorificks, Salivaticks, Frictions, Epiſpaſticks, Cauſticks, Cupping, Scarefying, Phlebotomy, Opthalmicks, Odontalgicks, Cephalicks, Opiates, Stimuli, *&c.* However I think it may be truly affirm'd of one and all the aforeſaid Methods of Exerciſe, eſpecially thoſe of the ſecond Claſs, that by what ever Methods the Body is exercis'd, there is a greater Streſs laid upon ſome Parts more than others, or which comes to the ſame Thing, that Motion is not communicated to all Parts equally and alike, the Effect and Conſequence whereof will be an unequal Derivation and Revulſion of the Fluids to, and from, particular Parts of the Body; the Fluids being always neceſſarily determined in the greateſt Quantity and Velocity, upon the Parts where there is the leaſt Reſiſtance. Conſequently that Kind of Exerciſe whereby Motion is moſt equally communicated and diſtributed to all Parts, both Solids and Fluids, muſt neceſſarily be the moſt natural and perfect, and the beſt for preſerving Health, and for the Cure of Diſeaſes. Of which equable uniform Method of communicating Motion to a Syſtem of elaſtick, contractile, diſtractile Tubes, ſuch as are the Bodies of Animals and Vegetables, Nature has furniſh'd us with two of the moſt admirable perfect Inſtances of this Kind; the firſt is that of the compound Action of the Lungs and Air upon the whole Syſtem of the Fluids, as they circulate ſucceſſively through the Veſſels infinitely divaricated throughout the veſicular membranous Subſtance of the Lungs, by which alternate equable Syſtole and Diaſtole of the Lungs, Motion is communicated to the Blood and all its Parts equally and alike, whereby the whole Syſtem of the Fluids receive the Benefit of a conſtant and moſt perfect Exerciſe, from the Motion that becomes impreſs'd thereon by the Air, as it circulates through the pulmonary Veſſels, whereby it becomes as it were Wire drawn, diſſolv'd, attenuated, and has all its component Principles perfectly aſſimulated and fitted for all the Offices of the Œconomy, *&c.* The ſecond Example of perfect Exerciſe which Nature preſents us with, is likewiſe deriv'd from the ſame univerſal Inſtrument and Cauſe, the Air, conſider'd as apply'd and operating upon the whole external Body; for as the Atmoſphere being a Fluid ſubject to perpetual Changes as to its Gravity, Elaſticity, Heat, Cold, *&c.* it becomes a conſtant Cauſe and Inſtrument of communicating Motion and Exerciſe to animal and vegetable Bodies, as conſiſting of an Aſſemblage of elaſtick Tubes fill'd with Fluids capable of being greatly rarified and con-

dens'd, and being always immerg'd into and encompaſs'd round therewith; from the variable State of which Fluid in reſpect to its Properties and Qualities, animal Bodies become ſubject to a univerſal Motion of Syſtole and Diaſtole, or of contracting and expanding, during the whole Period of Life; and this univerſal Agitation and Oſcillatory Motion thus continually communicated and impreſs'd upon the animal Machine by this variable Cauſe the Atmoſphere, inſtead of being prejudicial, is abſolutely neceſſary in the preſent State of Exiſtence, towards the Production, Preſervation and Continuance of all Degrees of Life, in Animals, Vegetables, Fire, *&c.* and without the conſtant Influence of which natural Motion and Exerciſe thus deriv'd from the Air, our own as well as all other Bodies about us would become arreſted and fall into a State of abſolute Reſt, Inactivity or Death. Now in both the Examples of Exerciſe here produc'd, it is to be obſerv'd, that our Bodies become exercis'd or have Motion communicated thereto by the Air, which in the firſt Caſe is apply'd and made to act upon the animal Fluids as they circulate ſucceſſively through the Lungs; and in the ſecond Caſe is apply'd and acts upon the whole external Body, and by conſequence upon the whole Syſtem of the Solids and Fluids. Now the Air being an elaſtick Fluid endow'd with its other variable Properties and Qualities, becomes on that Account the fitteſt and beſt adapted Cauſe and Inſtrument for communicating Motion and Exerciſe to a Syſtem of elaſtick Tubes, fill'd with compreſſible Fluids, as are the Bodies of Animals, *&c.*

3. From a due Conſideration of the aforeſaid two beautiful notable Inſtances and Caſes, wherein it has been ſhewn, that our Bodies are kept in a perpetual State of Exerciſe, by the Motion that is continually communicated thereto, by the ever changing Properties of the Air, without which conſtant natural Exerciſe, Life in no Degree could ſubſiſt. Taking then the aforeſaid two Caſes for a Model, Pattern and Exemplar of the moſt perfect and healthful Method of exerciſing or communicating Motion to animal Bodies, as being the Method practiſed by the Author of Nature, and preſcribed to us for our Imitation; conformable whereunto, I come now to deſcribe another new mechanical Method for exerciſing and communicating Motion to the animal Machine, by a new Manner of applying and cauſing the Air to operate thereupon, in a Method ſomewhat analagous, and in Imitation of the joynt Action of the Lungs and Air upon the Blood, as it circulates ſucceſſively thro' that Organ.

4. For this Purpoſe vide vertical Section, Fig. 7. Plate 2, wherein let B B B B repreſent a cylindrical Barrel, plac'd with its Axis perpendicular to the Horizon; and may be of Caſt Iron or Braſs, from one, to three Feet diameter in the Bore, and from five, to ten Feet in Height; upon the upper End of this Barrel which is open, there is fix'd acroſs the Middle of the Bore, a ſtrong flat Iron Bar m m, in the Middle whereof is a round Hole, within which there moves a ſtrong cylindrical Iron Rod R r, to the lower End whereof r, is fix'd a Piſton or Forcer F F, which may be a Plate of Iron or Braſs, turn'd for to fit the Bore of the Barrel, and to cauſe the ſame to move or work truer therein, it may be arm'd with Leather upon both Sides, and upon the upper Side of the Forcer there may be ſome Water, to prevent any Air from getting in or out between the Barrel and Forcer; to the upper End R of the Iron Rod there is fix'd at right Angles thereto a Piece of Wood T T, the two Ends whereof move perpendicularly up and down in a Channel or Groove form'd by the upright Pieces or Cheeks s d, s d; which together with the horizontal Pieces c c, ſerve as a Frame for fixing the Machine; to the Middle of the ſliding Piece T T, is fix'd a Ring or Eye-bolt R, with a Rope or Chain fix'd thereto; which being carry'd over the Pulleys z and q, has a Weight P faſten'd to the other End, which Weight as it deſcends, cauſes the Iron Rod R r, with the Piſton or Forcer F F, to aſcend upwards; to the under Side of the Piece T T are fix'd two other Rings 2, and 4; to each whereof is faſten'd the End of a Rope or Chain, which being carry'd underneath the Pulleys 1, and 3, are afterwards wound ſeveral Times round the Groove of the Wheel x x, to which they are made faſt; by the winding on, and off, of thoſe Ropes in the Groove of the Wheel as it moves round one Way or the contrary, the Piece T T with the Iron Rod R r, and Forcer F F, are determin'd and made to move forcibly downwards, at which Time the Weight P will be rais'd upwards; and upon ſlackening the Ropes and letting the Wheel move round with a revers'd Motion the contrary Way, the Weight P will thereupon deſcend, and cauſe the Forcer F F, to move upwards within the Barrel; w w is another Wheel fix'd upon the ſame Axis A A, to the Groove of this Wheel there may be fix'd the Ends of ſeveral Ropes w 1, w 2, *&c.* which Ropes after taking one or two Turns round in the Groove of the Wheel, may be carry'd out in all Directions therefrom; to each of which Ropes there may be apply'd any Number of Men, who upon pulling the Ropes cauſe the Wheel to turn round, whereupon the other Ropes x 1 2, x 3 4, in winding on upon the Wheel x x, will cauſe the Iron Rod R r, and Forcer F F, to move downwards in the Barrel, and that with any Velocity requir'd; and according as the Wheel w w moves a leſs or greater Way round, ſo the Piſton or Forcer F F, will be rais'd higher or lower in the Barrel proportionally, as ſuppoſe to the ſeveral Heights F 2, F 3, F 4, F 5, *&c.* as the Stroke is requir'd to be made ſtronger or weaker, (as to the Conſtruction of the Axis A A, with the Manner of applying the Power of Men thereto, I ſhall not enter upon a more particular Deſcription thereof here, having in another Paper relating to Mechanicks, with the Conſtruction of the Capſtane and Windlaſs, been particular upon that Subject, wherein I have deſcrib'd a new Method both for conſtructing and working the ſame; whereby thoſe two mechanical Organs will be render'd of much greater Force and more commodious in all Caſes, but more eſpecially on

board of Ships, &c. to which Paper I muſt refer for Brevity) to the lower End of the Barrel there is joyn'd a ſhort Pipe with a Flanch, by which it is joyn'd with Screws to the other ſhort Barrel RRRRRR, which may be either Square or Cylindrical, and of a Capacity to receive the Body of a Perſon ſitting therein, as repreſented by the Picture or Image in the Figure; this Barrel, wherein the Perſon is ſhewn ſitting, (which for better Diſtinction I ſhall name the Receiver) is cloſe ſhut at the upper End, only in the Middle whereof is a Hole, which may be open'd or ſhut upon Occaſion by a Valve or Plate y, fitted to the Cover RR, either by a Rivet or Hinge; in the Bottom of the Barrel BBBB is a Hole, over which is placed a Valve u, opening inwards and outwards.

5. All Things being thus diſpos'd in the Manner as before ſuppos'd, and the Perſon being ſeated within the Receiver, upon raiſing up the Forcer to any Height within the Barrel, as ſuppoſe to F 2, the Valve u, opening at the ſame Time inwards, the Air will enter thereat and fill the Space produc'd by the Motion of the Piſton or Forcer upwards; which being done, let the Men begin to pull the Ropes w 1, w 2, whereupon the Forcer will be made to deſcend forcibly from the Height F 2, until it comes to the lowermoſt Situation F F, by this Stroke of the Forcer in deſcending from F 2, to F F, the Air in the Receiver will become gradually condens'd around the Perſon's Body, ſuppoſe now the Air in the Receiver RRRR, by this Stroke of the Forcer, to be condens'd into half the Volume or Space occupied by common Air, in this Caſe the Perſon in the Receiver will be compreſs'd with a Weight double of what he would ſuſtain from the Preſſure of the Atmoſphere alone, or he will ſuſtain an additional Weight equal to about 40,000 Pounds; or equal to what he would ſuſtain by being immerg'd to the Depth of thirty five Feet under Water in the open Air. Now the Effects of ſuch great additional Preſſure being laid upon the Body, will be, that the whole external Surface of the Body being equally and ſtrongly compreſs'd, the Effects of which Preſſure being propagated inward to the very Center or Axis of the Body, throughout the whole vaſcular and glandular Syſtem, whereupon the Blood by this univerſal Syſtole and Contraction, will become triturated, diſſolv'd, and attenuated, juſt in like Manner as the Blood becomes ground, elaborated, and aſſimulated by the Deſcent and Preſſure of the Air upon the Blood Veſſels of the Lungs, upon every Act of Inſpiration and Expiration; now we may conceive the Perſon in the Receiver upon every condenſing Stroke of the Forcer, to become ſubject to the like ſimilar Changes, as he would be in the external Air or Atmoſphere, upon its Changing from being lighteſt to heavieſt; the Difference between which two extreme States, is about one tenth Part of the Air's whole Weight, whereas in this Caſe it is double of its whole Weight, and conſequently the Effects produc'd in the Perſon's Body by this Stroke of the Piſton or Forcer, will be twenty times greater than what he would have undergone by a Change of the Atmoſphere from lighteſt to heavieſt. The Forcer having made the deſcending Stroke, let it be rais'd up to the ſame Height F 2, as before, in order to make a ſecond Stroke, (now this Motion or Stroke of the Forcer upwards within the Barrel, is produc'd by the leaden Weight P being permitted to deſcend, upon the Men's ceaſing to pull the Ropes w 1, w 2, &c. whereby the Forcer being puſh'd upwards by the Spring of the condens'd Air in the Receiver, becomes eaſily rais'd up) obſerving to let the Forcer take the ſame Time in the riſing or aſcending Strokes, as it does in the falling or deſcending Strokes: Now all the Time the Forcer is moving upwards, the Air about the Perſon's Body in the Receiver becomes gradually more and more rarefied, as the ſame has now more room to evolve its Spring, ſo that when the Forcer is rais'd to F 2, the Air in the Receiver will be of the ſame Denſity, Weight and Preſſure, with the external Air or Atmoſphere, ſo that the Perſon will now be reſtored to the ſame Degree of Preſſure from the Air as he ſuſtain'd at firſt. And whilſt the Forcer is making the riſing or aſcending Stroke, the additional Preſſure that was before laid upon the Perſon, by the Condenſation of the Air, will be taken off gradually again, and in the ſame Time as it was laid on; in which Caſe the whole elaſtick vaſcular Syſtem, being now leſs preſs'd upon, will thereupon undergo and become ſubject to a univerſal Diaſtole or Expanſion, from the Center or Axis of the Body outwards to the Circumference, with a contrary Niſus and Direction to what it did before upon the Stroke of the Piſton downwards, ſo that the whole Series of Veſſels, Viſcera and Glands, with their contain'd Fluids, being in this Caſe ſubjected to a contrary Preſſure and Direction from the elaſtick reſtitutive Force of the contractile Solids, in returning to their former Dimenſions, from whence there will be produc'd a new Agitation, Oſcillation, and Comminution of the Fluids, which will be render'd thereby better fitted for Circulation, Secretion, Nutrition, &c. Now upon each Stroke of the Forcer upwards, the Perſon will become affected with the like proportional ſimilar Alterations, as he would be in the external Air or Atmoſphere, upon its changing from being heavieſt to lighteſt; with this Difference, that as in this Caſe, the Rarefaction of the Air is twenty Times greater, ſo the Alterations produc'd thereby in the Body will be alſo twenty Times greater, than what would have follow'd from a Change of the Atmoſphere from heavieſt, to lighteſt. This being done, we may now proceed to make another condenſing and rarefying Stroke as at firſt, which may be repeated alternately and ſucceſſively for any Time requir'd. Moreover the Air in the Receiver may be quickly and wholly renew'd and chang'd whenever the Perſon pleaſes, and be replac'd again with freſh Air, by ſetting open the Valve y, upon the Cover of the Receiver; or the Valve u, at Bottom of the Barrel; and if the Perſon

finds

finds any Inconvenience from Breathing with the Air in the Receiver, either from its being too much condens'd or rarefied by the ſeveral Strokes of the Forcer; or from the Steam and Vapours exhaling from his own Body, in ſuch Caſe he may be ſupply'd with freſh Air for Breathing, by holding the End r, of a flexible membranous leather Pipe r p, in his Mouth, the other End whereof p, communicates with the external Air, the Conſtruction, with the Manner of uſing which Suction or reſpiring Pipe having been already explain'd in the former Chapters, muſt for Brevity refer thereto.

6. Now with reſpect to this new mechanical Method of applying the Air for communicating Motion and Exerciſe to the humane Body, by cauſing it to operate with Strokes and Impulſes of different Force and Preſſure, alternately and ſucceſſively apply'd and impreſs'd thereupon; the following material Points are farther to be remark'd; firſt then, the Perſon in the Receiver may be conſider'd as plac'd within an artificial Atmoſphere, which, like as the general Atmoſphere wherein all animal Bodies, *&c.* are contained, is capable of having its Properties of Gravity, Elaſticity, Preſſure, *&c.* chang'd; but with this very conſiderable Difference, that this artificial Atmoſphere admits of having thoſe its Properties alter'd at Pleaſure, and as often as wanted, and alſo continued under thoſe Changes for any Time requir'd, and beſides it admits of being chang'd with much greater Variety as to the Quantity and Degrees thereof: Now the Properties of this artificial Atmoſphere as to its Gravity, Preſſure, *&c.* become chang'd in any Degree and Proportion by the Motion and Strokes of the Forcer, as it moves upwards or downwards in the Barrel. Secondly, the Strokes made by the Forcer in deſcending, (which for Diſtinction I ſhall name the condenſing Strokes) as alſo the aſcending Strokes (which I ſhall call the rarefying Strokes) may be perform'd with all Degrees of Velocity, and with all Quantities of Preſſure, and with any Interval or Space of Time between the Strokes, in ſuch wiſe that the condenſing and rarefying Strokes may be made to keep Time exactly with the Syſtole and Diaſtole of the reſpiring Organs, ſo that the whole Body being thus ſubjected to ſuch univerſal Syſtoles and Diaſtoles, accompanied with ſuch great additional Quantities of Preſſure, capable of being thus laid on and taken off the Body ſucceſſively, and that in all Degrees, with reſpect to the Quantity, Velocity, and Time, *&c.* the whole animal Syſtem both Solids and Fluids will become thereby thoroughly and moſt perfectly exercis'd, agitated, compreſs'd and dilated equally in all Parts, from the Circumference inwards to the Axis, and from the Center outwards to the Surface; as if it was manufactured in a Fulling-Mill, or ſqueez'd alternately in a Preſs, and this Machine for that Reaſon may not improperly be call'd a pneumatick Mill Preſs or Churn; or more properly an artificial Lungs, the Air being in this Caſe apply'd and made to operate upon the whole external Body by alternate Strokes, much after the Manner as it does upon the natural Lungs, in order to communicate Motion and Exerciſe to the whole Maſs of Blood, as it circulates through the ſaid Organ.

7. Although in the Caſe as was ſuppos'd in Number 5, aforegoing, the Air in the Receiver was underſtood to be condens'd into half the Space and Volume of the common Air, by the Stroke of the Forcer in deſcending from f 2, to f f; in which Caſe the Air in the Receiver will have the ſame Preſſure as that of a double Atmoſphere, as being twice as denſe, yet nevertheleſs the Strokes of the Forcer may be ſo regulated, as to condenſe and rarefy the Air alternately in the Receiver in any other Proportion, either greater or leſs; and thus if the Forcer, inſtead of riſing up to f 2, riſes only to one tenth, one fourth, or one half Part that Height, in which Caſes the Condenſation and Rarefaction of the Air in the Receiver, and the additional Preſſure that will be alternately laid on, and taken off the Body, will be only one tenth, one fourth, or one half, *&c.* of what it was in the foregoing ſuppos'd Caſe, when the Forcer was ſuppos'd to make the Stroke from the Height f 2; and to render the Air in the Receiver twice as denſe as common Air. Again, on the contrary, was it requir'd to lay any greater Preſſure upon the Perſon in the Receiver than that of a double Atmoſphere, as was ſuppos'd in the firſt Caſe; as ſuppoſe that of a Triple, Quadruple, Quintuple, *&c.* Atmoſphere, for that Purpoſe, the Forcer muſt be rais'd up to the ſeveral different Heights within the Barrel mark'd f 3, f 4, f 5, *&c.* ſo that the Forcer in deſcending from thoſe ſeveral Heights, will render the Air in the Receiver either three, four, or five Times denſer than common Air, and ſo for all other intermediate Degrees of Condenſation and Rarefaction, which may be thus varied in all the Degrees requir'd. And in order to know the Degrees of Condenſation of the Air in the Receiver, and how far to regulate the Strokes of the Forcer, ſo as to produce the juſt Degree of Condenſation and Rarefaction, as is judg'd will anſwer beſt to the Perſon's Caſe, and to fit the Machine to anſwer all Intentions of this Kind, for this Purpoſe there muſt be a mercurial Gage Tube b b, joyn'd to the Side of the Receiver, the lower End of which Tube is immerg'd into a Veſſel with Mercury e e e e, which communicates with the Receiver r r r r, by means of the Pipe 5 6, upon the upper Surface of the Mercury there may be put ſome Water to the Height mark'd w w, to keep the Mercury from any wiſe affecting the Air in the Receiver, *&c.*

8. This Method of producing ſuch univerſal Syſtoles and Diaſtoles throughout the whole animal Syſtem, in ſuch wiſe that the ſaid Motion of contracting and dilating, ſhall be produc'd with all aſſignable Quantities of Weight, Force and Preſſure, as alſo with all Degrees in reſpect to the Velocity of the Strokes, and likewiſe with reſpect to the Time between the Strokes, which may

be perform'd with any Degree of Celerity, and with any Interval of Time between, in ſuch wiſe that each Stroke as well the condenſing as the rarefying one, may be produc'd either in the Space of one, two, three, four, five, &c. Seconds of Time; or only once in the Space of one, two, three, four, five, &c. Minutes; by which Means thoſe Strokes may be made to keep Time with the Syſtole and Diaſtole of the Heart and Arteries, or with the alternate Motion of the Lungs. So that by this mechanical Method of applying the Air, the whole animal Machine may be ſubmitted to a Motion of univerſal Syſtoles and Diaſtoles, and if requir'd may be made to conſpire and operate at the ſame Time as the Heart and Lungs undergo the like alternate Motions; or with any other Interval between the Strokes requir'd, and as is judg'd will anſwer beſt for attaining the Intentions of Cure propos'd thereby. So that this Method of Exerciſe is univerſal, as it may be apply'd with all poſſible Degrees of Force, Preſſure, Celerity, Time, &c. and that to all Perſons, old or young, weak or ſtrong; or let their Caſe, Condition and Conſtitution be what it will, upon which Accounts this will become the moſt perfect of all Exerciſes, inaſmuch as Motion will become hereby communicated to the animal Solids and Fluids in the moſt efficacious equable perfect Manner, as the Motion is impreſs'd upon the Body by the elaſtick Fluid the Air, apply'd thereto by alternate ſucceſſive Impulſes and Strokes, whereby the Solids will be made to vibrate with great Force upon the Fluids, which will become thereby attenuated and propell'd by a ſtrong additional impulſive Force, in the ſame Manner as they are by the alternate Syſtoles and Diaſtoles of the Lungs, Heart, and arterial Syſtem; whereas in all other Kinds of Exerciſe, either Walking, Riding, Dancing, Fencing, Bathing, Vomiting, Purging, Sweating, Salivating, Bliſtering, &c. the Motion is communicated and diſtributed unequally to the Solids and Fluids, which become thereby only put into certain irregular Motions, Agitations, Concuſſions, with various contrary Directions, whereupon muſt follow unequal Derivations and Revulſions of the Fluids. Moreover Perſons old or infirm can't take the Benefit of any of the above Exerciſes, as being too laborious and fatiguing; but this new and moſt perfect Exerciſe, all Perſons may receive the Benefit thereof, inaſmuch as it requires no bodily Labour nor Fatigue to attain he ſame; for according to this Method a Perſon, tho' ſitting ſtill, yet nevertheleſs the whole Syſtem of his Solids and Fluids become exercis'd all the while in the moſt natural perfect Manner, without his uſing or employing any Effort with his Body for that Purpoſe, and that only by this Method of applying the Air thereto, ſo that the Old and Young, the Weak and Strong, the Healthy and Diſeaſed, may all alike equally receive the Benefit of this moſt efficacious healthful Exerciſe, even when their Caſe and Condition will not allow them the Benefit of any other Exerciſe whatever.

9. I ſhall here once for all offer one general explanatory Note relating to the Draughts now refer'd to, with thoſe relating to the other Parts of this Eſſay; that in the little Images, Pictures and Sections of the humane Body, in this, and all other the like Draughts, I have repreſented the Outlines, Boundaries and Surface of the Body by two parallel Lines, the outermoſt whereof is one real continued Line, but the innermoſt is a prick'd or diſcontinued Line, which two parallel Lines are intended to repreſent the different Effects produc'd in the Body, when ſubmitted to the Diſcipline and Exerciſe either of this pneumatick Machine, or any of the other mechanical Methods deſcrib'd in the other Chapters; thus upon every condenſing Stroke of the Forcer, the Body will become reduc'd to leſs Bulk and Dimenſions every Way, and as ſuch may at every condenſing Stroke be repreſented by the innermoſt prick'd Line; but at every rarefying Stroke the Body will thereupon evolve and dilate to its firſt uncompreſs'd State and Dimenſions, ſo this contrary Effect produc'd in the Body by each rarefying Stroke, may be aptly enough expreſs'd by the outermoſt real Line; ſo that the humane Body, when ſubmitted to the Exerciſe and Diſcipline of this pneumatick Mill or artificial Atmoſphere, may be conceiv'd as kept alternately contracting and expanding, or ſubjected to an alternate univerſal Pulſation, or Motion of Syſtole and Diaſtole; like as the Heart, Lungs, and Arteries; the Space between the outermoſt real Line and the inner prick'd Line, ſerving to expreſs the Quantity of that Contraction and Dilatation, or the alternate Vibrations which the Body will undergo, whilſt under the Diſcipline and Exerciſe of this Machine or artificial Atmoſphere.

10. Now that this Method of applying the Air to the humane Body is the moſt natural, perfect, healthful Way of exerciſing and communicating Motion thereto, is manifeſt from the very like Methods which Nature takes for the continual Exerciſe and Preſervation of the Life and Health of Animals and Vegetables; through all the ſeveral progreſſive States of their Exiſtence: Now this great End we find to be effected two principal Ways; the firſt is by cauſing our Bodies to be ſurrounded with a heavy elaſtick Fluid Medium, the Atmoſphere, by the continual Changes whereof as to its Gravity, Heat, &c. the Bodies of Animals and Vegetables are kept in a conſtant State of Exerciſe, and have a Motion of Syſtole and Diaſtole continually impreſs'd thereupon, being ever either contracting or expanding in reſpect to their Dimenſions. The ſecond general Way whereby Nature communicates Motion and Exerciſe to animal Bodies, is alſo perform'd by the ſame variable elaſtick Fluid the Atmoſphere, only differently apply'd, and made for to operate by alternate Strokes and Preſſure upon the animal Fluids, by means of the peculiar Organization and Mechaniſm of the Lungs, or of ſome other Organ analagous thereto; whereby the Blood receives the Benefit of the moſt perfect healthful Exerciſe, and is thereby kept in a fit State for

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the ſeveral Uſes of the Animal Œconomy. Now thoſe are the two general principal Methods inſtituted by the Author of Nature, for preſerving the Life and Health of Animals, and both Methods conſiſt wholly in the mechanical Effects of the Air differently apply'd to the Body; now as the new Method of Exerciſe here deſcribed is grounded on the very ſame Principles, and perform'd by a like mechanical Application of the very ſame Elaſtick Fluid, the Air; it follows demonſtratively, (allowing Nature's Laws and Inſtitutions as the trueſt Original to copy after) that this muſt be the moſt perfect, univerſal and healthful of all Kinds of Exerciſe, both for preſerving Health, and recovering it when loſt.

11. Moreover, this new mechanical Method of communicating Motion and Exerciſe to the Human Body, by means of the Air, will ſerve not only as the moſt perfect of all Kinds of Exerciſe for preſerving Health, but will prove, when prudently apply'd, one of the moſt efficacious univerſal Remedies in Nature for the Cure of Diſeaſes; and this Method, together with the others deſcribed in this Eſſay, aſſiſted with proper Aliment, will ſerve to effect all the Changes and Alterations that are neceſſary towards the Cure of all Diſeaſes, either of the Solids or Fluids, and whether they retain to the acute, or chronical Kind, *&c.*

12. Bathing, cold or hot, is juſtly eſteem'd as one of the beſt Exerciſes and Remedies for preſerving Health, and the Cure of Diſeaſes; foraſmuch as it is found by Experience (which is ever the beſt Rule to go by) to ſucceed in the Cure of many Diſeaſes, that have been in vain attempted by all the moſt famed pompous Medicines and Specificks ſo much in common Vogue and Practice. Yet notwithſtanding this juſt Praiſe and Encomium of the Bath, this new Method of exerciſing the Body with this Pneumatick Engine or artificial Atmoſphere, will prove of much greater and more univerſal Efficacy for the Cure of Diſeaſes, than either the cold or hot Baths; as will more fully appear from conſidering the following Points: Firſt, The chief Virtue and Efficacy of the Bath conſiſts in its Gravity and Preſſure, which (in the common Practice of Bathing as now in Uſe) is always of one certain limited Quantity, like to a Medicine given always in one invariable Doſe, let the Perſon's Caſe be what it will; but in the Practice of this new Method, the Body may be ſubmitted to any Degree of Preſſure from the Air, exactly ſuited to the Strength and Conſtitution of the Patient, and as the Symptoms and Indications may require: Moreover, in the common Method of Bathing, let a Perſon place his Body in the Water how he will, yet ſtill the Preſſure will be laid unequally upon his Body, which will always be accompany'd with an irregular Determination and Diſtribution of the Fluids; but in this new Method of Exerciſe the Preſſure will become laid on and taken off all Parts of the Body equally, as being communicated by the Elaſtick Fluid the Air. Moreover, the Preſſure which a Perſon ſuſtains upon being immerg'd in Water, operates upon his Body only as a dead unactive Weight, whereas the Preſſure which the Body receives from the Air, being thus made to act upon the ſame by alternate ſucceſſive Strokes and Impulſes, of different Quantities and Forces, is to be conſider'd as a continual active Preſſure and Principle of Motion and Exerciſe; for in every Stroke made by the Forcer, either for condenſing or rarefying the Air in the Receiver, the Quantity of Preſſure upon the Perſon's Body is continually varying from leſs, to greater, and the contrary; whereby the whole Body is kept in a conſtant Oſcillatory Motion and Fluxionary State: And thus from the Inſtant of Time that the Forcer begins to makes the condenſing Stroke until it is finiſh'd, or arrives at the lowermoſt Situation F F, the Preſſure upon the Perſon is all that Time gradually increaſing; and again, all the Time that the Forcer is making the rarefying Stroke, until it is finiſh'd, the Preſſure of the Air upon the Perſon's Body is gradually diminiſhing; ſo that the Preſſure, thus apply'd to the Body, operates thereon with a conſtant variable active impelling Force, whereby the whole Body is kept in a vibrating Motion; and not as a dead unactive Preſſure, as is the Caſe of the Bath, both cold and hot, ſo far as relates to the Property of Weight and Preſſure, and abſtracting from its Stimulus.

13. To demonſtrate farther what great and mighty Changes may be produc'd in the animal Machine, by this new mechanical Method of applying ſuch an active variable Quantity of Preſſure thereto, by means of the Elaſtick compreſſible Fluid the Air, it will be ſufficient for this Purpoſe, if we conſider the wonderful Effects which the very ſame Fluid has upon the Blood, by the joint Mediation and Operation of the Lungs, which are a perfect Pneumatico-Hydraulic Engine: This Subject has been already conſider'd in the third Chapter; however, as it ſerves ſtrongly to prove the Truth, Neceſſity, and Benefit of this new Method of exerciſing the Human Body, I ſhall here again briefly reſume the Conſideration of that Subject, that the Compariſon between both Methods may appear the ſtronger. The Blood then returning from all Parts of the Body by the Branches of the Vena Cava to the Heart, having loſt many Parts by Secretion, Nutrition, *&c.* and in moving through the diverging Syſtem of the Arteries, and being diveſted of great Part of the Lympha, is render'd thereby viſcid, poor, and effete, upon its Arrival at the Heart, where mixing with the Chyle and Lympha conſtantly flowing in from the thoracick Duct, after paſſing the Right Auricle, are together receiv'd into the Right Ventricle of the Heart, by which it is projected and thrown into the pulmonary Artery, by the Rameſications whereof the Blood becomes diffuſed throughout the whole internal veſicular Subſtance of the Lungs, which becoming fully inflated by the Deſcent and Intruſion of the Air thereinto, in the Act of Inſpiration, the pulmonick Veſſels being now freed from Reſiſtance, have their Diameter enlarg'd and fill'd with

Blood; which Air again, as it comes to be ejected, in the Act of Expiration, by its Preſſure upon the Blood Veſſels, ſerves to grind, analize, aſſimulate, and combine the Blood, Chyle and Lympha, *&c.* together; and thus by thoſe alternate ſucceſſive Strokes, or Syſtoles and Diaſtoles of the Lungs and Air, aſſiſted by the like alternate Strokes of the Heart, and arterial Syſtem, the Blood is kept perfectly mix'd, ſo as to conſtitute an uniform, ſmooth, Balſamick Fluid, fitted for all the Offices of Life. Now the very ſame Air, as apply'd outwardly to the Body by this new Pneumatick Machine or artificial Atmoſphere, produces an Effect upon the whole external Body, and by Conſent upon the internal Blood Veſſels, in a Manner exactly analogous to what it does upon the Blood Veſſels in the Lungs; for as the Air, by being alternately injected and ejected into and out of the Lungs, ſerves by its active Preſſure and ſucceſſive Strokes for to communicate Motion and Exerciſe to the Blood; even ſo in like Manner, the Air in the Receiver being alternately condens'd and rarefy'd, by this new Pneumatick Engine, and being directed and made to operate with all Degrees of Preſſure upon the Perſon's Body in the Receiver: Thus whilſt the Forcer is making the condenſing Stroke, (which may be conceiv'd as relative and analogous to the Act of Expiration, as perform'd by the Lungs) the Body being laid under an equably and uniformly decreaſing Preſſure, the whole vaſcular Syſtem will become ſubject to an univerſal Syſtole or Contraction, beginning from the external Surface of the Body, and propagated inwards to the central Parts or Axis of the Body: And again, during the Time that the rarefying Stroke is performing, (which may be conceiv'd as ſimilar and analogous with the Act of Inſpiration of the Lungs) the Body will be laid under an equably and uniformly decreaſing Preſſure; whereupon the whole Elaſtick vaſcular Syſtem, by its intrinſick reſtitutive Force and Spring, will evolve and unfold; and undergoing an univerſal Diaſtole and Expanſion in all its Parts, from the Axis or Center, to the Surface of the Body, will have its Dimenſions enlarg'd; and thus the Body will continue to be thus affected with an alternate Motion of contracting and expanding, ſo long as it is ſubject to the Diſcipline and Exerciſe of this new Pneumatick Engine, which is exactly ſimilar and analogous to the Operation of the Lungs, or a Pair of Bellows. So that the Perſon in the Receiver, by having the Air condens'd and rarefy'd alternately about his Body, may be conceived to receive the like Effect therefrom, as if his Body was provided with two univerſal Muſcles; the one drawing his whole Body with a Direction tending from the external Surface of the Body, towards its Axis; whilſt the other Antagoniſt Muſcle in its Turn draws all Parts of the Body with a Direction tending from the Axis of the Body, outward, to its external Surface; the Air when condens'd in the Receiver, performing the like Effect and Office with the firſt of thoſe two imaginary Muſcles; and the Air, when rarefy'd in the Receiver, produces a ſimilar Effect with the other Antagoniſt Muſcle: And thus the whole Animal Machine being thus ſubjected to a variable Quantity of Preſſure, increaſing and decreaſing equably and uniformly, will become thereby moſt perfectly exercis'd in all its Parts, like as the Blood is by the alternate Operation of the Lungs; or like as a Piece of Cloth is manufactur'd in a Fulling-Mill, by which univerſal Oſcillations, Contractions and Expanſions of the Solids and Fluids, the ſame will become perfectly well adapted for ſubduing the Viſcidity and coheſive State of the Fluids, and fitting them for paſſing the ſeveral Glandular Strainers, as alſo for curing Obſtructions, Tumors, Atrophies, Conſumptions, Dropſies, Cahexies, Agues, Fevers, *&c.* And as the Fluids will have their Craſis, Texture, and Temperament perfectly repair'd, mended, and improv'd, by the Diſcipline and Exerciſe of this new Pneumatick Machine or artificial Atmoſphere; ſo in like Manner the Animal Solids will receive an equal Benefit thereby; for by the quick, ſtrong, alternate Contractions and Dilatations which the Solids will undergo by this new Exerciſe, ſuch Parts as are no longer fit to be retain'd in the Texture and Compoſition of the Solids, as being either worn out, or being in their own Nature heterogeneous and unaſſimulable with the Structure of the Animal Fibres and Solids, will become thereupon looſen'd, ſeparated, and caſt out, and thereby Room made for the Introduction and Attraction of other Particles more homogeneous and approaching to the Principles and Compoſition of the Animal Fibres, which is what conſtitutes the Idea and Proceſs of a ſound perfect Nutrition or Reparation of the Solids.

14. Now to render this Machine and Method of Exerciſe ſtill more univerſal, and at once to anſwer all Intentions that can be obtained thereby; for that Purpoſe there is added to the Machine a ſmall Veſſel or Copper VVVV, which communicates with the Receiver RRRR, and Barrel BBBB, by the Pipe VF, (*Vide* Fig. 7. Plate 2.) the Uſe of this Veſſel is to produce Vapours or Effluvia, either humid or dry, which may be produc'd from Subſtances of all Kinds, Solids or Fluids, that have any medicinal Qualities; with the Vapours or Effluvia raiſed from any ſuch Materials, it is propoſed the Air in the Receiver may be impregnated in all Degrees and Proportions, as there is occaſion to anſwer any particular Caſe, Symptom and Indication; which Air thus artificially prepar'd and medicated, may prove of much greater Efficacy in ſome particular Caſes, than in uſing common ſimple Air alone. What relates farther to the general curative Intentions that may be derived from this Method of Fumigating the Body, either with humid or dry Vaporation, may be collected from what has been ſaid in the foregoing Chapters, in other the like Caſes, *&c.*

15. By the vertical Section, Fig. 8. Plate 2. the ſame Pneumatick Machine, with that deſcrib'd in the foregoing Numbers, is again repreſented, with this Difference only, that the Perſon

in this latter Caſe is ſhewn receiving the Diſcipline and Exerciſe of the Machine in a ſtanding Poſture within the Receiver, whereas in the former Caſe he was repreſented ſitting therein, *&c.*

16. In Fig. 8. Plate 2, there is ſhewn another Diſpoſition and Application of the aforeſaid pneumatick Engine, which is after the following Manner; thus B B B B is the Barrel, joyn'd to the Receiver R R R R, within which, and down towards its Bottom is fix'd a tranſverſe Piece q q, upon which the Perſon is repreſented ſtanding upright, the lower Part of the Barrel and Receiver being fill'd with Water, cold or hot, as the Caſe requires the upper Surface of the Water in the Receiver and Barrel being at the prick'd Line w 1, when the Forcer F F is at its loweſt Situation in the Barrel, the upper Level of the Water in the Receiver will be at w 1, and all the Space from the Surface of the Water to the Top of the Receiver is fill'd with Air, upon the Cover R R of the Receiver is a Valve or ſliding Plate y, made to open and ſhut by a ſmall Spring, to let the Air into or out of the Receiver as there is Occaſion; upon the Bottom of the Barrel is ingrafted a Pipe U P V, one End whereof opens into the Barrel and has a Valve U fitted thereto withinſide of the Barrel, and opens upwards and inwards; the other End of this Pipe communicates with a Veſſel or Copper V V V V, fill'd with Water, cold or hot; ſo that upon raiſing the Forcer F F, to any Height in the Barrel, as F 2, F 3, F 4, F 5, *&c.* the Water will come in from the Veſſel V V V V, and puſhing open the Valve U, will fill all that Part of the Barrel underneath the Forcer, ſo that let the Forcer be rais'd to what Height ſoever in the Barrel, the Water will riſe along with it cloſe to its Underſide, and upon puſhing the Forcer downwards, the Water endeavouring to return the ſame Way it came in, will cauſe the Valve U to ſhut, whereupon it will become all puſh'd and forc'd into the Receiver, and will riſe up to different Heights therein, in proportion to the Heights from which the Forcer deſcends in the Barrel. Thus if the Forcer be rais'd up to the prick'd Line F 2, and from thence deſcends or makes a Stroke to F F, in that Caſe the Water may be made to riſe in the Receiver from the prick'd Line or Level w 1, to the Height or Level w 2, ſo as juſt to cover the Top of the Perſon's Head; ſuppoſe again that the Forcer is rais'd up to the ſeveral Heights F 3, F 4, F 5, *&c.* upon puſhing the ſame down from thoſe reſpective Heights, until it comes to the lowermoſt Poſition F F, the Water in the Receiver will be rais'd to the ſeveral correſponding proportional Heights w 3, w 4, w 5, *&c.* Now as the Water in the Receiver is rais'd above the Level w 1, to the other ſeveral Levels and Heights w 2, w 3, w 4, w 5, *&c.* the Air in the upper Part of the Receiver will be condens'd proportionally. In this Draught there is nothing ſhewn but the Barrel and Receiver, all the Timber Frame ſerving to fix and ſuſtain the ſame, with the Apparatus and Machinry ſerving to work the Engine being left out; all which with what farther relates to the underſtanding this Draught, may be collected by refering to the former Draughts and Numbers where the ſame have been deſcribed.

17. All Things being thus diſpos'd in the Manner before explain'd, now in order to apprehend rightly the Operation, Effects and Uſe of this Machine, let the Perſon be plac'd ſtanding upright with his Body naked in the Receiver, the upper Surface of the Water being at w 1, underneath the tranſverſe Piece q q upon which he ſtands, and let all the Space between the Surface of the Water, and Cover R R of the Receiver, be fill'd with common Air, the Forcer F F being now at the loweſt Situation in the Barrel; which being ſuppos'd, let the Forcer be rais'd up, ſuppoſe to the Height F 2, whereupon the vacant Space produc'd in the lower Part within the Barrel, by the riſing up of the Forcer, will become fill'd with Water from the Copper V V V V, by the Pipe V P U; let now the Forcer make a Stroke by deſcending from F 2 to F F, whereupon the Water underneath the Forcer will be all thrown into the Receiver, ſo that the Level of the Water which before ſtood at w 1, will become rais'd by this Stroke to the Level or Height w 2, ſo as juſt to cover the Crown of the Perſon's Head, and the Air in the upper Part of the Receiver above the Water, will be condens'd into half the Space it took up before, whereby an additional Preſſure of about 40,000 Pounds Weight will be laid upon the Perſon's Body, for as the Air in the Receiver is ſuppos'd by this Stroke of the Forcer, to be render'd twice as denſe as common Air, the ſame will preſs upon the Surface of the Water now at w 2, with the ſame Weight and Preſſure as a Column of Water about ſeventy perpendicular Feet, and having the Area of the Water at w 2 for its Baſe, ſo that the Perſon's Body in the Receiver, though but juſt barely covered with the Water, will nevertheleſs ſuſtain as great a Preſſure therefrom as if he was immerg'd to the Depth of 35 Feet under Water, and expos'd only to the external Air; by which additional Preſſure the Perſon's Body will undergo an univerſal Syſtole or Contraction of all its Dimenſions, from the external Surface inwards to its Axis; the Quantity of which Contraction may be repreſented by the prick'd Line, ſerving to mark the Contour or Boundaries of the humane Body, as expreſs'd by the little Picture or Image in the Draught. Having ſhewn what Effects will be produc'd by the condenſing Stroke, I ſhall next conſider how the Perſon's Body will be influenc'd and affected upon making the rarifying Stroke, or raiſing the Forcer up until it comes to the ſame Height F 2, from whence it deſcended; upon doing which the following Phænomena and Effects will be produc'd; the Air in the Receiver that was condens'd by the preceding Stroke into the Space R R w 2, will now become expanded into the Space n n w 1, which being ſuppos'd twice as big as the other Space into which it was condens'd, conſequently the Air will be render'd twice as rare, and the Perſon's Body that was but juſt before ſubmitted to an additional Preſſure of 40,000 Pounds, or that of a double Atmoſphere; or as if he was immerg'd thirty-five Feet under Water in the open

Air,

Air, will now have that whole additional Preſſure entirely taken off his Body, which will thereupon by the reſtitutive Force and Reſort of the Solids be made for to undergo a general Diaſtole or Expanſion, from the Center outwards to the Surface of the Body, which will thereupon have its Dimenſions every where enlarg'd; which increas'd State or Dimenſions of his Body may be expreſs'd by the outermoſt real Line, in the little Image or Picture of the humane Body in the Draught; and the Space between the outer real Line and the inner prick'd Line parallel thereto, (which ſerve to determine the Contour or Limits of the Body) ſhews the Quantity of the Contraction and Dilatation which the Body will be made to undergo alternately and ſucceſſively by each condenſing and rarifying Stroke of the Forcer. Suppoſe now again the Forcer to be rais'd to the ſeveral reſpective Heights marked F 2, F 3, F 4, F 5, *&c.* and to make a Stroke by deſcending from any of thoſe ſeveral Heights, until it comes to the loweſt Situation F F, upon doing which the Water will be rais'd in the Receiver to the ſeveral correſponding proportional Heights, W 2, W 3, W 4, W 5, *&c.* and the Air in the upper Part of the Receiver be render'd two, three, four, five, *&c.* Times denſer than common Air; whereby the Perſon in the Receiver may have an additional Preſſure alternately laid on, and taken off his Body, equal to that of a double, triple, quadruple, quintuple, *&c.* Atmoſphere; or as if he was immerg'd to the Depth of 35, 70, 105, 140, *&c.* Feet under Water in the open external Air. And after this Manner the condenſing and rarifying Strokes may be made with all Degrees of Force and Preſſure requir'd, by raiſing the Forcer higher or lower, or by making the Strokes longer or ſhorter, ſo that the Perſon may not only be ſubjected to the Preſſure of a double, triple, *&c.* Atmoſphere, but to all the intermediate Degrees of Preſſure between that of a double or triple, *&c.* Atmoſphere. And the Strokes both for condenſing and rarifying the Air may be made with all Degrees of Celerity, and with any Space of Time between the Strokes, as has been explain'd in the preceding Numbers, all the Difference being, that in the former Draughts of this Machine, the Air alone was the Medium and Inſtrument made uſe of for communicating Motion, Exerciſe and Preſſure to the Body, but in this Draught of the Machine the Perſon has this Motion, Exerciſe and Preſſure communicated and alternately impreſs'd upon his Body by means of Air and Water together. And moreover the Water may be made to riſe to different Heights about his Body, either as high up as his Neck, Breaſt, Loins, *&c.* juſt as the Caſe and Intention indicates; and when the Perſon's Body is not wholly immerg'd, but only in part in the Water, yet ſtill that Part that is only preſs'd upon by the Air, will be very differently affected to what it would be in the common Practice of Bathing; for as the Air in the Receiver is condens'd, the Caſe will be different between a Perſon's ſtanding in the Water up to his Neck in the Receiver, to what it would be upon his ſtanding with the Water to the ſame Height about his Body in the external Air. Moreover by having the Copper V V V V made to communicate with the Barrel, and Receiver by the Pipe V P, the Receiver may be ſupplied either with cold or hot Water in all Degrees; as alſo with Vapours or Effluvia either humid or dry, with which the Air in the Receiver may be variouſly impregnated and medicated in all Degrees, as may beſt contribute to promote the ſeveral Intentions, as has been more particularly explain'd in the foregoing Chapters.

18. This new mechanical Method of exerciſing or communicating Motion to the humane Body, by laying on an additional variable Preſſure of any aſſign'd Quantity thereupon, and taking the ſame off again alternately, by means of Air and Water jointly together, will be found of extraordinary Efficacy and Benefit, and will prove more ſucceſsful in ſome particular Caſes, than performing the ſame Effects and Intentions with Air alone; and particularly in the Caſe and Cure of the Bite of a mad Dog, or any other Animal, with its laſt and moſt fatal Period and Symptom the Hydrophobia; for in this particular Caſe by uſing of Water together with the Air, there will be this ſingular Advantage obtain'd, over and above the Effects produc'd from Preſſure alone, and that is the Effect caus'd and reſulting from a twofold Stimulus, one whereof is produc'd from the Coldneſs of the Water, which every Time it is rais'd up by the condenſing Stroke about the Perſon's Body, muſt cauſe a diſagreeable Stimulus or uneaſy Senſation, which together with the additional Preſſure, will produce a proportionally greater Contraction of all Parts of the Body from the Surface inwards to the Center, than what it would have been from the Preſſure alone without the joint Action of the Stimulus; and again every Time the Water is taken off the Perſon's Body, (as it will upon every rarifying Stroke) there will be a proportionally greater Expanſion produc'd of all the Parts from the Center outwards to the Surface of the Body, not only from the additional Preſſure being taken off the Body, but from the Stimulation caus'd by the Coldneſs of the Water, being alſo taken away at the ſame Time. And there is moreover in this Caſe another Stimulus obtain'd from this Method of applying the Machine, and that is by cauſing both the condenſing and rarifying Strokes to be made to follow each other quickly, and with great Celerity, Preſſure and Force, whereby the Perſon may be laid all under Water unexpectedly and of a ſudden, the Water being made to riſe over his whole Body in an Inſtant of Time before that he is aware, now this ſudden unexpected Immerſion, attended with great Preſſure, will produce a Surprize, which will likewiſe operate as a Stimulus, which being join'd to the other Stimulus ariſing from the Coldneſs of the Water, together with the great additional Preſſure; all which three diſtinct Cauſes co-operating jointly together, with one Tendency and Direction, will produce ſtill a greater Contraction of all Parts of the Body from the Surface inwards to its Axis, than what the two firſt

Cauſes

Cauſes alone would have done; and again upon the contrary, upon taking the ſame off the Body, it will undergo a proportional greater Expanſion from the Axis outwards to the Surface. Now as both the condenſing and rarefying Strokes may be made with all Degrees of Preſſure and Velocity, in ſuch wiſe that the Perſon may be ſubjected to as great an additional Preſſure as if he was immerg'd to the Depth of one, two, three, four or five hundred Feet or more under Water, and that laid on, and taken off his Body alternately, and in an Inſtant of Time, ſo that by the quick Repetition of thoſe Strokes, accompany'd with ſuch Force and Preſſure, together with the Operation of a twofold Stimulus, thus alternately, quickly, and ſucceſſively apply'd to the Body, the ſame will become thereby throughly and moſt perfectly exerciſed in all its Parts both Solids and Fluids, and by the great Quantity of Motion thus impreſs'd upon the Solids, the ſame will be thereby enabled to ſubdue the animal Poiſon, and expel the ſame out of the Body; upon all which Accounts this Method manifeſtly appears for to afford the moſt natural, efficacious, rational Principles, for the Cure of this moſt terrible Diſtemper, with all others retaining to the like rebellious Race and Diſpoſition.

19. By the Draught and vertical Section, Fig. 4. with the horizontal Section and Plan, Fig. 5. agreeing therewith, in Plate 2, another Method is propoſed for Conſtructing the Barrel BBBB, with the Apparatus and Machinery, for Condenſing the Air in the Receiver RRRR, which is after this Manner; BBBB is a cylindrical Barrel of Caſt Iron or Braſs, from three to five or ſix Feet in the Bore, and from one to three or four Feet in Height, which muſt be bored withinſide; upon each End of the Barrel is a broad Flanch, to which there is fixed with Screws a metallick Plate, one at Top, and the other at Bottom, ſo as to render the Barrel, Water and Air tight; AA is an Axis of caſt or hammer'd Iron, to the Middle whereof, and Lengthwiſe of the Axis, is fix'd a broad Plate FF, (which I ſhall name the Forcer) the outer Edge of this Forcer, as the Axis AA turns round within the Barrel, muſt move cloſe to the Side of the Barrel, and to make it fit and move the truer and cloſer, the Forcer may be arm'd with Leathers upon both Sides; ZX is a Plate fix'd vertically in the Barrel, one Edge whereof Z, is fix'd into a Channel or Groove form'd upon the Inſide of the Barrel, and its inner Edge X joins cloſe to the Side of the Axis AA, all that Part of the Axis within the Barrel, between the top and bottom Plates, is turn'd to a true Cylinder; RRRR, is the Receiver with the Perſon ſtanding upright therein, which Receiver is joyn'd to the Barrel by means of a Flanch with Screws, in like Manner as in the other Draughts of this Machine before deſcribed; upon the Cover RR of the Receiver is ſolder'd a Pipe yy, with two Cocks thereto, one withinſide, and the other withoutſide, which the Perſon may open or ſhut to let the Air into, or out of the Receiver, as he finds Occaſion; the Barrel BBBB, communicates with the Copper VVVV by a Pipe VPU, by which it is kept ſupply'd with Water, cold or hot, in all Degrees, as alſo with Steam or Vapours to be apply'd, as the Perſon's Caſe and Symptoms indicate: That Space within the Barrel between the Forcer and Receiver is always fill'd with Water, *&c.* ſuppoſe now the Forcer FF, to be in the Poſition as is ſhewn by the prick'd Line F2, (*Vide* Plan, Fig. 5.) and let the upper Surface of the Water in the Receiver be at W1, (*Vide* Section, Fig. 4.) if now the Axis AA, and Forcer FF, be made to turn round in the Barrel from the Poſition F2, until it comes into the Poſition F1, juſt to the Side of the Orifice, where the Barrel and Receiver communicate, which is the utmoſt Bounds beyond which the Forcer never moves, ſo that when the Forcer moves with a circular Motion from the Situation F2, to the Situation F1, it will force and diſcharge all the Water contain'd in that triangular cylindrical Segment F12F, into the Receiver, whereby the Water will become rais'd therein from the Level W1, to W2, ſo as juſt to cover the Crown of the Perſon's Head, and the Air in the upper Part of the Receiver be condens'd into half the Space which it occupy'd before, whereupon the Perſon will have an additional Preſſure laid upon him equal to about 40,000 Pounds. And again, upon cauſing the Axis and Forcer to move with an angular revers'd Motion the contrary Way, from the Situation F1, until it comes into the Situation F2, from which it laſt mov'd, upon doing which the following Phænomena and Effects will preſent; the compreſſing Force being now remov'd, the condens'd Air at Top of the Receiver upon dilating and unfolding its Spring will puſh the Water down from the Level W2, to W1, underneath the tranſverſe Piece qq, upon which the Perſon ſtands, and the Perſon's Body that was juſt the Inſtant before all cover'd with Water, will now be only encompaſs'd round with Air of the ſame Denſity with the external Air, and his Body that was but juſt before ſubjected to an additional Preſſure of about 40,000 Pounds Weight, will now have the ſame entirely taken off; and by repeating the like condenſing and rarefying Strokes, by cauſing the Forcer to move alternately with a circular revers'd Motion, from the Situation F2, to F1, and back again; the ſame additional Quantity of Preſſure may be laid on, and taken off the Body alternately for any Time requir'd; and the Strokes may be perform'd with all Degrees of Velocity, and with any Interval of Time between the Strokes; as has been ſhewn in the former Numbers. Now if it was requir'd to have a greater additional Preſſure laid upon the Body, as ſuppoſe that of a triple, quadruple, *&c.* Atmoſphere; in that Caſe the Axis with the Forcer FF, muſt begin to produce the condenſing and rarefying Strokes, by moving from the ſeveral Diviſions and Stations within the Barrel, mark'd, F2, F3, F4, F5, F6, *&c.* Thus, for Example, if the Forcer begins for to move or make the Stroke from F3, to F1, the Water in the Receiver will become puſh'd up from the Level W1

to w 3, and the Air above the Water be render'd three Times as denſe as common Air, whereby the Perſon will be ſubjected to a Preſſure equal to that of a triple Atmoſphere. If the Forcer begins to make the Stroke by moving between F 4, and F 1, the Water will be rais'd up from the Level w 1, to w 4, and the Air become condens'd into four times leſs Space than common Air, whereby the Perſon will be placed under a Preſſure equal to that of a quadruple Atmoſphere. And if the Forcer be made to move from F 5, to F 1, the Water in the Receiver will be rais'd from w 1, to w 5, when the Air will be render'd five times denſer than common Air, and the Perſon laid under a Preſſure equal to that of a quintuple Atmoſphere; and ſo for all other Diſtances, ſo that according to the Lengths of the Strokes, the Air will be condens'd and rarefied proportionally, and that in all Degrees and Quantities, as may ſerve beſt to advance and promote the Intentions of Cure propos'd thereby; and in order to know how to regulate and adjuſt the Machine, ſo as to lay on the juſt Quantity of Preſſure intended, the ſame is for this Purpoſe provided with a mercurial Gage Tube b b, the Uſe whereof has been explain'd before. The pneumatick Engine, as here repreſented, may be work'd by the Force of Men, *&c.* for which Purpoſe there is fix'd upon the upper End of the Axis A A, a Wheel w w with a ſquare Groove round its Circumference, wherein are fix'd the Ends of ſeveral Ropes w 1, w 2, w 3, w 4, *&c.* to each whereof may be apply'd any Number of Men requir'd; and in pulling the ſaid Ropes, the Men may do it either ſtanding or ſitting with their Bodies reclin'd backwards, according to which Method there may be any Number of Men apply'd for working the Machine, to the Number of a Thouſand. As to what relates to the Structure of the Barrel and Forcer, with the Method of applying the common auxiliary Powers thereto, having given a particular Deſcription thereof, with divers other new Machines, in another Treatiſe relating to Hydraulicks, muſt refer thereto for Brevity.

20. In the foregoing Draughts and Deſcription of this Machine or artificial Atmoſphere, the ſame has been conſider'd only as apply'd to the whole Body, which was underſtood to be entirely incloſed in the Receiver, I ſhall next ſhew how the mechanical Effects of the ſame pneumatick Machine may be alſo apply'd to any particular Region or Member of the Body, as ſuppoſe it to be either a Leg, Arm, *&c.* after what Manner this may be effected may be readily underſtood by referring to the two vertical Sections of the Machine, Fig. 3. and Fig. 6. in Plate 2. In the firſt Figure a Perſon is repreſented with his Thigh, Leg and Foot, incloſed within a proper Veſſel or Receiver R R R R, being thruſt through a round Hole in the Plate or Cover R R fix'd upon one End of the Receiver, which Hole may be arm'd with ſoft Leathers to keep the Perſon's Thigh from being hurt by the Edge of the Hole, and likewiſe to ſecure and keep the Hole cloſe ſtopt, ſo that no Air, Water, or Steam may paſs out between the Member, and the Edge of the Orifice. The Perſon thus ſitting or ſtanding with his Body in the open Air, and his Thigh and Leg within the pneumatick Mill, upon ſetting the Machine to work, the Strokes with the Forcer may be made ſo ſtrong and quick, and with ſuch a Quantity of Preſſure, that the Member will become as throughly work'd and exercis'd, like as a Piece of Cloth is manufactur'd in a Fulling Mill: v v v v is the Boyler or Copper for producing Vapours or Effluvia from Subſtances of all Kinds that are endow'd with any medicinal ſanative Qualities for anſwering curative Intentions, with which Exhalations and Effluvia the Air in the Receiver may be kept impregnated to all Degrees of Strength requir'd; the Air in the Receiver being thus properly prepar'd and medicated with the Steam and Vapours produc'd from Ingredients well choſen and ſuited to the Intentions of Cure, will prove very ſucceſsful in many obſtinate Diſtempers, ſuch as Tumors, Ulcers, either of the Inflammatory, Œdematous, Scorbutick, Strumous, Scrophulous, Dropſical, Venereal Kind, *&c.* by reaſon of the ſtrong, quick, frequent Vibrations, Tremors, Pulſations, and Stimulation that will become alternately and ſucceſſively, and for any Time requir'd, excited, kept up and maintain'd in the Member by the alternate repeated Strokes of the Machine, whereby the oppreſs'd, languid, tonick Motion of the Solids will become reſtor'd, and the viſcid, ſizy, corrupt, ſtagnant Humours broken, attenuated and diſſolv'd, and thereby fitted either for Suppuration, or to be thrown out by Tranſpiration, or reſumed into the Veſſels in the Courſe of Circulation, *&c.*

21. By the other Section and Draught, Fig. 6. of Plate 2. which preſents a poſterior View of a Perſon ſitting with his Body in the open Air or Atmoſphere, and having his whole Arm incloſed in the artificial Atmoſphere within the Receiver R R R R; the Member being thruſt in through a Hole in the Plate or Cover R R, fix'd upon the End of the Receiver, which Hole muſt be guarded round with ſoft Cloths or Leather, to defend the Arm from being incommoded, and to ſecure the Junctures, ſo as to let no Air paſs out or in between the Perſon's Arm and the Edge of the Hole. What farther relates to the Conſtruction, Uſe and Application of this Draught of the Machine, may be deduced by referring to the preceeding Numbers.

22. Now in what Manner the other Parts and Regions of the Body may be made to receive the Benefit of this moſt ſalutary Method of Exerciſe, may be readily underſtood from what has been ſaid: Thus ſuppoſe that either the upper Region of the Body from the Loins upwards, was requir'd to be ſubmitted to this new mechanical Exerciſe and Diſcipline; or the lower Region from the Loins downwards. How the former of thoſe two Caſes may be executed may be readily conceiv'd, (without the Neceſſity of having particular Draughts for that Purpoſe) making proper Allowances, by referring to the Draught, Fig. 6. Plate 1. by conceiving the Veſſel B B B B, to be in this Caſe the Receiver, none of the other Parts of the Machine being here repreſented.

And as to the Manner how the ſecond Caſe is to be effected, the ſame may alſo with proper Allowances be underſtood by the other Draught and Section, Fig. 7. in Plate 1. wherein BBBB repreſents the Receiver with the lower Region of the Body inclos'd therein; no other Parts of the Machine being exhibited in this Draught, it being originally deſign'd for another Purpoſe, and is only here referr'd to, to avoid multiplying the Draughts, *&c.*

23. That the new Mechanical Methods deſcrib'd in this Chapter, for Preſerving Heath, and the Cure of Diſeaſes, are founded upon juſt, true, and rational Principles, and muſt be accompany'd with all the ſalutary Effects that have been aſcrib'd thereto, requires no further Proof or Demonſtration, than that of their proceeding upon the ſame Principles, and being perfectly conformable to the eſtabliſh'd Order and Methods which Nature takes for obtaining the ſame two General Ends; both in the Animal, and Vegetable World, *&c.*

CHAP. V.

Contains ſome general Remarks upon the mechanical Effects of the Air, when excited and put into a tremulous, oſcillatory, vibrative Motion, by ſome ſtrongly ſonorous Bodies or Inſtruments; wherein ſome general Principles are deſcrib'd for conſtructing of a Sounding or Phonick Machine, with the ſurprizing Effects and Alterations that may be produc'd in the animal Solids and Fluids, by the Air when thus modefied, and put into ſuch a particular State and Law of Motion, and being properly collected, apply'd, and made to operate upon the humane Body, either univerſally, or only partially and topically; in ſuch wiſe as to become one of the moſt efficacious univerſal Kinds of Exerciſe for Preſerving Health, as well as a moſt ſovereign Remedy for the Cure of Diſeaſes, &c.

1. I Have already ſhewn the Air to be the great univerſal Principle and Inſtrument of Nature, by the ever variable Influence and Effects whereof upon animal Bodies, whatever relates to their Life, Health and Diſeaſes, is in a Manner wholly regulated; and to anſwer thoſe important Ends and Purpoſes, the ſame is endow'd with all the neceſſary mechanical Properties and Qualities, that any other Medicines or Remedies have, and in a more perfect eminent Manner, as Fluidity, Gravity, Elaſticity, Preſſure, Heat, Cold, Humidity, Dryneſs, Motion, *&c.* in what Manner thoſe ſeveral Properties and Qualities of the Air may be apply'd, and made to operate upon the humane Body, either ſingly, or combin'd, in all Degrees, Quantities, and Proportions, with a View either to preſerve Health, or for the Cure of Diſeaſes, may be found deſcrib'd in the foregoing and following Parts of this Treatiſe.

2. I come now in this Place briefly to conſider that Property which the Air has in common with all other Bodies, namely, its Motion; and that ſo far only as it relates to and affects the humane Body: The Air then we may conſider as ſubject to a twofold Kind of Motion, by the firſt whereof the Air becomes mov'd with a rectilinear Motion, being carried in a Stream or Current directed towards ſome Point of the Horizon, as when it happens to be agitated by Winds; by which Motion, the ſame numerical individual Quantity of Air becomes really tranſlated ſucceſſively from one abſolute Place or Part of infinite Space, into another. Or, ſecondly, the ſame numerical individual Portion of Air being confin'd, as ſuppoſe in a large Veſſel, or cloſe Room, ſo as none of the ſaid Quantity of Air can get out; if within ſuch a cloſe confin'd Veſſel or Room, any ſtrongly ſonorous Bodies or Inſtruments, ſuch as ſeveral Drums were ſet a Beating, or ſeveral large Bells to Ringing, or a Number of Men employ'd with large Sledges or Hammers (after the Manner of the Copper or Anchor Smiths) for to beat either upon a large Copper Veſſel, or upon a Number of Bells properly ſuſpended; in which Caſe this confin'd Quantity of Air, without ever changing its abſolute Place or numerical Space, will become nevertheleſs ſtrongly mov'd and agitated in all its Parts, and that with a moſt quick, ſtrong, vibrating, tremulous, undulatory Motion, in ſuch wiſe that a Perſon being incloſed within ſuch an artificial aerial Vortex, agitated by the quick, ſtrong, reciprocal Pulſations, of the ſonorous Waves or Rays, iſſuing and returning alternately and ſucceſſively to, and from the ſonorous Bodies; will find himſelf very differently affected from what he would be by being in the open Air, ſuppoſing it to move with all the Velocity that it is obſerved to have in the higheſt Winds, by which rectilinear Motion, the Air or Wind only daſhes and impinges but againſt one half of the Perſon's Body, the other half of his Body being becalm'd or ſurrounded with an Eddy or Kind of Vortex; but in the other Caſe the Air being cloſely confin'd, the quick ſtrong Vibrations and Oſcillations that are communicated thereto, become reflected and reciprocated backwards and forwards ſucceſſively, ſo as to impinge and ſtrike againſt all Parts of the Perſon's Body equally alike; whereby the Perſon's whole Body, both Solids and Fluids, in all Parts from the Surface to the Centre or Axis, will become ſubject to a like univerſal, tremulous, oſcillatory Motion, by which extremely quick, ſucceſſive, ſmart Vibrations or Syſtoles and Diaſtoles, thus alternately excited and continued in the animal Solids, they will be thereby enabled to comminute, mix, and aſſimulate the

the compounding Principles of the Blood perfectly together, and thereby render it fitter for the Offices of Circulation, Secretion, Nutrition, &c. and the ſame will ſerve like to an univerſal Menſtruum or Ferment to diſſolve the Texture of the Blood when too ſizy and coheſive, and thereby remove and prevent Obſtructions throughout the ſeveral Series of Veſſels and Glands; and moreover the Solids by thoſe quick ſtrong Vibrations communicated thereto by the Air thus modefied and modulated in its Motion, will become thereby enabled to expel, ſhake and throw off any extraneous noxious Bodies, that may have inſinuated themſelves into their Pores and Interſtices, and thereby obſtructing their natural tonick Motions, and deſtroying their Spring and Reſort, &c.

3. Now ſuch an artificial reſounding Air-Room or Phonick-Chamber, may be conſtructed with many Contrivances to augment and heighten the Effect and Motion of the Air upon the Perſon's Body, and for this Purpoſe the Ceiling at Top of the Room may be conſtructed in the Form either of an eliptical, parabolical, or hyperbolical Cupelo or Dome, ſo that the Perſon being plac'd in the Focus of this concave Arch or Vault, all the ſonorous aerial Rays or Waves will be reflected therefrom, and made to converge to the Focus, and become ſtrongly collected, directed and impreſs'd upon the Perſon's Body. And in order ſtill further to magnify and heighten the Effect of this Motion of the Air upon the Perſon's Body, the Sides of this reſounding Air-Veſſel, Room or Chamber, may be form'd with ſeveral Concave Niches or Arches, either ſpherical, parabolical, &c. having all one common Focus with the concave parabolical Cupelo at Top of the Room or Veſſel, whereby the ſonorous Rays reflected from all thoſe ſeveral concave Vaults, being all collected into one common Focus, will form a mighty ſtrong Kind of aerial Vortex or Whirlpool, variouſly agitated, reciprocated, and made to impinge and reflect alternately, and with great Celerity againſt the Perſon's Body. Moreover the Effect following from this tremulous pulſatil Motion communicated firſt to the Air, and by that to the Perſon's Body, may be increas'd, accumulated, and augmented ſtill further, by ſuppoſing the Perſon's Body to be incloſed within a Veſſel or Receiver ſuch as RRRR, (*Vide* Fig. 9. Plate 2. with the Plan, Fig. 10. correſponding thereto) and have the Air condens'd about his Body, which Receiver ſuppoſe to communicate with ſeveral large ſonorous Veſſels of Copper or Braſs, ſuch as BBBB, BBBB, &c. by means of the Pipes CD, CD, &c. if now ſeveral Perſons are employ'd and ſet to work for to ſtrike ſucceſſively and orderly with great Sledges or Hammers upon the Receiver, with the ſeveral Veſſels communicating therewith, after the Manner of the Copper or Anchor Smiths, in that Caſe the Air in the ſeveral Veſſels BBB, &c. being put into a violent ſmart vibratory Motion, the like Motion will be communicated to the Air ſurrounding the Perſon's Body in the Receiver, which will become thereby ſubjected to a Series of ſmart quick reciprocal Pulſations, or univerſal Syſtoles and Diaſtoles, and thereby receive all the Advantages ariſing from this new mechanical Method of exerciſing the Body by communicating a new additional Quantity of Motion thereunto; which will prove of very extenſive Benefit and Efficacy, conſider'd either as it will afford the moſt natural, perfect, univerſal Kind of Exerciſe, as it may be apply'd to all Sorts of Perſons, even the moſt antient and infirm, &c. who can take the Benefit of no other Exerciſe whatever; and moreover this Method of exerciſing or communicating Motion to the animal Solids and Fluids, will ſerve as the moſt univerſal ſovereign Remedy for the Cure of many Diſeaſes; that it muſt be attended with both thoſe ſalutary Effects is abundantly plain and demonſtrable from the Laws relating to the Communication of Motion, Percuſſion, Impulſe, Harmony, and the humane Mechaniſm, &c. That the animal Solids muſt receive great Benefit hereby is evident, for by the quick, ſtrong, alternate Vibrations that will become produc'd and kept up therein for any proper reaſonable Time, ſuch Parts as are no longer fit to be retain'd in their Texture and Compoſition, as being either worn out, or being in their own Nature incompatible and unaſſimulable with the Structure of the animal Fibres and Solids, will become thereby diſengag'd, ſeperated and caſt out, and thereby Room made for the Introduction and Attraction of other Particles more homogeneous and of a ſimilar Nature and Compoſition with the animal Fibres; from whence will follow a perfect healthful Nutrition and Reparation of the Solids; and as the Solids will be greatly benefited and ſtrengthned by this moſt ſalutary Exerciſe, the Fluids muſt alſo by neceſſary Conſequence have their Texture, Craſis and Temperament greatly mended and improved thereby, by having their Lentor diſſolv'd, and render'd more fluxil and paſſable through the ſeveral Series of Veſſels and Glands, and thereby ſerve for curing Obſtructions in all Parts, with Tumors, Atrophies, Conſumptions, Aſthmas, Dropſies, Cahexies, Agues, relax'd Nerves, &c.

4. Moreover, not only the whole Body, but every particular Region and Member thereof, may be made ſeperately and independently by itſelf alone, to receive the mechanical Effects of the Air when thus modified and put into ſuch a tremulous undulatory Motion. Now this moſt uſeful Problem of communicating Exerciſe, by means of a new additional vibrative Motion, to every Part and Member ſeperately and by itſelf alone, without ſubjecting the whole Body thereto at the ſame Time, may be ſolv'd and effected, by having a proper Veſſel or Receiver fitted to the Part or Member; thus ſuppoſe it to be the Breaſt of a Perſon affected with a Tumor, &c. for that Purpoſe let a proper Receiver be provided, ſuch as abnn, *Vide* Fig. 11. Plate 3. with an Oriſice capable to receive within it the whole tumified Breaſt b, round the Mouth of which Receiver (a ſeperate View whereof is ſhewn by Fig. 16.) muſt be form'd a ſmooth flat Ring, which may be cover'd with ſoft Leather, to make it ſit both eaſy and cloſe upon the Part; the Receiver being

being apply'd to the Breaſt, and kept faſt on either with the Perſon's own Hand, or an Aſſiſtant, or with Bandage; let the Cock of the Pipe z p be ſet open, and the End z, of the Pipe be join'd to the End x, of the Pipe x p, of the ſingle Braſs or Copper Veſſel b b b (or of the compound Veſſel repreſented by Fig. 9. and 10. Plate 2.) which may be alſo a Drum, Bell, or any other ſtrongly ſonorous Body: If now either the Perſon himſelf, or an Aſſiſtant, or more Hands, when there is Occaſion, be employ'd and ſet to Work with large Hammers or Sledges, for to beat orderly and ſucceſſively upon this ſonorous Body b b b, the Air therein will be put into a violent, tremulous, vibratory Motion; which Motion will be communicated to the Air in the Receiver by the Pipe z p, and the Air in the Receiver will communicate and impreſs the like ſmart, undulating, pulſatile Motion to the whole Syſtem of Veſſels contained in the Breaſt, with the Fluids therein; whereby the languid oppreſs'd Reſort and Spring of the Solids will be rouz'd up and excited to Action and Motion, and be thereby enabled to ſubdue, attenuate, and propel the inactive, ſtagnating, ſizy Fluids, and thereby diſpoſe and fit them, either for being reſum'd back into the Veſſels, or to be diſcuſs'd and breath'd out by the Application of warm Fomentations or Vapor-Baths, *&c.* or elſe for to bring the extravaſated Humours to a laudable Digeſtion and Suppuration.

5. And by having another ſuch like topical Machine or Receiver a b n n, adapted to the Penis, as is ſhewn by Fig. 10, that Member may be made to receive all the ſalutary Effects ariſing from this new mechanical Way of Exerciſe with the Air; which being apply'd with Judgment, and at proper Times, in the Progreſs of the Cure of the Diſorders incident to this Member, will contribute greatly to advance and expedite the Cure, by exciting ſuch an oſcillatory vibrating Motion in the Veſſels and Solids of this Part, which will thereby be put under a ſtrong Effort and Niſus, and enabled to ſhake off and expel the venereal ſaline Spiculæ adhering to them, and deſtroying their Elaſticity and tonick Motions, *&c.*

6. And by having ſuch like proper topical Receivers or Inſtruments made to fit to all the Regions and Parts of the Body (as may be underſtood by the Draughts, Fig. 6, 7, 8, and 9, of Plate 1. by ſuppoſing the Receivers b b b b, apply'd to this ſonorous Machine) they may be all made to receive the like Benefit of this moſt perfect Kind of Exerciſe from the Air, which is the natural Element to which the humane Body is committed and accuſtom'd from the firſt to the laſt Period of its Exiſtence; and the ſame appears to be intended chiefly for this End, of keeping the Bodies of Animals and Vegetables, in a continual but variable State of Motion and Exerciſe.

7. It is moreover propoſed, that this new Method of applying the Air thus modefy'd, with reſpect of its Motion, will alſo be of great Uſe when judiciouſly and ſeaſonably apply'd at proper Times, not only to promote and expedite the Cure of Tumors; but likewiſe of Wounds, Ulcers, Inflammations, Eruptions, Gangrenes, *&c.*

8. The humane Body being an Elaſtick vaſcular compreſſible Machine, upon its being plac'd in the compound Focus of ſuch an artificial Atmoſphere or aërial Vortex, thus ſtrongly agitated on all Sides by the ſonorous Rays or Waves reflected from ſeveral parabolical or hyperbolical Vaults, muſt have all its Parts, both Solids and Fluids, ſubject to the like univerſal, tremulous undulatory Motion of Syſtole and Diaſtole, beginning at its Circumference, and propagated inwards to its very Center or Axis, from whence the Motion becomes again reflected outwardly from the Axis to the Surface of the Body; and thus the whole animal Syſtem will continue to oſcilate and vibrate, or contract and expand ſucceſſively, and with great Velocity, during the Time it is ſubject to this Exerciſe or Motion of the Air, with which it will keep exact Time, like to two uniſon Chords or Inſtruments: That this muſt be the Caſe and Effect is demonſtrable from the Laws relating to the Communication of Motion, and the animal Solids being all eminently elaſtick. Now that the mechanical Effects produced by ſuch ſtrong, quick, vibrating Pulſations impreſs'd upon the whole animal Syſtem, muſt be very great and ſurprizing, is abundantly manifeſt from the Laws of the animal Œconomy; foraſmuch as it has already been obſerv'd in the Introduction, *&c.* that whatever Changes are wanted or intended to be produced in the Body, either with a View to eſtabliſh Health, or for the Cure of Diſeaſes, can be effected no other Ways, than by adding or ſubſtracting Motion, either to, or from the whole Body; or to, and from its Parts; and the real Effects and Operation of all Medicines and Means of healing, conſiſt wholly in the Quantity of Motion which they are capable for to add or ſubſtract either to, or from the whole Body, or its ſeveral Parts; and in regulating the Direction and Diſtribution of this Motion. This being the Caſe, the Air then thus apply'd, will become the moſt univerſal of all Remedies, as well as the moſt ſafe, certain, and efficacious, as we can by means thereof impreſs what Quantity of Motion we pleaſe, either upon the whole Body, or its ſeveral Parts, and likewiſe for to regulate its Direction. Now this Method of applying the Air thus modefy'd, with reſpect to its Motion, operates and produces its Effects upon the Body by much the ſame mechanical Principles as that of Friction with a Fleſh-Bruſh, or rubbing with the Hand, or a Cloth; which is found to be of great Uſe and Efficacy in many Caſes, for to ſollicit and excite the languid oppreſs'd Solids, by cauſing their little Machinulæ or Springs to be frequently and gently bent by rubbing; whereby they recover their natural Elaſticity and tonick Motions, and ſo be-

come enabled to ſubdue and overcome the Incumbrances laid upon them, from the ſluggiſh Diſpoſition of the Fluids.

9. But to bring the Compariſon and Parallel ſtill nigher, and to demonſtrate that the new mechanical Method of applying the Air thus modefy'd, with reſpect of its Motion, to the humane Body, in the Manner here deſcribed, muſt neceſſarily produce the ſalutary Effects and Changes as has been alledg'd, I ſhall for that Reaſon conſider it in another View and Light; and that is, as it is really and properly a Species and Kind of Muſick or Harmony, only of the ſtrongeſt, coarſeſt, harſheſt Sort; and whereas common Muſick is adapted chiefly to excite proper harmonious Motions upon the auditory Organs, ſo this new mechanical Kind of Muſick is intended to be raiſed to ſuch a Pitch and Degree of Strength, as to become ſenſibly felt throughout the whole Body (in which Caſe ſhould it prove too ſtrong for the Ear, the ſame may be ſecured from its Effects, by having a proper Glaſs Veſſel or Receiver fitted to cover the ſame) ſo that this by Way of Diſtinction may be named, a Kind of mechanical Muſick; being deſigned for producing harmonical Motions or Vibrations throughout the whole Body or nervous Syſtem, in Oppoſition to the other Sort, which is deſigned only to pleaſe the Ear. This being the Caſe, conſequently the Effects which this new Sort of mechanical Muſick will have upon the whole animal Machine, will be analogous and ſimilar with thoſe of common Muſick, only differing in Degrees, the Effects in both Caſes proceeding from the ſame Cauſe, namely, the Motion of the Air differently modefy'd, and made for to operate with different Forces upon the nervous Syſtem. And whereas Muſick is obſerv'd to have a general good Effect upon Mankind, by exciting, inſpiring, and rouzing up the Powers and Faculties both of the Body and Mind, to a more exalted, perfect Pitch and Diſpoſition for acting in general, in which Reſpect Muſick may really and properly be conſider'd as a Kind of univerſal Medicine or Exerciſe, both to the Body and Mind; and this its Efficacy is owing wholly to the harmonious Motions, Vibrations, and tremulous Pulſations, thereby communicated to the elaſtick Solids and Nerves, but chiefly thoſe miniſtring to the auditory Organs, by which they become convey'd and propagated to their original or common Senſorium in the Brain. Of the mighty Effects of Muſick, Hiſtory (both ſacred and prophane) furniſhes many Examples, among which I think none more famous and ſurprizing than the remarkable Inſtance and Caſe of the Tarantula, of which extraordinary Phænomenon, we have the moſt perfect Account and Solution given by the learned Dr. *Mead*, in his Treatiſe upon the mechanical Effects of animal Poiſons.

10. The humane Body, conſiſting of a Syſtem of Solids eminently elaſtick, like to a moſt finiſh'd exquiſite ſtring'd muſical Inſtrument, the Chords whereof being duly tenſe and ſtretch'd, become extreamly ſuſceptible of Motion from the leaſt Impreſſions of external Objects; in ſuch wiſe, that the ſmalleſt Sound or Motion of the Air cauſes the whole humane Frame and animal Syſtem to vibrate inwards and outwards, from its Circumference to its very Center or Axis; and as the Degrees of Elaſticity, Stricture, and Tenſion of the animal Solids, are different in every individual Perſon, and in the ſame Perſon at different Times; from whence we become furniſhed with the beſt Reaſon of accounting mechanically for the different Idioſyncraſys, Temperaments, Antipathies, Paſſions, *&c.* with the different Effects which Muſick or Sound, *&c.* muſt have upon different Perſons, as well as upon the ſame Perſon at different Times; which Diverſity of Effects depends altogether upon the Tenſion and Stricture of the animal Solids, which admits of infinite Degrees in the ſeveral Individuals, and great Variety and Difference in the ſame Individual at different Times. And from hence it is manifeſt, that Sound or the Air, when put into a tremulous Motion, will have as different Effects upon different Perſons, as alſo upon the ſame Perſon at different Times, either for preſerving their Health, or the Cure of Diſeaſes, as any other Kind of Means or Medicines, whether Emeticks, Catharticks, Diureticks, Sudorificks, Walking, Riding, Bathing, or any other Kind of Exerciſe, *&c.* For as the ſame Kind and Quantity of any Medicine or Exerciſe, *&c.* will not ſuit all Perſons alike, ſo neither will the ſame Kind and Degree of Sound or Muſick produce an equal Effect upon all Perſons alike. Now the ſalutary Effects of Muſick or Sound hath hitherto been attributed to its Influence and Operation upon the auditory Organs and Nerves only; this however I think too reſtrain'd and limited a Way of accounting for its Operation and Effects, foraſmuch as the whole nervous Syſtem, and by Conſequence the whole animal Machine, both Solids and Fluids, muſt become very ſenſibly and really mov'd and affected thereby. Now after what Manner the Body will become affected by the Air when put into ſuch a vibrative Motion, and apply'd by a proper Machine either to the whole Body, or ſome of its Parts only, may be underſtood by viewing the Draught, Fig. 9. Plate 2. whereby is ſhewn the Picture or Section of a humane Body, incloſed within ſuch a phonick, ſonorous Machine, as before deſcribed; the external Surface of the Body being defin'd by two concentrick parallel Lines, the outermoſt whereof being one real continued compound Line, but the innermoſt is a prick'd or diſcontinued Line, the Interval or Space between which two Lines, ſerves to repreſent the univerſal Vibrations, Tremors, and Pulſations, which the whole Body will be ſubject to during the Time of its being incloſed in the Machine; the Quantity and Velocity of which Vibrations thus excited in the Body, will be in Proportion to the Intenſity of the Sound, and the Degrees of Tenſion in the animal Solids for that Time, *&c.*

11. We

11. We are moreover furniſhed with another common remarkable Inſtance and Proof of the great Influence and Effects of the Air, when apply'd according to the Principles of this new Method, and becomes directed and made to act with alternate, quick, ſucceſſive Strokes and Impulſes upon Bodies; for it is by a like Mechaniſm that the Air operates in the Production and Continuation of artificial Fires, ſuch as are fed and nouriſhed with a proper Pabulum; now there is nothing more required to the Generation and Conſervation of artificial Fires, than to collect and concentrate elementary Fire, which is diffuſed equally throughout all Spaces and Places, by giving a new Direction thereto, either by Attrition or Attraction, as with a Burning-Glaſs, &c. by which it receives a new Determination and Refraction, and made to converge to a Focus, where the Rays being condens'd and congregated, and being ſupply'd with proper Matter or Fuel, a viſible Fire will be thereupon generated and produced; about which newly produced Fire, the Air immediately forming a concave ſpherical Mould Furnace or Vault, cloſely embraces and compreſſes the ſame all around; which aerial elaſtick Mould is kept continually vibrating inwards and outwards, by its own Weight and Elaſticity, and the contrary repelling Force of the Fire, endeavouring to fly off and make its Eſcape: Now this elaſtick Air-Mould or Vault, by its continual Vibrations, or Syſtoles and Diaſtoles, ſerves for to break, divide, comminute and mix the Particles that are already ignified and ſaturated with the elementary Fire, with the other freſh Particles of the Fuel that are not yet actually laid hold of by the Fire, or as yet but beginning to be ignified; whereby the Fire thus once begun, becomes ſupply'd with freſh Particles from the next Parts of the Fuel, which are continually protruded and thruſt in by the alternate Vibrations of the Air ſurrounding the ſame; much after the ſame Manner as the Blood is kept mix'd with the Chyle, by the alternate Vibrations or Syſtoles and Diaſtoles of the Lungs, this aerial Mould being to be conſider'd to operate upon the Fire, in a Manner analogous to what the Lungs do upon the Blood. So that this vibrating Motion, Oſcillation, and Preſſure of the Air, becomes equally and for the very ſame Reaſons, neceſſary to the Production and Conſervation of artificial Fire, as it is to the Life of Animals and Vegetables; and that from the ſame Principles and Mechaniſm. And ſuch Parts of the Fuel, out of which the Fire has extracted what is fit for its Support and Nouriſhment, either precipitate in Form of Aſhes, or aſcend in Smoak, being carry'd up into the Air, which ſerves alſo at the ſame Time as an exhaling Medium thereto, and when the Fuel is all conſumed, the elementary Fire becomes diffus'd equally every where as before, without the leaſt Diminution, and only diſappears until it becomes excited and brought into Action by ſome proper Cauſe determining it thereto, &c.

12. As the Methods deſcrib'd in this Chapter for preſerving Health, and the Cure of Diſeaſes, depends upon the Communication of a tremulous Motion, either to the whole Syſtem of the animal Solids and Fluids, or only to ſome particular Region or Member of the Body, by means of the Air being firſt put under ſuch a particular State and Law of Motion, and made to communicate the like tremulous vibrative Motion to the humane Body; which being a compreſſible vaſcular Machine, and eminently elaſtick, becomes very ſuſceptive and retentive of this particular Kind of Motion: Now all Motion may be diſtinguiſhed under three general Diviſions, namely, rectilinear, curvelinear, and tremulous or vibratory. Bodies being affected either with the firſt or ſecond Kind of Motion, may be mov'd from one abſolute Space or Place to another, whilſt all the Parts and Particles of the ſaid Body are relatively at Reſt among themſelves; but when any Body becomes affected with the third Kind of Motion, each of the moſt minute Particles of the ſaid Body is continually changing its relative Place with Reſpect of the other compounding Particles, notwithſtanding the whole complex Body may at the ſame Time be ſuppoſed to occupy and remain in the ſame abſolute Place; or be mov'd either with a rectelinear or curvelinear Motion, from one Part of univerſal infinite Space to another. And however the Modus whereby Motion is produc'd and communicated, is as inexplicable as are the ſimple original Ideas produc'd in the Mind, from the Impreſſions of external Objects upon the Organs of Senſation, yet nothing is more certain than that there is ſuch a tremulous oſcillatory Motion and Agitation continually impreſs'd upon the whole univerſal Syſtem of Matter, and all material Beings; which tremulous reciprocal Motion may be conceived to bear the like Analogy and Relation to the general Syſtem of Matter, which the Soul or Principle of Life does to animal organiz'd Bodies; for as an animal Body without a Principle of Life can perform no Operations, ſo Matter without Motion can produce no Effects, but would for ever remain in a State of abſolute Reſt and Inactivity, without ever undergoing any Mutation or Change whatever; ſo that what Effects and Changes happen to Bodies, the ſame are all neceſſarily produc'd by Motion alone, of which they are no more than the Effects only; ſo that Motion is the principal Cauſe and Inſtrument whereby all the Alterations that happen to the Body are produc'd, it being impoſſible for any Body, or Syſtem of Bodies, to become any wiſe affected, chang'd, or alter'd for the better or worſe, but from ſome Quantity of Motion either impreſs'd thereupon, or deducted therefrom, let the Cauſe thereof be what it will, material or immaterial.

13. Now the general Cauſes and Inſtruments which God (the Firſt Cauſe and Author of all Motion and Being) makes uſe of for producing and communicating Motion, are the Powers of Gravity, or Attraction, and Repulſion, elementary Fire, Air, Elaſticity, Magnetiſm, &c. Thus

we find the Sun, that immenſe Body and intenſe Focus of concenterated elementary Fire or Light, by his continual ſtrong Vibrations and Impulſes upon the fluid Ether and Medium of Light, diffus'd every where throughout the viſible Univerſe, continually producing and propagating ſuch a tremulous vibrating Motion in all Bodies, which tremulous Motion ſerves as the univerſal Ferment, Spirit and Soul of Matter, whereby it is kept always diſpoſed to change, and to aſſume new Forms, tending either to the Accretion and Perfection, or Diſſolution and Corruption of Bodies; without which tremulous Motion, whereby Matter is kept in a continual Luctus and Fermentation, the ſame would otherwiſe coaleſce and become one unactive Maſs, unfit for the Generation and Production of any Beings, juſt in like Manner as the Earth would become barren and unfit for Vegetation, was it not kept by daily Labour, dug, plow'd, mix'd, mov'd, manur'd, and intimately agitated by the Solar Rays, *&c.*

14. I ſhall not here undertake to decide that famous and much controverted Queſtion, namely, whether there be the ſame Quantity of Motion at all Times exiſting in the material Univerſe, as ſome Philoſophers maintain; or whether Motion may, and is not deſtroy'd and generated, or produc'd *de Novo*, as others affirm; wherefore leaving this as a Point yet undecided, I ſhall proceed to obſerve only what we are certain to be real Matter of Fact, namely, That there is ſuch a tremulous Motion, more or leſs, continually impreſs'd upon and communicated to all Bodies within this Solar Syſtem, is certain, from the Propagation of Light, either from the Sun, or other ignefied luminous Body, which I humbly conceive to be effected by a conſtant, impulſive, vibratory Motion, impreſs'd either by the Sun, *&c.* upon the Fluid of Light, which conſiſting of Particles endow'd with the greateſt Subtilty and Elaſticity, ſerve to convey, tranſmit and propagate, the like vibrative tremulous Motion ſucceſſively, with incredible Velocity and a rectilinear Direction, to immenſe Diſtances: The Fluid of Light itſelf, or the Ether, being always equally diffuſed and exiſting the ſame in Quantity throughout the Syſtem, and this by Night as well as Day; but in order to bring it into Action or Motion, and to render its Effects ſenſible, there is required the Preſence of ſome Body actually luminous, or in which the Fluid of Light is really condens'd and concenterated in a much greater Quantity, than what it is in other Parts of the ſaid Fluid, the Degrees both of Light and Heat in Bodies, being wholly owing to the different Degrees and Quantities of Light or elementary Fire condens'd and accumulated therein; in like Manner as the Sun's Rays, when made to converge, and being collected into a Focus, become intenſely hot, luminous and viſible, only from their greater Denſity and Spiſſitude. For was that Hypotheſis true, which ſuppoſes Light to conſiſt in a real Efflux and Emanation of Particles thrown off and projected from the Body of the Sun, it would overthrow the Law of Gravity and univerſal Attraction of Matter, with all the Syſtems that have been grounded and built thereupon; for if the Sun be allow'd to attract, and retain all the Planets in their reſpective Orbits, and keep them from flying out of the ſame, which they would otherwiſe do by the centrifugal projectile Force, were it not for the centripetal Force of Gravity, whereby they conſtantly tend towards the Sun, conſequently by a much ſtronger Reaſon it follows, that no Parts nor Particles how ſubtile ſoever, can be thrown off or projected from the Body of the Sun, by reaſon that the Power of Gravity, whereby the Parts and Particles of the Sun's Body do mutually attract each other, is much greater than the centrifugal Force produc'd in the ſaid Particles from the Rotation of the Sun about his Axis, and which is the principal Reaſon that can be offer'd in Support of this Hypotheſis. Beſides the Sun's Body muſt have many Ages ago been wholly diſſipated and diſſolv'd upon this Suppoſition, that the Particles which compoſe the ſame are thus continually flying off in concentrick Surfaces and Lays, for to maintain and ſupply the Expences of Light and Heat throughout the Planetary Syſtem, *&c.*

15. Thus then we ſee that our Bodies are at all Times ſubject to ſuch a tremulous Motion, produc'd and kept up therein by the continual Action both of elementary Fire or Light, as alſo by calling in the Aid and Aſſiſtance of artificial culinary Fire, when the former alone is too weak and inſufficient for the above End. And moreover, the Air being an elaſtick Fluid, and evermore ſubject to ſuch a tremulous Motion from the Action of elementary Fire and Light, with that of ſonorous Bodies, the ſame ſerves likewiſe as another general Cauſe for impreſſing and communicating ſuch a tremulous Motion continually, more or leſs, to all animal, and other terreſtrial Bodies.

16. A tremulous Motion may be produc'd and propagated to immenſe Diſtances not only in fluid elaſtick Bodies, as is the Caſe in the Propagation of Light and Sound, but likewiſe in ſolid Bodies, that are continuous and elaſtick; thus, if one End of a Cord, or Wire, be ſtruck upon, there will be produced a Tremor throughout its whole Length, let the ſame be ever ſo long; and ſo ſmall a Stroke as that of the Beat of a Watch being apply'd to one End of a Piece of Timber, will be communicated and propagated through its whole Length, as is evident by its being ſenſibly heard by applying the Ear to the other End: Moreover the Effects of a tremulous Motion may be further obſerv'd in the Caſe of two Clocks, which being plac'd upon the ſame Floor, or againſt the ſame Wall, though at the Diſtance of a hundred Yards or more, may notwithſtanding affect each others Motion, by the Tremors and Pulſations communicated really, though imperceptibly, by the Movement of each Clock, to the Boards or Wainſcot, and by the elaſtick Fibres thereof become reciprocally propagated from one Clock to the other. Much

after

after the ſame Manner as two uniſon Chords of any two muſical Inſtruments, if one of them be made for to vibrate or play, the other will at the ſame Time be brought into Conſent, and become agitated with the like tremulous Motion, which Phænomenon and Effect can be accounted for from no other Principle, but that of a vibrative reciprocal Motion, produc'd by ſtriking the firſt Chord or String, and is from thence transferr'd to the ſecond, by means of the like vibrating oſcillatory Motion impreſs'd upon the Air, by the ſimilar Motion of the firſt String. And juſt in the ſame Manner the human Body conſiſting of a Contexture of Tubes and Solids, *&c.* greatly elaſtick, and endow'd with the moſt exquiſite Senſation, may be conſider'd as a moſt perfect muſical Inſtrument, which is ever more or leſs affected with ſuch a vibratory Motion throughout its whole Subſtance, from the Action of the general Cauſes aforementioned, and from the Action and Motion of every Body ſurrounding us; and by this Principle I think we may beſt account for thoſe ſingular Inſtances of Sympathy and Antipathy, which ſome Perſons have to certain Objects, and why Yawning becomes Catching, *&c.*

17. Moreover, moſt of the ſubtil ſurprizing Phænomena and Effects which we meet with in Nature, appear to be produced and to be the Effects only of ſuch a tremulous Motion, ſuch as are the Phænomena produced by rubbing of electrical Bodies, and thereby putting them into ſuch a vibrating Motion, and exciting them to Action, whereby they acquire a Power of Attracting and Repelling light Bodies. All which Effects relating to electrick Bodies, I humbly think may be adequately deduced and accounted for from the above Principles, without having Recourſe to any imaginary fictitious Fluid or Effluvia, that may be call'd ſpecifically and properly electrical, or to any Radiation or Emanation of Particles, properly ſuch, flowing from the electrical Body when excited to Action or Motion, and communicating the like Motion to Bodies at a Diſtance; foraſmuch as all thoſe Appearances may be accounted for from much more ſimple and obvious Cauſes, namely, from the vibrative oſcillatory Motion produced firſt in the electrical Body by Attrition or Rubbing the ſame, which Motion becomes from thence communicated both to the Fluids of Air, and Light, and by means of a Series of elaſtick continuous Bodies duly diſpoſed, the ſame may be propagated by thoſe two Fluids to conſiderable Diſtances; whereas one may as well undertake for to account for all the Appearances relating to the Motions of the cœleſtial Bodies by the *Carteſian* Hypotheſis of Vortex's, as to pretend to ſolve the Phænomena of electrical Bodies by means of any Fluid ſpecifically or properly electrical, or the Efflux and Emanation of any Effluvia, really ſuch, iſſuing out of the electrick Body, when excited to Action or Motion. And the Truth of what is here advanc'd, is further confirm'd and eſtabliſh'd from this Obſervation, That ſuch Bodies as are endow'd with the greateſt Degrees of Elaſticity, are found to have the greateſt Electricity, as being the moſt ſuſceptive and retentive of thoſe vibratory Motions and tremulous reciprocal Pulſations, from which alone, as the true and proper Cauſe, all the Phænomena and Effects of electrical Bodies appear to be produc'd. Beſides, it is impoſſible to conceive how any electrical Effluvia radiating and iſſuing out of the electrick Body, can have its Direction changed in a thouſand different Ways, as it is in paſſing along a Rope or Line, bent into many Folds and Returns, and in all manner of Directions: Whereas it is eaſy to conceive how a tremulous Motion may be communicated to ſuch a Rope by the Fluids of Air and Light, and be propagated through its whole Length, by applying the electrick Body when excited and put into Motion, to one End of the Rope. Moreover all radiating Bodies emit their Qualities to equal Diſtances, *in orbem*, or ſpherically; whereas Electricity requires the Application of other Bodies, to render its Effects ſenſible at any conſiderable Diſtance, *&c.*

18. Notwithſtanding what hath been here remark'd relating to Electricity, may be accounted as a Digreſſion foreign to the proper Subject of this Treatiſe, we may however deduce therefrom a new Mechanical-Method which will be of real Efficacy, and contribute much to the Cure of Wounds, Tumors, Paralitick, and other Topical Ailments and Diſorders; namely, that as all Bodies when heated, either by Rubbing, Attrition, *&c.* will emit Effluvia (which however as has been before obſerv'd, are in no wiſe to be accounted as the Cauſe of thoſe Effects commonly call'd Electrical, and obſerv'd to follow therefrom) yet nevertheleſs as thoſe Effluvia, when copiouſly rais'd and emitted by intenſe Rubbing and Attrition, are ever accompany'd with an intenſe Motion and Vibration, which becomes impreſs'd at the ſame time upon the Fluids both of Light, and Air: If ſuch Bodies, eſpecially thoſe of the reſinous Kind, *&c.* when ſtrongly rubb'd and excited to Action, are apply'd or kept nigh to any ailing diſeas'd Part, and have their Force renew'd from Time to Time as the ſame becomes deſtroy'd, and kept thus freſh apply'd to the Part for a proper Time, and at reaſonable Intervals; the ſmart quick Vibrations, which the Effluvia thus iſſuing from the ſaid Bodies, in conjunction with the Fluids of Light and Air, will communicate to the diſeaſed Member, to which they are thus apply'd, will contribute greatly to aſſiſt and reſtore the loſt Tone, Spring, and Elaſticity of the animal Solids and Fibres, as the ſame will ſerve like to a dry Vapour-Bath, and thereby enable them to overcome the Incumbrances and Reſiſtance laid thereon by the ſtagnant viſcid Fluids, *&c.* The Rationale and Mechaniſm, by which all thoſe ſalutary Effects become produced, are abundantly manifeſt from the Laws of the Animal Œconomy, *&c.*

19. That the new Mechanical Methods for Preſerving Health, and Curing Diſeaſes, deſcrib'd in this Chapter, muſt be accompany'd with all the ſalutary Effects aſcrib'd thereto, requires no

farther Demonſtration, than that of their being perfectly agreeable with the eſtabliſh'd Order and Method purſued by Nature for attaining the ſame two general Ends; both in the Animal, and Vegetable Kingdoms.

CHAP. VI.

Contains the Conſtruction, Deſcription, Uſe and Application, of ſundry topical Machines, whereby the ſeveral Regions and Members of the Body may be made to receive all the ſalutary Effects that can be obtain'd from that univerſal Principle of Preſſure, apply'd thereto in all Degrees, either by Means of Water, or Air; with all their other Properties and Qualities ſo regulated, adjuſted, and proportion'd, as will beſt anſwer the Indications of Cure, &c.

1. HAVING in the firſt two Chapters deſcrib'd ſome new Methods and Machines whereby the whole Body might be ſubjected to all Degrees of Preſſure, either by Water alone, or with Air alone, or with both the ſaid Elements jointly combin'd and allied together; I come now to propoſe ſome new Methods and Machines whereby the ſeveral Regions and Parts of the Body may be likewiſe ſubjected to all Degrees of Preſſure, *&c.* by either one or both the ſaid two Elements, and be made to receive beſides all the Benefit ariſing from the Uſe and Application of Vapour-Baths, humid or dry, *&c.*

2. But firſt of all it may be obſerv'd, that one principal End of applying topical Baths, is either to direct or cauſe a more plentiful Derivation of the Fluids to ſome particular Part, as when it is intended to forward Suppuration in Tumors, as alſo in paralitick Caſes, or the Suppreſſion of any natural Evacution, *&c.* or ſecondly, to divert and cauſe a Revulſion of the Fluids from ſome Part or Region, as ſuppoſe the Head and ſuperior Parts, as in the Caſes of Apoplexies, Quinſies, Opthalmies, Hemorrhages, and in all Affections of the Brain and nervous Syſtem, (when the ſame proceed from too plentiful an Afflux and Derivation of the Fluids thereto) or when any of the natural Evacuations are increas'd above what is the ſtandard Meaſure of Health, *&c.* This general Remark being premis'd, I ſhall now proceed to the immediate Subject of this Chapter, and deſcribe ſome new Methods for conſtructing and applying of topical Baths, *&c.* whereby thoſe two primary medicinal Intentions of Derivation, and Revulſion, or what relates to the Diſtribution of Motion in the ſeveral Parts of the animal Machine may be moſt ſucceſſively obtain'd. For this Purpoſe, *Vide* Fig. 6. Plate 1. which repreſents the ſame Sort of Bathing-Veſſel and Apparatus (as has been deſcrib'd in the firſt Chapter from Number 6 to 12) ſerving to bathe the whole Body; but in this particular Caſe and Manner of uſing the Machine, only the upper Region or half of the Perſon's Body, from about his Loins upwards, is inclos'd in the Bathing Veſſel; the Hole in the Bottom n n of the Veſſel whereat the Body enters, muſt be ſecur'd all round with ſoft Leathers, faſtened thereto by a flat Ring with Screws, ſo as to reſemble the Leather-pouch of a Budge-Barrel, which Leathers are to be made faſt to the Perſon's Body with Rowlers (thoſe Leathers and Rowlers are not expreſs'd in this Draught, to avoid embarraſſing the Figure therewith, and as the ſame are readily to be underſtood without any linear Repreſentations) all Things being thus diſpos'd, we may now proceed to the Operation of bathing the upper Region of the Body, with Water cold or hot; and in either Caſe the Water may be made to riſe juſt ſo high as to cover the Perſon's Head, or only as high as his Neck, Breaſt, *&c.* ſo that upon bending his Body, or keeping the ſame erect, he can bring his Head either all under Water, or raiſe it above as he has Occaſion to take Breath, *&c.* the Bathing Veſſel being fill'd with Water to the Height intended, let the pneumatick Engine a a a a, be ſet to work to give the Air in the upper Part of the Bathing Veſſel the Degree of Denſity and Preſſure, that is judg'd will ſuit beſt with the Symptoms and Indications of the Perſon's Caſe, which I will ſuppoſe to be ſuch as calls for a ſpeedy and powerful Revulſion of the Fluids from the ſuperior Parts, as in Apoplexies, Quinſies, Peripneumonias, Hæmorrhages, Inflammations either of the Meninges of the Brain, Eyes, Face, *&c.* in which Caſes let the Bathing Veſſel be fill'd to a proper Height either with ſimple Water, or with Water prepar'd and medicated with proper Ingredients endow'd with ſpecifick appropriate Virtues, for contracting, relaxing, reſolving, diſcuſſing, *&c.* which being done, let the Air in the Bathing Veſſel be brought to have that Degree of Preſſure as is judg'd will ſuit beſt with the Perſon's Caſe. If now at the ſame Time the lower Part of his Body that is without the Bathing Veſſel, be underſtood to be plac'd in a Veſſel with warm Water (which Veſſel is not ſhewn in this Draught) in which Caſe the Blood-Veſſels miniſtring to the Head and ſuperior Parts being more compreſs'd by the Air in the Bathing Veſſel (which in this Caſe is ſuppos'd to be of a greater Denſity than the external Air, which preſſes upon that Half of his Body without-ſide the Veſſel) than the deſcending Blood-Veſſels miniſtring to the inferior Parts, which are preſs'd upon only by the external Air, and the cold Water in the Bathing Veſſel by its Stimulus, tending alſo to contract and lay a greater Reſiſtance upon the aſcending Veſſels, whilſt the warm Water of the Semicupium apply'd to the lower Region

Region of the Body, by its relaxing Quality and Stimulus will diminiſh the Reſiſtance of the deſcending Veſſels, from all which concurring Cauſes the Fluids will become determin'd in a greater Quantity and Velocity into the deſcending, than into the aſcending Veſſels, and thereby cauſe a Revulſion of the Fluids from the ſuperior Parts, and at the ſame Time a proportional Derivation thereof to the inferior Parts, as was propos'd and intended. And, on the contrary, was the Fluids requir'd to be directed in greater Quantity and Velocity to the upper Parts, for which Intention, let the Bathing Veſſel be fill'd with warm Water, and the Air therein be rarified and brought to a Degree of Denſity and Preſſure below that of the external Air by means of the pneumatick Engine, (as has been deſcrib'd in the Firſt Chapter) placing the lower Part of his Body without-ſide the Bathing Veſſel in a Semicupium or cold Water Bath, upon doing which the End and Intention propos'd will be obtain'd, namely, of making a Diverſion or Revulſion of the Fluids from the inferior Parts, with a proportional Derivation of the ſame to the ſuperior Parts.

3. Now the two general Intentions propos'd in the preceding Numbers, namely, of making a Revulſion from the ſuperior Parts, as the Head, Neck, Breaſt, *&c.* in the Caſes of Hæmorrhages, Inflammations, *&c.* or any extraordinary Determination of the Fluids to thoſe Parts; or on the contrary, when it is requir'd to make a Diverſion of the Humours from the lower Parts, as in Caſes of Tumours, *&c.* Now it is propos'd that this general Intention of Cure may be effected without having any Water in the Bathing Veſſel, only by condenſing and rarefying the Air therein, until it is brought to have the Degree of Denſity and Preſſure requir'd to anſwer the Intention propos'd; which Practice will in moſt Caſes anſwer better, than by applying Water either to that Part of the Body within, or without-ſide the Bathing Veſſel. And thus if the Air in the Bathing Veſſel be condens'd, and made to act with a greater Preſſure upon that Part of the Body incloſed therein, than what the external Air does upon that Part without-ſide the Veſſel, upon doing whereof this Intention will become anſwer'd as to the firſt Caſe, namely, of revulſing the Humours from the upper Parts. And, on the other hand, if the Air in the Bathing Veſſel be rarefied and made to act with leſs Force and Preſſure upon that Part of the Body included therein, than what the external Air does upon the other Part without-ſide the Veſſel, upon doing whereof, the general Intention of Derivation and Revulſion will become obtain'd as to the ſecond Caſe propos'd, namely, of making a Diverſion or Revulſion of the Humours from the lower Parts, as was propos'd to be done. Suppoſe now that in effecting of the firſt Caſe and Intention, the Air in the Bathing Veſſel was rendered twice as denſe as common Air, in which Caſe that Part of the Perſon's Body incloſed therein, will ſuſtain double the Quantity of Preſſure, which the other Part of his Body without-ſide the Bathing Veſſel does, by which great Difference of Preſſure upon the two Parts of his Body, the Fluids will receive a proportional Difference in their Direction and Determination to the ſaid reſpective Parts. And according to this Method the Air in the Bathing Veſſel may be condens'd ſo as to render its Preſſure upon that Part of the Body inclos'd therein, three, four or five Times greater, or more, than what it is upon any other Part of the Body of equal Extent and Area, with the Part inclos'd in the Veſſel, and ſo for all Degrees of Preſſure; by which Method it is propos'd the moſt powerful Diverſions may be made, in regulating the Determination of the Fluids to the ſeveral Parts, according to the Indications. Now, on the contrary, if the Air inſtead of being condens'd in the Bathing Veſſel, be rarefied, in ſuch wiſe as to have but half the Denſity and Preſſure of the external Air, then the contrary Effects will follow, for in this Caſe that Part of the Body within the Veſſel will ſuſtain but half the Preſſure which the other Part of his Body ſuſtains from the external Air, upon doing which, there will be a proportional Revulſion of the Humours from the lower Parts; and ſo for all other Degrees of Rarefaction of the Air in the Bathing Veſſel. So that as the Preſſure may be thus laid on, and taken off the Body in all Degrees, conſequently what relates to the general Intention of Derivation and Revulſion, or the Diſtribution of the Fluids to the ſeveral Parts of the Body, may be moſt effectually regulated according to the Indications.

4. By the other Draught and Section Fig. 7. Plate 1. the Perſon is repreſented as receiving the Operation and Exerciſe of Bathing, with his Body in a contrary revers'd Poſture to that deſcrib'd in the foregoing Number, namely, with the lower Part of his Body inclos'd in the Bathing Veſſel, and the upper Part expos'd to the external Air; and as this Method and Caſe differs from the foregoing one only in reſpect of the Parts of the Perſon's Body that are inclos'd in the Bathing Veſſel or Receiver, ſo that whatever Intentions of Cure may be practiſed in the firſt Caſe, (as deſcrib'd in the laſt foregoing Number) may likewiſe be obtain'd in this latter Caſe and Method, and with greater Safety and leſs Trouble; what thoſe Intentions are, with the general Methods of effecting the ſame, has been briefly hinted at in the preceding Numbers, compar'd with what has been ſaid in the firſt and ſecond Chapters, *&c.*

5. Moreover, if the Perſon's Caſe and Symptoms ſhould indicate the Uſe and Neceſſity of applying any Fluid to that Part of his Body included in the Bathing Veſſel or Receiver, the ſame may be done with all Sorts of Fluids, either ſeparately or allay'd and compounded together in all Proportions, ſuch as Water, Milk, Wine, Vinegar, Urine, Oils, diſtill'd Waters, Decoctions, Infuſions, *&c.* and thoſe ſeveral Fluids may have their Virtues further heighten'd by being impregnated with the Particles of ſuch ſolid dry Ingredients as have a Fitneſs to advance and forward the Intention.

6. By

6. By thoſe two Draughts, compared with what has been ſaid in the two firſt Chapters, it will be readily underſtood how either the upper or lower Parts of the Body may be made to receive all the Advantages and Benefit that can be deriv'd from partial Bathing, as alſo from Irroration or Fumigation with Vapour-Baths, either humid or dry, ſimple or compound, and likewiſe from Pump-Bathing, *&c.* with the Effects of the Air, as deſcrib'd in the Fourth and Fifth Chapters, *&c.*

7. By the vertical Section, Fig. 1. Plate 1. a Perſon is repreſented as ſtanding upright within the Bathing Veſſel, with the Water rais'd to ſeveral Heights round his Body, which different Heights of the Water may be expreſs'd by the prick'd Lines w1, w2, w3, w4, w5, *&c.* in which Caſe the Perſon may be conſider'd as ſubject thereby to ſo many different, partial, or local Bathings, which may be perform'd with Water cold or hot, and in all Degrees, or with Water or any other Fluids allay'd and compounded together in all Proportions. And ſuppoſing the Perſon to ſtand with the Water as high up upon his Body as the prick'd Line w4 (or any of the other like dotted Lines) in that Caſe the upper Part of his Body, without or above the Surface of the Water, may be made to receive the Benefit of Irroration or Suffumigation with Vapours and Effluvia produc'd from all Subſtances, Animal, Vegetable and Mineral, Solids or Fluids, ſimply or compounded; as has been ſhewn in the Two firſt Chapters, *&c.*

8. By the other vertical Section, Fig. 3. Plate 1. there is ſhewn a poſterior View or Section of a human Body lying extended horizontally at full Length within the Bathing Veſſel BBBB, and cover'd one half with Water, the upper Surface whereof being expreſs'd by the dotted Line ww, which may be made cold or hot in all Degrees, and be allay'd, compounded and medicated with all Sorts of Ingredients as are of approv'd Efficacy to anſwer the Intention and Caſe, which I will ſuppoſe to be a Hemiplegia, *&c.* and in this Caſe alſo the Air in the upper Part of the Veſſel or Receiver may be either condens'd or rarefied, and brought to act with all Degrees of Preſſure, as is judg'd proper for the Intention: RP is a flexible membranous Pipe, which the Perſon holds in his Mouth to enable him to breathe withal, by which he is ſupply'd with freſh Air of any Denſity requir'd out of the reſpiring Veſſel xxxx, according as it ſuits beſt with his reſpiring Organs. Moreover the Perſon lying thus within the Bathing Veſſel, with his Body half cover'd with Water, either cold or hot, may have the other half Part, or Side of his Body, made to receive the Exerciſe and Benefit accruing from Vapour-Baths, humid or dry, ſimple or compound, by which ſeveral Ways the Motion and Diſtribution of the Fluids may be regulated and govern'd, and the moſt powerful Derivation and Revulſion be made of the ſame laterally, from one Side of the Body to the other, as the Symptoms and Caſe require, and as has been ſhewn before.

9. Moreover by the other Draught and Section, Fig. 8. Plate 1. an Apparatus is propos'd, whereby any particular Member or Limb, as ſuppoſe a Perſon's Leg and Thigh, may receive in the moſt perfect Manner all the Benefit that can be produc'd by Preſſure and Bathing of all Sorts. For this Purpoſe let BBBB be the Bathing Veſſel or Receiver, of Copper or Caſt Iron, of ſuch a Capacity as to receive a Perſon's Leg and Thigh, which enters in at a round Hole upon one End of the Receiver, round the Circumference of which Hole is a Ring, projecting a ſmall Way above the Plain of the Plate; to which Ring may be faſten'd a Piece of Leather, or an oil'd Bladder, which muſt be bound tight about the Member with a Fillet or Rowler, (but in this Figure neither the Projecture of the Ring, Bladder, nor Rowler, are expreſs'd, as being readily conceiv'd without any linear Repreſentations) to one End of the Bathing Veſſel or Receiver there is join'd a ſhort Pipe D, with a Cock thereto, the other End of which Pipe may be made to join on upon Occaſion to the Barrel of the Pneumatick Engine aaaa, for which Purpoſe this End of the Pipe may be made tapering, ſo as to fit into a Hole in the Side of the Barrel, like to a Spiggot and Faſſet: This Engine ſerves either for forcing Air or Water into the Receiver indifferently; vvvv is a Copper Veſſel for producing Vapours or Effluvia, humid or dry, from Materials of all Kinds, after the Manner as has been ſhewn in the two firſt Chapters. All Things being thus diſpos'd, we may now proceed to the Operation of Bathing the Member either with ſome cold or hot Liquor, ſuppoſe it to be warm Water, which being heated to the Degree requir'd, (to be known by the Thermometer TT annex'd to the Receiver) in the Copper H; upon ſetting open the Cock of the hot Water Pipe HP, the Receiver will become fill'd with Water, juſt to cover the Limb; which being done, let Air be thrown into the Receiver above the Water, by the Pneumatick Engine, until it nas the Denſity and Preſſure intended (which Degrees of Condenſation may be known by the mercurial Gage Tube bb affix'd to the Receiver) ſuppoſe now the Air in the Receiver to be twice as denſe as common Air, in that Caſe the Member inclos'd in the Receiver, whether it be a Leg, or Arm, *&c.* will ſuſtain twice the Preſſure that the other Leg or Arm does, that is expos'd only to the Preſſure of the common external Air; and after this Manner the Preſſure may be increas'd, varied, and made to operate upon the ailing Member in all Degrees and Proportions requir'd. And, on tne contrary, by rarefying and exhauſting the Air, either in whole or in part out of the Receiver, the Preſſure may in like Manner be taken off the Member, ſo as to render it leſs in any Proportion aſſign'd, than what it is upon the other Limb that is expos'd only to the external Air. So that as the Preſſure may be thus taken off, as well as laid on the diſeas'd Member in all Degrees and Quantities, by which Method the moſt powerful Derivation and Revulſion may be made of the Humours to, or from the ailing Members; here I have only ſuppos'd the Limbs to be bath'd with ſimple Water, but

ſuch

ſuch Caſes will moſtly require the Bath to be compounded, and may conſiſt of all Kinds of Fluids, either ſingly, or combin'd together, in all Proportions. And when the Intention is only to make a Derivation and Revulſion, the ſame may be perfectly effected only by the Preſſure of the Air, without any other Fluid; all which is abundantly manifeſt from what has been ſaid.

10. Moreover by this Receiver the Limb may be made to receive all the Benefit, which is both great and conſiderable, that is to be obtain'd from Vapour-Baths, humid or dry: Now to fit the Machine for humid Vaporation, the Materials may be either of the Animal, Vegetable, or Mineral Provinces, and the Fluids from which the Steam is to be produc'd may be mix'd with all Ingredients that have any Fitneſs and Virtue to anſwer the Intentions of Cure, which Materials or medicated Liquors being put into the Copper VVVV, when the Vapours are rais'd in a ſufficient Quantity, upon opening the Cock of the Steam Pipe VP, the Vapours will ruſh into the Receiver, the Air wherein will become ſtrongly impregnated therewith in all Degrees; but if in Caſe the Vapours have not Force enough of themſelves to impregnate the Air in the Receiver ſtrongly enough, then the Steam Pipe may be made to diſcharge the Vapours firſt into the Pneumatick Engine aaaa, by which it may be forc'd into the Receiver in any Quantity requir'd, and the Air at the ſame Time made to act with any Degree of Preſſure that is proper. And by the like Proceſs the Machine may be fitted for a dry Vapour-Bath, for Fumigation, all the Difference between this and the humid Vapour-Bath conſiſting only in the Materials; the former conſiſting of ſuch as are capable to generate humid Exhalations, by Ebullition, *&c.* whereas the latter conſiſts of ſuch Ingredients as ſerve to produce dry Fumes or Effluvia by Accenſion, Attrition, or intenſe Heat, *&c.* and as the Steam or Vapours, either dry or humid, may be kept conſtantly ſupply'd in the Receiver, and made to act with all Degrees of Strength and Preſſure upon the diſeaſed Member, by which Means the ſtrongeſt Derivation and Revulſion may be made, with the beſt Diſpoſition for the Cure of many Caſes, as Tumors, Gangrenes, *&c.*

11. There is this further conſiderable Advantage to be obtain'd from this Method, that whether the Member be bath'd with any Fluid, or with Vapours, that in both Caſes the Fluid, or the Vapours, may be kept conſtantly throwing in upon the diſeaſed Member by the Engine, and that with all Degrees of Velocity and Impulſe, which Fluids or Vapours being thus collected and directed by the Engine into a Stream, and made to act and impinge by alternate Jerks and Strokes, and with all Degrees of Velocity and Impulſe againſt the ailing Part, by the conſtant Stimulation and Strokes of the Fluids or Vapours upon the Part, there will be a continual Undulation, Tremor and oſcillatory Motion excited and propagated throughout the whole Solids, Veſſels, and Fluids, of the Member; which will contribute greatly to the Cure of many obſtinate Caſes, as Œdematous, Scrophulous, Scirrhous, Scorbutick, Hydropical, Venereal, Tumors, Ulcers, *&c.* by Attenuating, Relaxing, Contracting, Reſolving, Incraſſating, Stimulating, Pacifying, Attracting, Repelling, Digeſting, Diſcuſſing, Deterging, Humecting, Drying, *&c.* which Intentions can't poſſibly be obtain'd ſo well, by letting Water fall upon the Part from a Pump, by reaſon the Water in this Caſe not having the Velocity and Momentum, as when thrown and projected by a proper Engine for that Purpoſe, conſequently can't produce ſuch remarkable good Effects, for want of the aforeſaid neceſſary Properties, which are what renders this kind of Pump-Bathing of much greater Efficacy in ſome particular Caſes, than the common Practice of Bathing. And by cauſing the Receiver to be apply'd to the Machines deſcrib'd in the Fourth and Fifth Chapters, the diſeaſed Member may be made to receive the ſalutary Effects ariſing from the particular Exerciſes there deſcribed.

12. The other Draught and vertical Section, Fig. 9. Plate 1. ſerves for to ſhew how a Perſon's Arm, by having ſuch another proper Receiver BBBB fitted thereto, with the like Apparatus, may be made to receive the like Operation, Exerciſe and Benefit, that can be obtain'd from Bathing of all Sorts, in like Manner as has been deſcrib'd in the preceding Numbers. And what relates to the Machinery and Apparatus of this Draught, the ſame may be collected by referring to the Deſcription given of the like Machine, from Number 6, to 10, of the Firſt Chapter, the ſimilar correſponding Parts in both Draughts, being deſign'd and mark'd with the ſame Letters and Characters. And by applying this Receiver to the Machines repreſented by Fig. 7, 9, 10, *&c.* of Plate 2; the Member, or Perſon's Arm, *&c.* may be made to receive all the ſalutary Effects ariſing therefrom, as deſcrib'd in the Fourth and Fifth Chapters, *&c.*

13. After what Manner the ſeveral Regions and Members of the Body will be affected, when ſubmitted to the ſeveral Operations and Exerciſes deſcrib'd in this Chapter; for that Purpoſe ſuch Parts of the Body as are underſtood to undergo any of the ſaid Mechanical Operations, have their external Surface deſign'd by two Lines, the outermoſt being a real Line, but the innermoſt a prick'd or dotted one; the Interval or Space between the ſaid two parallel Lines, ſerving to exhibit how the Part or Member will be made to expand and contract, or vibrate and oſcillate Inwards and Outwards alternately, *&c.* as hath been already ſhewn in other the like ſimilar Caſes, in Number 14, of Chap. 1; and Numbers 5, and 21, of Chap. 2; and in Number 43, of Chap. 3; alſo in Numbers 9, and 17, of Chap. 4; with Number 9, of Chap. 5, *&c.*

CHAP. VII.

Contains ſome general Obſervations upon the Structure, Mechaniſm and morbid Affections of the Stomach, with its Appendage the Inteſtines; ſhewing this primary compound Gland and Organ, the alimentary Tube, including the whole Syſtem of the chylopoietick Organs, when diſorder'd or incapacitated for doing its Office duly, to be the true original Cauſe whence moſt of the capital Diſeaſes take their firſt Riſe and Growth, ſuch as the Colick, Iliac Paſſion, Ruptures, Tympanies, Emphyſemas, Conſumptions, Aſthmas, Dropſies, Agues, Atrophies, Apoplexies, Epilepſies, Palſies, Hydrocephalies, with the Hyſterick and Hypochondriack Affections, &c. together with a new Mechanical Method for Curing and giving Relief in the above Caſes, &c.

1. PReviouſly to the Subject of this Chapter, I ſhall offer the following general Obſervations.

2. Firſt, That the Stomach, with its Appendage and Syſtem, the Inteſtines and chylopoietick Organs, being one of the primary vital Organs of the Animal Machine, the ſame when any ways diſorder'd, ſerves of itſelf as a Cauſe adequate and ſufficient for Producing and Accounting for all Sorts of Diſeaſes incident to Mankind.

3. Secondly, As all Medicines, whether exhibited internally or externally, exert their principal Force and Effects upon the Parts to which they are firſt immediately apply'd, whether they be Emeticks, Catharticks, Dieureticks, Sudorificks, Alteratives, Epipaſticks, Bathings, Frictions, Punctures, Inuſtions, *&c.* It follows, that all Medicines given internally, are to be conſider'd as little elſe than topical Remedies apply'd to the Stomach and Inteſtines, which are the firſt principal Scene wherein their Effects are chiefly diſplay'd and manifeſted; it being found by Experience, that the greateſt Part of the Medicines thus convey'd by the Stomach never paſs the Lacteals, or make their Way into the Habit, and come within the Stages of the Circulation, at leaſt in the Quantity and Manner as is commonly ſuppoſed and intended, ſuch as are moſt metallick and mineral Subſtances, Boles, Earths, teſtaceous Powders, *&c.* which however triturated and levigated by Art, remain ſtill inſoluble, and incapable of being reduc'd by the Heat and Action of the Stomach, *&c.* to a Degree of Tenuity fit to enter the lacteal Veſſels, and which we find Nature has wiſely provided againſt, to prevent the infinite Damages that muſt have follow'd from the Reception of ſuch foreign, extraneous, unaſſimulable Particles; from whence we may infer, that the principal Force and Effects of all ſuch Medicines are exerted chiefly within and upon the compound alimentary Tube; and altho' their Effects may be propagated and extend even to the remoteſt Organs and Glands, either by Increaſing or Diminiſhing their Secretions, this may rather be aſcrib'd as a conſequential ſecondary Effect, proceeding from the neceſſary Conſent, Connection and Influence, which the Stomach and Inteſtines have with all the other Organs and Glands, than to any real immediate Action of the Medicines upon thoſe Glands.

4. Thirdly, As the Exhibiting ſuch Loads of nauſeous inſoluble Medicines and Alteratives, for ſo long a Time as is commonly practiſed in the Cure of both internal and external Diſorders, muſt neceſſarily tend to the untimely Deſtruction of this moſt eſſential Organ the Stomach, with its Appendage the chylopoietick Organs, by Relaxing and Spoiling their Texture, Tone, and muſcular moving Force, *&c.* and thereby lay a certain Foundation for all the capital Diſeaſes, which I have here aſcrib'd thereto.

5. Fourthly, From what has been obſerv'd it follows, how extremely cautious and ſparing we ought to be, not to divert and miſapply this capital Organ from its proper Office, when there appears to be no real Defects in itſelf that wants remedying; by making it to ſerve as a common Sewer or Laboratory for preparing and conveying Medicines to all Parts of the Body, by which unnatural Procedure Millions have been loſt. And if all the Intentions that can be produc'd by other Medicines adminiſter'd internally, can be effected by proper Methods of applying the mechanical Effects of Air and Water, *&c.* to the humane Body, and its ſeveral Parts externally: This muſt ever be allow'd as the moſt natural, ſafe, perfect, univerſal and eligible Method.

6. Having in the Second and Third Chapters ſhewn what univerſal Influence the Air has by its mechanical Effects and Operation, Firſt, upon the whole external Body; and, Secondly, upon the whole Syſtem of the Fluids, as they circulate through the Lungs: I come now for the Subject of this Chapter, to conſider a third important Operation which it hath, and that is within the whole alimentary Tube, as alſo within the Cavity of the Abdomen and Thorax, by virtue of which threefold Operation, it acquires an abſolute Dominion over the Bodies of Animals, and becomes the univerſal Cauſe and Inſtrument both of Health and Diſeaſes.

7. Having in the laſt foregoing Chapter propos'd ſome mechanical Methods of Cure, conſider'd as apply'd topically to ſome particular Regions and Parts of the Body; as a further Sequel and Continuation of that Subject, I ſhall beg Leave here to propoſe a new mechanical Method of curing or giving Relief in ſome of the moſt excruciating Diſtempers afflicting Mankind, being

ſuch

ſuch as have their Riſe and Original within the alimentary Tube, ſuch as the Colick, Iliack Paſſion, &c. when the ſame are produc'd, as they commonly are, either from too great, or too ſmall a Quantity of Air in the Stomach and Inteſtines, or from too great or too ſmall a Quantity of Air in the Cavities of the Abdomen and Thorax; by what Mechaniſm the above Diſtempers are produc'd may be thus briefly underſtood. The Stomach and Inteſtines being one continued elaſtick muſcular Tube or Canal, only differing in reſpect of their Capacity, and Denſity of their muſcular Fibres and Membranes; now this compound alimentary Tube with its abſorbent capillary lacteal Veſſels, being the true and real Root of the whole Body, bears the very ſame Relation to the Trunk and Limbs of the Body, as the Root of a Tree does to its Trunk and Branches; and the whole inner Surface of the alimentary Tube, from the Mouth to the Anus, may be really and properly conſider'd as a Part of the external Surface of the Body, and upon which the Air operates with all its Properties and Qualities in like Manner as upon the other external Parts of the Body, or upon the internal Surface of the Lungs, which may alſo be conſider'd as a proper Part of the external Surface of the Body. Now this compound alimentary Tube is kept always in ſome meaſure fill'd with the Aliment, Chyle, Fæces, and the other Fluids that are continually diſcharg'd thereinto, from its own proper Glands, with thoſe of the adjacent Viſcera, as the Saliva, Bile and pancreatick Juice, &c. This compound Tube is moreover kept conſtantly ſupply'd with Air, which is continually taken in along with the ſolid and fluid Aliment, and likewiſe with the Saliva each Time that it is ſwallowed down. The Air thus inclos'd in the alimentary Tube, with that included in the Cavities of the Abdomen and Thorax, when of a proper Quantity, is abſolutely neceſſary to the due Performance of the Operations of this complex Organ, and the Purpoſes of animal Life, and that in regard firſt, as it contributes by its great Fluidity, Elaſticity, and Motion, &c. like to an univerſal Menſtruum or Ferment to diſſolve, analize, mix and break open the Texture and Coheſion of the Aliment, and to preſent and impel the Chyle when ſufficiently attenuated into the Orifices of the capillary lacteal Veſſels, by which it is abſorb'd, attracted, and convey'd to the common Receptacle, to be diluted with the Lympha; in like Manner as the Sap is drove and forc'd into the Capillary Tubuli, in the Roots of Vegetables, by the Air aſſiſted by the Power of Attraction, &c. Secondly, this internal Air contain'd in the alimentary Tube, as alſo in the Cavities of the Abdomen and Thorax, when of a juſt and proper Quantity, by its Elaſticity and Preſſure, together with the Aliment and Fæces, ſerves to maintain a Ballance and Equilibrium with the external Air, as alſo with the Spring and contractile reſtitutive Force of the muſcular Coats of the whole compound alimentary Tube, to prevent its becoming too much contracted and collaps'd, when much emptied of Food, and to keep it always in a due Degree diſtended and open throughout its whole Length for the Paſſage of the Fæces, &c. So that this internal Air, together with the other Contents, ſerves as an antagoniſt Power to counterballance not only the Spring and muſcular periſtaltick Motion of this compound Organ; but likewiſe to counterpoiſe the external Air with the alternate Syſtole and Diaſtole of the Diaphragm and abdominal Muſcles, the principal Uſe of thoſe Muſcles being to ſerve as auxiliary Powers to the two primary Organs of Digeſtion, and Reſpiration or Sanguification; for upon every Syſtole or Contraction of the Diaphragm and abdominal Muſcles, the internal Air in the alimentary Tube, with that in the Cavities of the Abdomen and Thorax will become condens'd, whereupon the Tube will be made to undergo a Syſtole or Contraction at the ſame Time; by which Contraction of the Tube inwards, and Compreſſion by the aforeſaid Muſcles outwards, the Chyle will be impell'd and drove forwards through the lacteal Veſſels and thoracick Duct, to the Heart, by the alternate Compreſſion of the Air both in the alimentary Tube and Cavities of the Abdomen and Thorax. And again upon every Diaſtole or Relaxation of the Diaphragm, and abdominal Muſcles, the Compreſſion being then taken off the alimentary Tube, the inclos'd Air in the Abdomen, Thorax, and alimentary Tube, will thereupon expand and cauſe the whole Tube to dilate or undergo a Diaſtole at the ſame Time; whereupon the Mouths of the Lacteals will become open, and the Chyle impell'd thereinto partly by the Power of Attraction, and alſo by the Preſſure of the inclos'd Air, aſſiſted by the periſtaltick muſcular Motion of the Tube. So that we may conceive the whole alimentary Tube, with the Air inclos'd therein, as alſo in the Cavities of the Abdomen and Thorax, to have an alternate ſucceſſive Motion of Syſtole and Diaſtole at the very ſame Time with the Diaphragm and abdominal Muſcles, or at the very ſame Time that the other principal Organ the Lungs performs its Syſtoles and Diaſtoles; whereby we ſee, that as both thoſe two principal Organs are deſign'd for one general End and Uſe, the firſt to diſſolve and comminute the Aliment, and the ſecond to diſſolve and attenuate the ſame further, and having alſo analiz'd the Blood, to aſſimulate both together; ſo both Organs have one common Motion, and keep Time exactly together. Now to the End that the Air may be retain'd in a due and proper Quantity for the Purpoſes and Uſes aforeſaid within the compound alimentary Tube, the ſame is for that Reaſon provided with two annular ſphincter Muſcles, one at the upper Orifice of the Stomach, and the other at the lower End of the Tube or Anus, by which two ſphincter Muſcles or Valves, the Air is kept cloſely confin'd, and only permitted to make its Eſcape, in Proportion as it becomes too much accumulated and rarefied, to keep it from deſtroying the due Equilibrium, by obſtructing the muſcular Action and periſtaltick Motion of the alimentary Tube; ſo that when the Spring and muſcular Force of the Tube is duly proportion'd to that of its two ſphincter Muſcles,

Muſcles, the incloſed Air will be always kept within its due Bounds, and of a proper Quantity, as it will always be expell'd and forc'd out, whenſoever it becomes too much accumulated, by the contractile Force of the Tube, either upwards, downwards, or both Ways, through the ſaid two ſphincter Muſcles; to the End therefore that all the Motions and Functions of this complex alimentary Tube and chylopoietick Organs may be duly executed, there is requir'd a proper Equilibrium between thoſe three antagoniſt Powers, the firſt is the muſcular Force and Motion of the compound alimentary Tube or Gland, aſſiſted by the Diaphragm and abdominal Muſcles; the ſecond is the muſcular Motion and Force of the two ſphincter Muſcles; and the third is the Reſiſtance ariſing from the Quantity and Preſſure of the included Air and Aliment, *&c.* when thoſe three Powers are duly conſtituted and have their reſpective Properties, Qualities, Quantities, Reſiſtances and moving Forces, rightly ballanc'd, adjuſted, and proportion'd to each other, all the Operations of this complex Organ or Gland the Stomach and Inteſtines, will be well executed; but if any one of them gains the Aſcendant and becomes predominant, or has its Operation and motive Force impair'd and diminiſh'd, either from an original wrong Conformation of the Parts, or from accidental Errors or Irregularities in the Uſe of the Non-Naturals, in ſuch Caſe Diſeaſes of all Sorts may be produc'd therefrom. Thus for Example, ſuppoſe the two ſphincter Muſcles to be either form'd originally with a Degree of muſcular Force greater than what is proper, comparatively and relatively in reſpect to the compound alimentary Canal, which I believe may frequently happen to be the Caſe, though not naturally, but only accidentally from Irregularities in Living; or ſecondly, ſuppoſe this compound alimentary Tube, either by long Sickneſs, great Evacuations, partial Palſies, or which is moſt frequently the Caſe, either by Intemperance, or long Courſes of Medicines, *&c.* to have its Spring and muſcular Force relax'd and diminiſh'd in a much greater Degree proportionally than the two Sphincters, in all which Caſes the alimentary Tube not having Force enough to command the Opening and overcome the Reſiſtance of either of the two ſphincter Muſcles or Valves, to let the Air out as often, and in ſuch Quantities as is neceſſary, to preſerve a due Ballance between the aforeſaid Powers, the internal Air will become thereupon accumulated within the alimentary Tube in a greater Quantity than is conſiſtent with the Health and due Exerciſe of that Organ; in ſuch wiſe that neither the Excrements by their Weight, nor the Air by its Elaſticity, for want of being duly aſſiſted by the muſcular Force and periſtaltick Motion of the Tube, are able to ſurmount the Reſiſtance and open to themſelves a Paſſage by the Anus, ſo often, and in ſuch Quantities, as is neceſſary to preſerve a juſt Equilibrium throughout the alimentary Tube, with that of the other Powers and Reſiſtances oppos'd thereto; whereupon the Air being confin'd and collected in too great a Quantity, and being nether able to force its Way upwards through the upper Orifice of the Stomach, nor downwards by the Sphincter Ani, becomes more and more accumulated, and being much heated and rarefied, muſt greatly diſtend the whole compound Tube, from whence it is eaſy to ſee what great and ſurpriſing Effects may be thence produc'd, ſuch as painful Stimulation, Convulſions, Spaſms, Twiſtings, Involutions, and Implications of the Inteſtines, with an Inverſion of the periſtaltick Motion, Iliack Paſſion, Colick, Tympanies, Emphiſemas, Ruptures, with all the Symptoms of the hypocondriack and hyſterick Affections. And by impeding the Motion of the Diaphragm, with the due Dilatation and Contraction of the Thorax (by this undue Diſtention and Preſſure of the Stomach and Inteſtines, thus inflated with Air) the Operation of the Lungs being thereby likewiſe incumbered and obſtructed, conſequently all the Diſeaſes following from an imperfect Reſpiration or Sanguification muſt be produc'd thereby, as Conſumptions, Aſthmas, Dropſies, Atrophies, Agues, Obſtructions, Gout, *&c.* and likewiſe by the great Diſtention and Preſſure of the Stomach and Inteſtines (occaſion'd from this undue Quantity of rarefied Air, windy Expanſion and Vapours) the Circulation of the Blood in the deſcending Branches of the Aorta, as alſo in the aſcending Branches of the Cava miniſtring to the lower Region and Parts of the Body, will be greatly obſtructed, whereby a much greater Derivation and Quantity of the Fluids will be ſent through the aſcending Veſſels to the Head and upper Parts, whence will be produc'd Head-achs, Phrenſies, Apoplexies, Vertigos, Convulſions, Hydrocephales, Peripneumonies, Quinſies, Inflammations of the Meninges, Eyes, Face, with Hemorrhages, and all the Symptoms of the hypocondriack and hyſterick Affections, *&c.* Again, on the contrary, ſuppoſing the muſcular motive Force of the compound alimentary Tube, inſtead of being weaker, to be comparatively and relatively ſtronger than what is proper to maintain a due Equilibrium and Ballance with the two ſphincter Muſcles; in that Caſe the Air will become expell'd and thrown out of the alimentary Tube oftner, and in greater Quantities, than is conſiſtent with the regular Execution of the Functions of this complex Organ and Gland; ſo that there not being Air enough to keep the alimentary Tube duly diſtended and counterballanc'd, and to aſſiſt in the Reduction and Comminution of the Food, *&c.* All the Diſeaſes of the contrary Kind and Diſpoſition will enſue therefrom. Moreover this internal Air contain'd in the alimentary Tube, will become always neceſſarily affected with all the Changes that happen in the external Air or Atmoſphere; and thus as the Atmoſphere changes from heavy to light, or from cold to hot, this internal Air will expand, and diſtend the whole alimentary Tube proportionally; and on the contrary, as it changes from being light to heavy, or from hot to cold, this internal Air will become condens'd, and the whole Tube contracted proportionally; and ſo far all the Changes that happen in any of the other Properties and Qualities

of

of the Atmoſphere, which will always produce the like equal Changes in the alimentary Tube, with the Air contain'd therein, *&c.* ſo that upon the whole, without running up the Account to any farther particular Detail, upon conſidering the various Ways that this principal complex Organ and Gland, the Stomach and Inteſtines, is ſubject to be affected, as has been thus briefly deſcrib'd, we may conclude for certain, that the aforeſaid morbid Conſtitutions and Affections of this complex Organ, is for ordinary the true, general, original Cauſe and Parent of all the aforeſaid capital Diſeaſes, *&c.* which have hitherto been falſly aſcrib'd to other remote, imaginary, inexplicable, unintelligible Cauſes, *&c.*

8. The Obſervations, Facts, and Reaſoning aforeſaid, being allow'd for true, it is propos'd that great Relief may be obtain'd in the abovementioned Caſes, by the following plain, ſimple, mechanical Method and Apparatus; for this Purpoſe let an Inſtrument be prepar'd like to that of Fig. 10. Plate 1. ſomewhat reſembling a Syringe, but muſt be made conſiderably larger and wider in the Barrel; thus B B b b, is the Barrel about four or five Inches in the Bore, and about ſix or eight Inches long; which muſt be bored very true; F F, is a Forcer or Piſton of Braſs, turn'd to fit true to the Bore of the Barrel, and to make it to work the truer therein, it may be arm'd with Leather upon both Sides; F f, are two cylindrical Iron Rods fix'd to the Forcer F F, and joyn'd together at their other Ends, which ſerve for to move the Forcer from one End of the Barrel to the other; in the Center of the Forcer, between the two Iron Rods, is a round Hole with a Valve U, fitted thereto, which Valve opens upon puſhing the Piſton or Forcer downwards to the Bottom of the Barrel b b, but becomes ſhut upon retracting the Forcer to the oppoſite End B B, upon the Bottom b b of the Barrel there is joyn'd a ſhort Pipe a P, with a Cock thereto at P, the End a of this Pipe being deſign'd to be thruſt into the Anus, the Diameter thereof muſt be regulated accordingly, and the End thereof may be made ſomewhat tapering and flexible to facilitate its Entrance. The Inſtrument being thus conſtructed, its Operation, Uſe and Application, is after this Manner; the Cock P being ſhut, upon puſhing the Forcer home to the Bottom of the Barrel, all the Air will be forced thereout, through the Valve U, and upon drawing the Forcer back towards B B, there will be a Vacuum produc'd within the Barrel; which being done, let the End a, of the Pipe a P, be introduc'd through the Sphincter Ani into the Inteſtinum Rectum; and upon ſetting open the Cock, if there be any unuſual improper Quantity of Air in the inteſtinal Tube, as the Reſiſtance ariſing from the ſuppoſed too ſtrong Conſtriction and muſcular Force of the Sphincter, together with the Preſſure of the external Air or Atmoſphere, being now both wholly taken away, the windy Flatus, rarefied Air and Vapours, confin'd and accumulated in the alimentary Tube, will thereupon force their Way and ruſh into the Cavity of the Barrel, (carrying along with them part of the Fæces and Contents) which being now a perfect Vacuum, and empty Space, can make no Reſiſtance to their Exit and Entrance; the Barrel being now charged with the rarefied flatulent Air, and ſtimulating hot Vapours, *&c.* then ſhutting the Cock P, let the Pipe a P be drawn out of the Anus, when puſhing the Forcer home to the Bottom of the Barrel, all the corrupt noxious Air will become thrown out, and the Inſtrument be ready for another Operation, which may be thus repeated as often and as long as neceſſary; and according to this Method the Inteſtines may be readily, ſafely, and at any Time pump'd, purg'd, and clear'd of all ſuch rarefied noxious Air, and hot ſtimulating Vapours, when too much accumulated therein; and by which the alimentary Tube is ever more or leſs incommoded, irregularly ſtimulated, twitch'd, convuls'd, compreſs'd and diſtended, and which is the true Source and Origin of many, and moſt of the capital Diſeaſes, which for want of due Attention to this one ſelf-evident Cauſe, have been falſly attributed to other many remote, perplex'd, hypothetical, chimerical Cauſes. Now as Diſeaſes of all Sorts may be produc'd from too great an Accumulation of Air in the alimentary Tube, occaſion'd from its over-relax'd State, and languid muſcular Motion; ſo on the contrary, Diſeaſes of all Sorts may alſo be produc'd from having too ſmall a Quantity of Air in the alimentary Tube, occaſion'd by its having too great a Degree of Elaſticity and muſcular Force; now when this latter happens to be the Caſe, it is eaſy to ſee how the ſame is to be reliev'd, by injecting Air into the Tube, with this or any other ſuch like Inſtrument.

9. In conſequence of the Reaſons and Obſervations before advanc'd, it is propos'd that ſuch Perſons as are ſubject to be coſtive, from a weak, languid, muſcular Force, and protruſive periſtaltick Motion in the alimentary Tube, joyn'd to a diſproportionate and relatively too great a muſcular Force and Contraction in the Sphincter Ani, that great Relief may be obtain'd in ſuch Caſe from the Uſe of this Inſtrument, eſpecially if the Contents of the Inteſtines be firſt ſoften'd, by injecting ſome tepid warm Liquor or Vapour, and then upon applying the Inſtrument, the Fæces will become forced through the Pipe a P into the Cavity of the Barrel, there being nothing there to oppoſe or reſiſt their Exit, whereas they had not Force enough by their own Weight, aſſiſted by the weak, languid, vibrative Motion of the inteſtinal Tube, to open to themſelves a Paſſage, by overcoming the Reſiſtance of the Sphincter Muſcle, ſupported outwardly by the Preſſure of the Atmoſphere, *&c.*

10. It is moreover propos'd, that ſuch an Inſtrument being apply'd to the Anus, will ſerve likewiſe to extract and draw the rarefied Air out of the Inteſtines, when the ſame happen to fall down out of their Place, as in the Caſe of Ruptures, *&c.* in which Caſes the prolaps'd Inteſtine

can't oftentimes be return'd, by reaſon of the great Tumefaction therein, which commonly is nothing elſe but rarefied Air or Vapour confin'd within that Part of the Inteſtine which is ſuffocated and ſtrangled within the Orifice and Perforation through which it fell down; which rarefied Air or windy Exhalation being all exhauſted by this Inſtrument, the prolaps'd Inteſtine will thereupon admit of being much more certainly, ſafely, and readily thruſt back through the annular Orifice or other caſual Apperture and Perforation, and become reſtor'd and replac'd, *&c.*

11. Moreover the Womb or Uterus by reaſon of its Vicinity and Connection with the compound alimentary Tube (both being inclos'd in the Cavity of the Abdomen) muſt therefore become neceſſarily and mutually affected and influenc'd by the Diſorders of each other, in ſuch wiſe that when the Air contain'd in the Stomach and inteſtinal Tube, as alſo in the Cavities of the Abdomen and Thorax is either of too great or too ſmall a Quantity, the Womb with its Contents muſt thereupon become ſubject to a Preſſure greater or leſs than what is proper and healthful thereto, from which one ſelf-evident obvious Cauſe alone all or moſt of the Diſeaſes and Diſorders peculiar to the Fair Sex, ſuch as the Suppreſſion and overflowing of the Menſes, Barrenneſs, Abortions, difficult Births, Prolapſus of the Uterus and Anus, Chloroſis, Fluor Albus, *&c.* may be more naturally and rationally accounted for than from the many labour'd refin'd Syſtems and Hypotheſes that have been deviſed for that Purpoſe, *&c.*

12. Moreover all the ſeveral Uſes and Intentions to be obtain'd by this Inſtrument, as has been before propos'd only in general, may be greatly promoted and advanc'd, by ſuppoſing the Perſon's Body either before, or after, or at the Time of uſing this Inſtrument, to be partly inclos'd within ſuch a Veſſel as BBBB, in the like Manner as repreſented by Fig. 6. Plate 1. or by Fig. 7. Plate 1. and for to have his Body previouſly prepared by undergoing ſome of the ſeveral new mechanical Methods of exerciſing the Body by the Application of the Properties of Air or Water, *&c.* thereto, as has been explain'd in the ſeveral preceding Chapters, and particularly in deſcribing the above two Draughts and Figures.

CHAP. VIII.

Contains a new mechanical Method and Apparatus for the Cure of cutaneous Diſtempers or external local Maladies, as Wounds, Tumors, Ulcers, Inflammations, Gangrenes, Venereal Diſeaſe, &c. *by means of Air,* &c. *apply'd by proper Machines to the Parts affected; and made to operate thereupon with its Properties and Qualities chang'd, proportion'd and adjuſted ſo as will ſuit beſt with the Intentions of Cure,* &c.

1. HAVING in the two laſt preceding Chapters deſcrib'd ſome topical local Methods of Cure, before I diſmiſs this Subject ſhall propoſe a new mechanical Method and Apparatus for the Cure of cutaneous Diſeaſes, which will comprehend moſt of the Caſes, Symptoms, and Intentions relating to Wounds, Ulcers, Tumors, Inflammations, Gangrenes, *&c.* And for this End I ſhall chooſe to begin with the Conſideration of a modern faſhionable Diſtemper, which being of a complex Nature, will in its ſeveral Stages and Gradations furniſh us with moſt of the Varieties, Symptoms, and Intentions of Cure, that can happen in any of the general Caſes abovemention'd, and that is a Gonorrhœa Recens, and Virulenta; or the two firſt reputed Stages or States of the Venereal Diſeaſe, wherein we ſhall meet with Inflammation, Fluxion, Venereal Wounds, (the firſt Stage being much like to a lacerated poiſon'd Wound) Ulcers, Tumors, Shankers, Warts, Buboes, Caruncles, Fungus, Phymoſis, Paraphymoſis, *&c.* Now as to the firſt Original or Appearance of this Diſtemper, I have ſhewn already ſuch Enquiries to be altogether vain and trifling, and abſolutely impoſſible to be determin'd; it being an Accident that muſt have always inſeperably attended the immoderate unſeaſonable Uſe of this Exerciſe. And as to the material Cauſe and Manner of its Propagation, with reſpect to which there may be this Difference remark'd, that a Man and Woman both being perfectly ſound, may notwithſtanding their cohabiting inſeperably together, become ſubject to this Diſorder, from a Strain or Rupture of the Veſſels, which if not timely attended to, will degenerate and terminate in an Ulcer, and proceeding gradually will produce all the true genuine Symptoms of a Gonorrhœa; that it muſt have been firſt introduc'd, and may ſtill be ſo, from ſound Perſons converſing together is plain; unleſs we allow the firſt Pair of the humane Species to have been created with this Infirmity, and to have intail'd it upon every Individual by an indefeaſible hereditary Right throughout all ſucceſſive Generations; this Way however of contracting the Diſtemper from ſound Perſons, is but rarely the Caſe, and when timely adverted to, is no ways dangerous, being no more than a ſimple Wound. But the moſt common and dangerous Way of its Propagation, is from converſing with Perſons already infected therewith, by the Attraction and Intromiſſion of ſome highly putrid corroſive ſaline Particles deriv'd from Ulcers pre-exiſting in the Parts of Generation, which being receiv'd into the Pores and Inteſtines of the Parts, by their great Acrimony, Attraction and Stimulation quickly ſolicit and bring on an unuſual Fluxion of the Humours to the Part affected,

attended

attended with Inflammation, Tumefaction, Rupture of the Veſſels, Excoriation and Ulceration of the Parts; which in its firſt Period and State may in ſome meaſure be reſembled to a Gun-ſhot Wound, or the Bite or Sting of ſome poiſonous Animal, in which Caſes all the extraneous Bodies as the Fire, Shot, Poiſon, *&c.* muſt be extracted before that the Wound can be diſpoſed for to heal or re-unite; ſo in like Manner the firſt Intention in the Cure of a Gonorrhœa, is to extract thoſe extraneous, venereal, fiery, ſaline Particles out of the Parts, before they can be diſpos'd or brought to a State and Condition of healing, which firſt primary Intention will be always beſt obtain'd by warm emollient Fomentations and Bathings apply'd to the Part; and by bathing the whole Body pretty frequently and at proper Times in cold Water. Now with reſpect to the Cure of this Diſtemper, with all the uſual Symptoms attending thereon, I will venture to affirm that by a proper Uſe and Application of the mechanical Properties and Qualities of the Air, with cold and hot Baths, as alſo Vapour-Baths with Fomentations and Fumigations, *&c.* apply'd to the Penis, *&c.* by means of proper Machines and Inſtruments fitted to the Parts, the ſame will be more ſafely, expeditiouſly and perfectly cured, than by the Uſe of internal Remedies, or any other Methods now in Practice; for this Purpoſe it is to be conſider'd, that the Penis being a depending Part and endow'd with the moſt exquiſite Senſation, whenſoever any Diſorders happen thereto they prove very difficult to cure, by reaſon of the great Fluxion and Tendency of the Humours to this Part, which frequently cauſes involuntary Erections in the Member, and which proves one of the greateſt Impediments and Obſtructions to the Cure. One main principal Intention then to be aim'd at, and upon which the Succeſs and Expedition of the Cure greatly depends, is to prevent thoſe involuntary Erections, by which frequent Diſtenſions of the Parts, the ſame are kept from reuniting and healing, the new repullulating Fibres being at every ſuch Time torn to Pieces, and their Inoſculation and Reunion prevented, and thereby Room made for the venereal Virus and putrid ſaline Spiculæ to inſinuate themſelves further into the Parts, producing Ulcers, *&c.* The principal Intention then in this Caſe is to make a Diverſion or Revulſion of the Fluids, by turning their Courſe and cauſing them to flow in leſs Quantity and Velocity to the Part. Now it is humbly propos'd that this Intention of cauſing a Revulſion of the Fluids, may be moſt certainly and effectually obtain'd, by having a Veſſel ſuch as a b n n, (*Vide* Fig. 10. Plate 3.) which may be of Glaſs, Braſs, *&c.* and of various Forms as is found moſt commodious. (A ſeparate View and Section of the Veſſel is ſhewn at Fig. 16.) one End whereof n n is open, and of ſuch a Width as to admit the Penis eaſily therein, (as alſo the Scrotum and Teſticles upon Occaſion, when affected with any Diſorders) the Orifice n n whereat the Penis enters, may be form'd with a flat ſmooth circular Ring, which may be cover'd with ſoft Leather to make it ſit eaſier and cloſer upon the Body, ſo that when the Member is put into the Veſſel, (which for better Diſtinction I ſhall name the Receiver) and the Orifice n n preſs'd cloſe to the Oſſa Pubis, and made faſt thereto, with proper Bandage apply'd round the Body; to the other End of the Receiver there is fix'd a ſhort Pipe z p with a Cock thereto, and m p is another ſuch Pipe which may be made to ſcrew on either to the upper or under Side of the Receiver, as there is Occaſion; which being ſuppos'd, the Receiver may be fill'd with any proper medicated Liquor, ſimple or compound, or with Decoctions, Fomentations, Infuſions, Cataplaſms, or with pure Air only; or with Air, that is impregnated with Effluvia or Vapours produc'd from Materials of all Sorts, properly choſen for anſwering any general Intention that may be indicated in the Progreſs of the Cure, ſerving either for relaxing, contracting, ſtimulating, reſolving, diſcuſſing, drying, humecting, digeſting, incarning, cicatrizing, *&c.* which being done, let Air be injected either with a Syringe, or let the Pipe p z of the Receiver be join'd to the Pipe x a of the Engine a a a a, Fig. 12. by which Air may be forc'd in any Quantity into the upper Part n a o, of the Receiver, which muſt be left empty for that Purpoſe. The Air in the upper Part of the Receiver being brought to a proper Degree of Condenſation, by its Preſſure upon the whole Body and Veſſels of the Penis, like to an equable ſoft Bandage apply'd equally thereto, and acting with a proper Degree of Preſſure thereupon, will thereby effectually reſtrain and cheque the Fluids from flowing ſo plentifully and ſtrongly thereto; whereby the main principal Intention will be gain'd towards the Cure, ſo that the Part being by this Means effectually ſecur'd from Fluxion, with the neceſſary Attendants thereon, Stimulation, Pain, and involuntary Erections; and being thus reſtor'd and kept at Eaſe and Reſt, the Medicines apply'd thereto will have full Liberty to do the Work re quir'd of them; and Nature, which is always the beſt Phyſician, will perform the Cure.

2. Now with reſpect to the Proceſs and Method of Cure in this and all other Diſeaſes, it is to be obſerv'd, that the humane Body being a vaſcular compreſſible Machine compos'd of two general Powers or Principles the Solids and Fluids; the Solids, together with the Preſſure of the Atmoſphere, being the moving Power apply'd for circulating the Fluids, which are the other oppoſite Power or Reſiſtance; ſo long then as the moving Force of the Solids and Air is duly proportion'd to the Reſiſtance of the Fluids, the whole Machine will have all its Motions duly perform'd, it being impoſſible for the Body to become ſenſibly affected with any Diſeaſe, but either the whole Syſtem of the Solids, or ſome Part thereof muſt neceſſarily become affected, either with too great a moving Force, which is generally the Caſe in Fevers, and inflammatory acute Diſtempers, or with too ſmall a Degree of moving Force, which proves to be the Caſe commonly in chronical Diſeaſes. From whence we may draw this natural Concluſion, that as all

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Diſeaſes conſiſt in an unuſual Change produc'd in the motive Force of the Solids, either of the whole Body, or of ſome one or more of its Organs being either rais'd too high, or depreſs'd too low, whereby the Fluids become irregularly circulated and unequally diſtributed to the ſeveral Parts of the Body; and from thence will follow this other Concluſion, that all the poſſible Means, Methods, and Intentions of Curing Diſeaſes, may be reduc'd to this one of Regulating and Reſtoring the Ballance of Motion between the Solids and Fluids, which can only be done by adding or ſubſtracting Motion to, or from the Solids, and in determining and regulating the Fluids, both as to their Quantity, Quality, and Direction, ſo as to keep the animal Machine in the whole, and in all its Parts, poſſeſs'd with its natural Quantity of Motion. Conſequently the whole mechanical Effection of all Medicines and Methods of Healing of what Sort ſoever, may be referr'd to this one ſingle Intention, of Increaſing or Diminiſhing the Quantity of Motion in the Solids and Fluids as it is found requiſite, and in Regulating the Direction and Determination of the Motion as it is wanting. From whence we are taught this fundamental Aphoriſm and Rule, which comprehends the whole that relates to the Practice both of Phyſick and Surgery, That the Cure of all Diſeaſes or Ailments, be they of what Kind ſoever, conſiſts in adding and ſubſtracting Motion, ſo as to preſerve the animal Machine in the Whole, and in every Part, poſſeſs'd with ſuch a Quantity of Motion as is moſt natural, conſtitutional, and healthful thereto; and hence we learn, that the whole Efficacy of all Medicines and Methods of Healing conſiſts in their Fitneſs to produce or deſtroy Motion, or change and alter its Direction, and conſequently ſuch as ſerve to anſwer this Intention moſt univerſally, ſafely and effectually, are to be eſteem'd the beſt. It were an eaſy Matter to demonſtrate the Truth of the aforeſaid Principle, would it not occaſion too long and unneceſſary a Digreſſion; by running through the ſeveral Claſſes of Medicines, and ſhewing that their whole Intention and Operation conſiſts in the Quantity of Motion they are capable to produce or deſtroy, and in Changing or Regulating this Motion. And it is upon this Account that Emeticks, eſpecially ſome of the rougher mercurial Kind, have hitherto been eſteem'd of ſuch great Efficacy in Venereal Caſes. But as the Effects which Emeticks of any kind have in this, or any other Diſorder, conſiſts wholly in the univerſal great Momentum and Quantity of Motion that becomes communicated thereby to the whole Syſtem of the Solids and Fluids, with the Determination and Direction of the Motion to the central Parts of the Stomach and Inteſtines, by which univerſal Shock and Convulſion, the whole Body becomes agitated in its remoteſt Parts, whereby Obſtructions will be remov'd, and if any extraneous noxious Particles, ſuch as the Venereal Virus conſiſts of, are wedg'd in and impacted into the Pores of the Solids, the ſame will by this univerſal Shock become broken, diſlodg'd, and ſqueez'd out, whereby the Solids being freed of thoſe putrid, ſaline, ſtimulating Particles, will coaleſce and reunite, recovering their native Spring and Tone. So that all the ſalutary Effects produc'd by Emeticks is wholly owing to the great Quantity of Motion impreſs'd thereby upon the Body, and not to any ſpecifick Virtues or occult Qualities, wherewith thoſe and other Medicines have been thought to produce the above good Effects. However, it ſeems a very unnatural Method of Proceeding, eſpecially in the firſt and ſecond Stages of this Diſeaſe, and before that it has reach'd and been communicated to the Blood, for to ſubject the whole Body to ſuch a violent Quantity of Motion and Exerciſe, purely for the Sake of Regulating the Quantity of Motion, and making a Revulſion from the Penis, which is the only Part as yet ſuppos'd to be diſorder'd in its natural Motions, eſpecially when the ſaid Member may have the ſame, or a much greater Quantity of Motion impreſs'd thereon directly and independantly, without fatiguing and harraſſing the whole Body for that Purpoſe, by which imprudent Practice it is to be fear'd more Perſons have been deſtroy'd than by the Diſeaſe itſelf.

3. Now to deſcend to Practice, and to exemplify and illuſtrate the Application and Uſe of this new Method, grounded on the foregoing Principles and Reaſoning; ſuppoſe then the Penis arm'd with its Receiver, as at Fig. 10. by means of which Inſtrument all Sorts of Medicines may be commodiouſly apply'd thereto, that are of known Efficacy to anſwer any Intention that may preſent in the Progreſs of the Cure, either for Relaxing, Contracting, Digeſting, Incarning, Cicatrizing, &c. or which includes all the Intentions at once, that is either to increaſe or diminiſh the Quantity of Motion in the Member or Part, as it is found neceſſary, until it acquires its proper natural Temperament, Tone and Strength. Thus then the Penis being inclos'd in its Receiver, may be made to receive all the ſalutary Effects (which in this Caſe will ſurpaſs any other) that can be obtain'd either from a cold or hot Bath, and by Injecting the Air into the upper Space a n o, above the Surface of the Liquor, &c. in the Receiver, denoted by the prick'd Line n o, by a Syringe or other proper Engine or Inſtrument, ſuch as a a a a, apply'd to the Pipe z p, the Member may be ſubjected to any Degree of Preſſure, the ſame as if the Perſon's whole Body was immerg'd under Water from the Depth of one Foot, to that of a Hundred, or a thouſand Feet; if ſuch a Quantity of Preſſure could ever be requir'd; ſo that from the ſtimulating Force ariſing from the Coldneſs of the Liquid in the Receiver, together with the great Preſſure that may be thus laid upon the Part in all Degrees, by the condens'd Air within the Receiver; by which Means the Penis may have a much greater Quantity of Motion and Stimulation communicated thereto, than what can poſſibly be done any other Means; by which uniform equable Preſſure and Stimulation, thus equably apply'd to the whole Syſtem of Veſſels in the

Penis, the ſame will be thereby put under a ſtrong Contraction, whereby the noxious, putrid, venereal Particles, that had inſinuated themſelves into the Pores and Interſtices of the Solids, will become attenuated and expell'd, whereupon the Parts will reunite and recover their loſt Tone and Spring. Moreover this Intention of ſubjecting the Penis to any Degree of Preſſure, may be done by having only Air in the Receiver, without any Water, and this Air may be abſorb'd and impregnated with Effluvia or Vapours, either moiſt or dry, produc'd from proper Materials of all Sorts, which Vapours are underſtood to be firſt produc'd in a ſeparate Veſſel vvvv, ſuch as that of Fig. 12. and when the Vapours are rais'd in a ſufficient Quantity, upon opening the Cock of the Steam Pipe v p, which is underſtood to communicate with the Pneumatico-Hydraulick Engine aaaa, Fig. 12. into which the Vapours may be made firſt to paſs, and from thence are thrown into the Receiver, ſo as to render the Air therein ſaturated therewith in all Degrees; by which Means the Member may be made to receive all the Benefit that can be obtain'd from Vapour Baths, both humid and dry, in the moſt advantageous Manner; which Practice of Fumigating the Part, when properly apply'd, will prove of conſiderable Uſe in ſome Stages, Periods, and Symptoms of the Cure. Moreover the Penis thus arm'd with its Receiver, by opening the Cock of the Pipe p m, and applying the End of the Pipe z p to the Engine aaaa, the Penis may have cold or hot Water, or Vapours thrown upon it ſucceſſively and alternately with all Degrees of Velocity and Impulſe requir'd; which Water or Vapours, by impinging thus by alternate Strokes and Jerks upon the Member, together with the Stimulation ariſing from its Coldneſs or Heat, will conduce greatly to excite an oſcillatory vibrative Motion throughout the whole Subſtance of the Member, and thereby enable the ſame to ſhake off and expel thoſe poiſonous, putrid, venereal, ſaline Particles, which clog and oppreſs the Spring and tonick Motion of the Parts, and keep them from Reuniting, by their Stimulation, with the Fluxion and Pain conſequent therefrom: Thus then we ſee how the Penis may independently, and of itſelf alone, without involving the whole Body unneceſſarily in Trouble, with the Aſſiſtance of this artificial Armour or Receiver, be made to receive in the moſt perfect Manner all the Benefit that can be produc'd either from a cold or hot Water, or Vapour Bath, either ſimple or compound, but with many ſingular Advantages that can no ways be obtain'd from the modern Practice of applying the ſame; all which ſeveral Intentions, and how the ſame are to be attain'd, will become better underſtood by referring to the foregoing Chapters, *&c.* And by applying the Pipe z p, of the Receiver, to the Barrel of the Engine deſcrib'd in the Fourth Chapter, or to that deſcrib'd in the Fifth Chapter, the Member may be made to receive the Benefit of the new and ſalutary Methods of communicating Motion and Exerciſe to the Body, and its ſeveral Members, as may be found there more fully and particularly explain'd.

4. To illuſtrate after what Manner the Parts and Members of the Body will be affected, when made to undergo any of the mechanical Operations and Exerciſes here deſcrib'd, *&c.* for that End, ſuch Parts of the Body as are ſubmitted to any of the ſaid Operations and Exerciſes, have their external Surface defin'd by two parallel Lines, the outermoſt whereof being a real Line, and the innermoſt a prick'd Line; and the Interval between the ſaid two Lines is intended to denote and expreſs the Alterations and Changes which the Part or Member will be made to undergo, either by Expanding, Contracting, Vibrating, *&c.* as may be more fully underſtood by referring to Number 14, of Chap. 1; Numbers 5, and 21, Chap. 2; Number 43, Chap. 3; Numbers 9, and 17, Chap. 4. with Number 9, Chap. 5, *&c.*

5. Moreover in all Caſes, attended with a Solution of Continuity in what Part of the Body ſoever, the Conſequence following thereupon will be a Fluxion, or greater Derivation of the Fluids to the Part ſo affected, than what is proper and conſtitutional thereto, as is the Caſe in Wounds, Ulcers, Fractures, *&c.* Moreover, whenever the moving Force or Spring in any Part or Organ of the Body becomes overmuch relaxed, a Fluxion or greater Determination of the Fluids both in Quantity and Velocity, to the Part ſo affected will neceſſarily enſue thereupon, more than what is compatible with its healthful natural State; the Fluids becoming ever determin'd in greater Quantities, and with greater Velocity, upon thoſe Parts that are the moſt depending, weakeſt, and leaſt able to withſtand their Force and Preſſure. Now the uſual Methods for Reſtraining and Preventing Fluxion and Hemorrhage in the Cure of Wounds, Ulcers, Tumours, *&c.* conſiſts chiefly in Bandage, or other proper Contrivances made to fit and preſs upon the Parts, the more equally the better; but here it is to be obſerv'd, that the chief Excellency of Bandage being to ſupport and ſuſtain the Part affected, whether Wound, Ulcer, Tumor, Fracture, *&c.* and to keep the Medicines apply'd thereto with a ſufficient Degree of Stricture and Preſſure, and likewiſe that the Preſſure be laid on equally upon the whole Part: Now this Intention can never be perfectly anſwer'd by any kind of Bandage with Compreſs and Rowlers, nor by any other Contrivance however executed and apply'd with the greateſt Art and Addreſs; which will be always found to bind and preſs unequally upon the Part, which Inequality of Preſſure will always be accompany'd with Uneaſineſs, Pain, Fluxion, and ſymptomatick Fever, *&c.* more or leſs in Proportion. And this Obſervation holds more eſpecially true with reſpect to the Parts of Generation, which by reaſon of their depending Situation, exquiſite Senſation, with their peculiar, cellular, cavernous, membranous Structure, whereby they are ſubject to ſuch ſudden and great Degrees of Diſtention and Contraction; upon which Accounts it is impoſſible to contrive

or adapt any Bandage that ſhall ſit eaſy, and act at the ſame Time with a conſtant, equal, and ſufficient Preſſure upon the Part, whereby this Member becomes ſubject to great Fluxion, with its uſual Attendants, Pain, Inflammation, and involuntary Erections, which are the great Impediments that render the Cure of Diſorders in this Member ſo tedious, troubleſome, and imperfect; but now according to this new Method, of having the Genitals inclos'd in a proper Receiver for the Purpoſe, as before deſcrib'd, all the ill Symptoms of Fluxion, Pain, Inflammation, involuntary Erections, will become effectually remedied, by cauſing Air to be injected into the Receiver, until it is ſufficiently condens'd; which Air by its uniform equable Preſſure upon the whole Member, will prove the moſt perfect of all Bandages, by reaſon the Parts may be thereby ſubjected to any Degree of Preſſure and Stricture whatſoever, without receiving any Injury therefrom, by reaſon the Bandage or Preſſure is in this Caſe apply'd uniformly and equally, and in all Degrees requir'd to the whole Member, by the elaſtick Fluid the Air, which becomes in this Caſe the Bandage for the Member, and of all others the moſt perfect, as it will dilate and contract equally as the Member does, (to which it ſerves and does the Office of a fluid Mould or Caſe) and yet may be made to act with ſuch a Force and Preſſure upon the Organs of Generation, as will be ſufficient to cheque and bridle all the irregular, exorbitant Motions and involuntary Erections incident thereto, *&c.* So that upon the whole I will venture to promiſe, that this Diſeaſe, with all the Symptoms attending thereon, during its two firſt reputed Stages, and before that it has made its Way into the Habit, and contaminated the Fluids and Solids, may be ſafely, perfectly, and expeditiouſly cured, only by keeping the Genitals cloſely invelop'd and wrap'd up within ſuch a condens'd aerial Bandage or artificial Atmoſphere, made for to act with a proper Degree of Preſſure thereon, and by exerciſing the Member at proper Times, as the Symptoms ſhall indicate, either with the cold or hot Water Baths, ſimple or compound; or with the Vapour-Baths, humid or dry; as alſo the Method of Pump-Bathing; together with the new Methods deſcrib'd in the Fourth and Fifth Chapters, uſing now and then gentle emollient Fomentations and Fumigations; obſerving a temperate, light Regimen or Diet, *&c.*

6. It is moreover humbly propos'd, that this Method of condenſing the Air within ſuch proper recipient Veſſels, and applying the Air ſo condens'd for to operate and preſs upon the ſeveral external Parts of the humane Body, will be alſo of great and univerſal Uſe in the Cure of Wounds, Ulcers, *&c.* in which Caſe when the Fluids are ſound and healthful, could the Fluxion, with the Pain, Inflammation, and ſymptomatick Fever, which are Conſequences ever more or leſs attending thereupon, be but effectually prevented, the Cure or Reunion of the Parts would become ſoon effected, this being entirely the Work of Nature, and brought about by the eſtabliſh'd Laws of animal Mechaniſm, or that univerſal Principle of Self-Preſervation and Attraction impreſs'd upon every Being, by the Author of all Being. And this Reunion of the divided Solids is produc'd by a ſucceſſive gradual Elongation of the wounded Fibres and Veſſels, from an Attraction, Aſſimulation, and Appoſition of the nutritious Parts of the Blood to the Extremities of the divided Solids, until they come to inoſculate and reunite. The Medicines, be they of what Kind ſoever, that are apply'd to the Parts, having in this Caſe no other Uſe than to keep the Extremities of the divided Veſſels and Solids moderately warm, moiſt and ſupple, ſo as to keep the Veſſels open and pervious, and to prevent their becoming dry'd, wither'd, collaps'd, obſtructed, and callous, which would hinder their Elongation, and conſequently their Reunion. By which we ſee the whole Buſineſs, ſo far as humane Art can go, in the Cure of Wounds and Ulcers, conſiſts in managing properly what relates to Revulſion, or in Regulating the Quantity of Motion in the Fluids, and changing its Direction, by cauſing them to move in a leſs Quantity, and with leſs Velocity to the Part affected, than what would be proper in a natural healthful State of the Part, and before it was wounded, and in keeping the Extremities of the divided Solids duly moiſten'd with ſome proper balſamick Liquor. Now to attain this main cardinal Intention of preventing Fluxion, or Regulating the Quantity, Direction, and Velocity of the circulating Fluids to the Parts affected, in the Caſe of Wounds and Ulcers, *&c.* the Methods which the modern Practice furniſhes us with for that Purpoſe, is Bandage, with Compreſs and Rowlers; but, as has been already obſerv'd, no Bandage made with Compreſs and Rowling, though ever ſo well contriv'd, and apply'd with the greateſt Skill and Dexterity, can ever be made for to ſit ſo eaſy, and fit ſo well and equally to the Part, but there will ariſe an Inequality of Preſſure therefrom, which will neceſſarily produce Fluxion (the very Evil intended to be remedied thereby) with the other inſeperable Symptoms conſequent therefrom, Pain, Uneaſineſs, Inflammation, and Fever, which are the principal and only Impediments to the Cure: But now according to the new Methods here propoſed, of having proper Veſſels or Receivers peculiarly fitted and adapted, ſo as to ſit cloſe, eaſy and tight, to the ſeveral external Parts of the Body, and having ſuch an Aperture and Opening, upon that Part where they join to the Body, as will be ſufficient to cover and receive within it any Wound, Ulcer, Tumor, *&c.* as may happen in the ſeveral Parts of the Body; which Receivers being made faſt to the Body with proper Bandage, let Air be injected thereinto until it acquires ſuch a Degree of Condenſation and Preſſure, as will be equal to counterballance and reſtrain the circulating Fluids from ouzing or weeping out at the Extremities of the divided Veſſels; and in this Caſe the Preſſure of the Air may be brought to ſuch a Degree of Force and Exactneſs, as to be juſt equal to the

Reſiſtance which the circulating Blood receiv'd from moving in the Veſſels before their Continuity was broke or divided; ſo that the wounded or ulcerated Part will become thus ſuſtain'd and ſupported outwardly by the Preſſure of the condens'd Air, which acts with an equal Force and Preſſure upon the Extremity of every ſingle divided Veſſel or Fibre, how ſmall, or how remote ſoever (which is abſolutely impoſſible to be done by any other Sort of Bandage or Contrivance) and that with a Force and Reſiſtance equal, or greater in any Degree requir'd, than what the circulating Fluids receiv'd in moving through the ſaid Parts, when continuous, whole, and undivided. And if the oppoſite Member, as ſuppoſe a Leg or Arm, is put into another Veſſel, with the Air exhauſted in Part, *&c.* by which Means the Fluxion of the Humours to the ailing Part, with the Pain, Inflammation and ſymptomatick Fever conſequent therefrom will become remedied in the moſt perfect Manner; ſo that if the Extremities of the divided Solids are kept freed from all extraneous Bodies, and ſuch as clog and occaſion Incumbrances to the repullulating renaſcent Solids, and are only kept duly ſupple and moiſtned with ſome ſoft ſmooth Liquor or Balſam to prevent their Drying and becoming callous, impervious and obſtructed, if this Point be but taken due Care of, Nature will accompliſh the Cure without any other Helps; not but that in ſome particular Caſes, the Uſe and Application of the cold or hot Baths; or Pump-Bathing; as alſo Vapour-Baths, Fumigations, Fomentations, *&c.* apply'd at proper Times as the Symptoms indicate, may be of Uſe to promote and forward the Cure. Now in this Caſe as the Air is made the Bandage of the Part, there will be no Neceſſity for cramming the Wound or Ulcer full of Doſſils, Tents, Pledgets, Stipticks, and loading and ſtifling the Part with Compreſs and Rowling over all; from which, improperly apply'd, all the ill Conſequences and Symptoms attending upon Wounds, Ulcers, and Tumors do wholly proceed, as Fluxion, Pain, Inflammation, Fever, Calloſity, Sinuoſity, Fungoſity, Extinction and Suffocation of the Natural Heat, and Circulation, with Gangrenes and Mortification, *&c.* The common Opinion that Air is prejudicial to Wounds or Ulcers, does not appear to be well ſupported, and this can only be upon Account of the Degrees of Heat and Cold that it is poſſeſs'd with, by which Qualities it may be enabled to dry and contract the Orifices and Extremities of the divided Veſſels, whereby becoming totally obſtructed and callous, they become incapable of Nutrition and Elongation, and as ſuch hinders their Elongation and Reunion: But if the Air in thoſe new Receivers or Veſſels be kept of a Degree of Heat and Warmth equal to the Temperament of the Body (which it will neceſſarily be of, being cloſely confin'd in a Veſſel, and having immediate Contact with the Body) and rendering the ſame properly impregnated with the warm tepid Vapour, rais'd from ſome ſoft, balſamick Liquor, or only keeping the Wound duly moiſten'd therewith, then the above Objection and Difficulty becomes ſolv'd; and beſides we are taught from Obſervation and Experience, that no ſuch Inconveniences happen to Brutes, who though affected with Wounds and Ulcers, *&c.* will, though conſtantly expos'd to the Influence of the Air, become notwithſtanding perfectly cured.

7. Moreover this Method of applying Receivers or Veſſels properly adapted to the ſeveral Parts of the Body, which Receivers being fill'd with Air condens'd in all Degrees, and otherwiſe artificially fitted and prepar'd in reſpect to all its other Properties and Qualities, as will ſuit beſt with the Intentions of Cure; which Receivers being thus properly prepar'd, may be conſider'd as ſo many artificial Atmoſpheres, and being apply'd and made to operate upon the ſeveral Parts of the Body, will be found of univerſal Uſe in Tumors of all Kinds, Œdematous, Inflammatory, Scirrous, Strumous, Scrophulous, Scorbutick, Venereal, *&c.* and that either as they will ſerve to anſwer the Intention of Repelling the Humors upon their firſt Appearance if judg'd ſafe; or for attenuating, diſcuſſing and fitting the Humors to paſs off by Tranſpiration; or when neither of thoſe two Intentions are proper, nor can be obtain'd, the ſame will ſerve to bring them to Digeſtion or Suppuration, by cauſing the Air to operate upon the Part with all its Properties ſo alter'd, combin'd and adjuſted, intended and remitted, as will beſt ſuit with the Intentions of Cure. And by ſubmitting the Tumors to the Exerciſe of the cold and hot Baths, with the Method of Pump-Bathing, as alſo to Vapour Baths; with the new Methods of Exerciſe, as deſcrib'd in the Fourth and Fifth Chapters: All which Methods may be apply'd directly and immediately to the ailing Part alone, without ſubjecting the whole Body to be harraſs'd and fatigued with endleſs Loads of internal Medicines, for the Sake of Regulating the undue Quantity and Direction of the Fluids only upon ſome particular Part; as may be readily underſtood from what has been ſaid.

8. It is moreover humbly propoſed, that by this Method of having proper recipient Veſſels fill'd with condens'd Air, and apply'd to the ſeveral external Parts of the Body, the ſame will prove of ſingular Uſe in the Cure of Hemorrhages. Now to effect this Operation, all that is requir'd is to lay ſuch a Quantity of Preſſure upon the divided Veſſels, as is ſufficient to counterpoize and ſurmount the impulſive Force and Impetus of the circulating Fluids: Now this Intention may be effectually perform'd, having firſt ſecur'd the Extremities of the divided Veſſels by proper Ligature, *&c.* by having a proper Receiver form'd ſo as to fit exactly to the Part affected, and cauſing the Air to be injected thereinto, until it has acquir'd a Degree of Denſity ſufficient to counterballance and reſtrain the Blood from iſſuing out at the ruptur'd Veſſels, ſo that by this Method the Operation is wholly effected by the Preſſure of the Air only, whereas

to

to accompliſh the ſame Operation the modern Way, what a large Apparatus is required of Stipticks, Aſtringents, Corroſives, actual and potential Cauteries, arm'd Doſſils and Pledgits, with Compreſs and Rowlers, *&c.* and all oftentimes to no Purpoſe, when the bleeding Veſſels are large, or happen to lie within the deep winding Sinus's of old fiſtulous Ulcers, or in Anuriſms that lie deep underneath the external Surface, in which Caſes, and in Wounds that are deep and with an oblique Direction, none of the above Means can well be apply'd with Succeſs; but in making uſe of the Air in the Manner here propos'd, ſuch Accidents may be prevented, the Preſſure of the Air extending to the Bottom of all Depths and Cavities how remote, complicated and winding ſoever. So that here again we have another Inſtance of the univerſal Uſefulneſs of the Air to animal Life, Health, and the Cure of Diſeaſes, inaſmuch as it ſerves as the moſt perfect, ſafe, univerſal powerful Bandage and Stiptick of all others; the Author of Nature having appointed it to ſerve as an equable elaſtick Bandage to invelope and incloſe the Bodies of Animals, without which they could not poſſibly live or grow, as the Veſſels would become burſt to Pieces by the diſtending Force of the rarefied Fluids. Experience teaches us farther, that by the Uſe of Stipticks, Corroſives, Cauſticks, Cauteries, with ſtrong Compreſs and Bandage, many pernicious Accidents enſue therefrom, as Fluxion, Pain, Inflammation, Mortification, Fever, with perpetual and incurable Ulcers, Fiſtulas, *&c.* all which Accidents will become in a great meaſure remedied by effecting the Operation by means of the Air apply'd to the Part, which acting with an equable uniform ſufficient Preſſure upon all Parts, will be able to check the Blood from iſſuing out of the ruptur'd Veſſels, without cauſing any painful Stimulus, either from the Inequality of its Preſſure, or from any of its Properties or Qualities being diſagreeable to the Body, ſuch as all artificial Stipticks, Cauſticks, *&c.* neceſſarily are.

9. And it is moreover propos'd, that ſuch topical Machines properly apply'd in the ſeveral Ways, as has been ſhewn in this and the other particular Caſes in the preceding Numbers and Chapters, may be of great Service and Benefit in ſome Diſorders incident peculiarly to the Fair Sex, ſuch as the Uterine or menſtrual Hemorrhages, either to reſtrain and check them when exceſſive, or to ſollicit and promote them, when either obſtructed or totally ſuppreſs'd; as alſo in many other Diſorders relating to the Uterus, with the Parts adjacent and retaining thereto, both during the Time of Pregnancy and Delivery, *&c.*

10. By having the Air thus condens'd in proper topical Veſſels, and apply'd for the Cure of Hemorrhages, *&c.* in the room of Stipticks, Cauſticks, and Bandage with Compreſs and Rowlers, *&c.* there is this farther great Advantage, as ſuppoſe a Perſon to have an Hemorrhage from a large Veſſel, lying deep under the Surface, either in his Neck, Arm, Thigh, or Leg; now in order to ſtop the Blood, the Bandage is apply'd round the whole Neck, Arm, Thigh or Leg, whereby the ſound Veſſels and Parts are ſubject to the ſame Preſſure with thoſe that are ruptur'd, and which alone want the Aſſiſtance of Bandage to ſupport and ſuſtain them. And as the Preſſure is thus apply'd equally to the ſound Veſſels, as it is to thoſe that are broken, and being oftentimes made very tight, whereby the ſound Veſſels being all greatly compreſs'd, the Circulation of the Blood in the Parts without the Bandage reſpecting the Extremities of the Body, becomes greatly interrupted thereby, producing Obſtructions, Inflammations, Gangrenes, Mortifications, with a total Loſs of the Member; which Accidents will become in a great meaſure remedied, by applying and ſubſtituting the Air in the room of ſuch Bandage with Compreſs and Rowlers, *&c.* which may be made for to preſs chiefly upon the ruptur'd Veſſels only, the other ſound Veſſels and Parts being left in a great meaſure at full Liberty and free from Preſſure, ſo that the Blood will circulate therein as uſual, and as if no ſuch Accident had befallen to the Part, *&c.*

CHAP. IX.

New Principles for conſtructing the Pyrometer, for meaſuring the Alterations or fluxionary Increments and Decrements produc'd in the Dimenſions of Bodies, by the different Degrees of Heat apply'd thereto; with its Uſe and Application for regulating the Pendulums of Clocks; as alſo for ſettling an immutable permanent Standard-Meaſure for the Lengths, Capacities, and Weights of Bodies (which are all ſtill wanting) together with its Uſe and Application for eſſaying and meaſuring the Effects produc'd in the animal Fluids and Solids, by Heat, Cold, Humidity, Dryneſs, Fermentation; and likewiſe for meaſuring the Alterations which the living humane Body undergoes in its Dimenſions, from the different Degrees of Gravity, Heat, Cold, Moiſture, and Dryneſs of the Air, or from any other Cauſes whatſoever, as Exerciſe, Reſt, Sickneſs, &c.

1. ELementary Air, and Fire, may be conceiv'd as Menſtruums to each other, the Air or Atmoſphere being always perfectly ſaturated and impregnated with elementary Fire, Light or Heat; from which it acquires thoſe Qualities of being hot in different Degrees, according as this elementary Fluid the Fire happens to have a greater or leſs Quantity of Motion impreſs'd thereon, either by the Sun, *&c.* or as it becomes more or leſs concenterated, condens'd and collected by the Attraction of Bodies; I ſhall not undertake here to decide that much controverted Queſtion, whether Cold be a poſitive phyſical Being, or only a privative negative one; as being nothing more but Heat, conſider'd in reſpect to its ſeveral deſcending Degrees. However this laſt Opinion appears to be the beſt grounded, moſt reaſonable and defenſible, yet nevertheleſs, as the firſt is the moſt general receiv'd Opinion, I ſhall here ſuppoſe it to be the true one, as the Reaſoning and Concluſions which I ſhall deduce from that Suppoſition will be no ways affected thereby, whether it be ſo, or not.

2. Elementary Air, Heat and Cold, we find by their triple combin'd Force and Action, hold an univerſal Empire and abſolute Dominion over the whole Syſtem of terreſtrial Beings, being the principal Agents and Inſtruments by which the Generation, Growth and Corruption of all Bodies are produc'd; and by the continual variable Action of which three general Cauſes, all Bodies both ſolid and fluid, are kept in a conſtant fluxionary State with reſpect to their Dimenſions; which are perpetually changing, being either expanding and rarifying as the Degrees of Heat increaſe, or contracting and condenſing as the Cold increaſes, or the Degrees of Heat decreaſe. And from hence it neceſſarily follows, that as yet we have no perfect Inſtruments for meaſuring and determining exactly the abſolute Dimenſions of Bodies, either ſolid or fluid; for to that Purpoſe it is neceſſarily requir'd, as an eſſential Property of a perfect Meaſure of any Kind, that it be invariable fix'd and always permanently the ſame without Variation or Change in its Dimenſions, for if the Inſtrument or Meaſure itſelf be ſubject to have its own Dimenſions chang'd, as well as the Bodies to be examin'd and meaſur'd thereby, it can never be accounted an abſolute perfect Meaſure. And this is an Imperfection to which all our moſt perfect Standard-Meaſures and Inſtruments of every Kind are ſubject to, as well ſuch as ſerve for meaſuring of Lengths, as Standard-Feet, Yards, *&c.* as thoſe which ſerve for meaſuring the Capacities of Bodies, as Standard-Pints, Quarts, Gallons, *&c.* and likewiſe thoſe Inſtruments which ſerve for meaſuring Time, as Pendulums, *&c.* as alſo ſuch as ſerve for finding the Weights of Bodies, as Standard-Ounces, Pounds, *&c.* All which Standard-Meaſures, Inſtruments, Weights, *&c.* being equally ſubject to have their Dimenſions thus continually chang'd by the Influence of Heat and Cold thereupon, as well as the Bodies propoſed to be meaſured and examined thereby, conſequently can't ſerve to determine the like Alterations produc'd in the Dimenſions of other Bodies, from the Action of the ſame Cauſes.

3. Thus it has been found by Calculation and Experiment, that the proper Length of a Pendulum for to meaſure Seconds of Time muſt be about $39\frac{2}{10}$ Inches, and this will hold nearly true in all Parts of the Earth, making proper Allowance for the Increaſe and Decreaſe of the centripetal and centrifugal Forces; in going towards the Equator, where the centrifugal Force is the greateſt, and the Force of Gravity the leaſt, the Pendulum will require to be ſhortened, but in going towards the Poles, where the centrifugal Force vaniſhes, and the Power of Gravity being there the ſtrongeſt, the Pendulum muſt be ſomewhat lengthned, and proportionally in all the other intermediate Climates. Now with reſpect to the Pendulum there is one very uſeful Problem ſtill wanting to be reſolv'd, that is, to find an Inſtrument whereby the true and abſolute Length of a Pendulum may be actually meaſur'd, and that at any Time, and as often as requir'd; as ſuppoſe it was requir'd to know how much the Pendulum is longer in the greateſt Heat of Summer, than in the greateſt Cold in Winter, or in any other intermediate Degrees between thoſe two Extreams. Now I know of no Inſtrument which the preſent Practice furniſhes for ſolving this Problem, for in order thereto, there is requir'd ſome permanent unalterable Inſtrument or Meaſure for to appeal to, neither will a Clock or Pendulum though ever ſo well adjuſted, ſerve in this Caſe for a perfect Standard-Meaſure or Regulator, by reaſon of its being itſelf ſubject and ſuſceptive of the very ſame Alterations, and as ſuch can never ſerve to meaſure the like Alterations in other Bodies, from the

very ſame Cauſes, and acting alike upon both. This Phœnomenon and Affection then of the Pendulum's becoming longer or ſhorter by the different Degrees of Heat, was not found out and diſcover'd by actual Meaſuring, or by applying any Scale or other Inſtrument thereto, all which Scales or Inſtruments, let them be made ever ſo exact, and of what Materials ſoever, yet inaſmuch as they are all ſubject to have their Dimenſions chang'd, can never ſerve to diſcover the like Changes, either in the Pendulum or any other Bodies. This Affection then of the Pendulum's lengthning and ſhortning, was firſt found out, not by applying any Meaſure thereto, (there being none yet found out proper for that End, for the Reaſons above) but from exact Aſtronomical Obſervations, made with accurate Inſtruments, of the Meridian Tranſits of the Sun and fix'd Stars, compar'd with the Motion of a Pendulum Clock for any Time; which Obſervations of the cœleſtial Bodies in their Appulſes to, and Tranſits over the Meridian, being compar'd with the Motion of a Clock or Pendulum kept going for any Time, furniſh'd the firſt Occaſion for finding out, and remarking this lengthning and ſhortning of the Pendulum, to be one principal Cauſe of the Inequality of its Motion, and of its not keeping equal Pace and Time with the Motion of the cœleſtial Bodies. And the ſaid Aſtronomical Obſervations of the Meridian Appulſes and Tranſits of the Sun and fix'd Stars, are as yet the moſt perfect Meaſure and Regulator for correcting and regulating the Motion of Clocks and Pendulums by.

4. There is therefore one eſſential Property wanting in all our Standard-Meaſures, both for the Lengths and Capacities of Bodies, and the ſame holds equally true as to Standard-Weights, namely, that they are not of the ſame permanent immutable Dimenſions at all Times, which they ought neceſſarily to be, in order to their diſcovering what Alterations other Bodies undergo in their Dimenſions and Weights. Now I humbly think that I have found a Method whereby this Imperfection and Objection may be remedied, and the Problem before propos'd, relating to the meaſuring the exact Quantity of the lengthning and ſhortning of the Pendulum be exactly ſolv'd and determin'd. Now to attain this End there is nothing more requir'd, than to find a proper Method whereby all Standard Meaſures, Inſtruments and Weights, *&c.* when once ſettled and adjuſted, may be kept, or brought at any Time after, when wanted to be uſed, to be of the ſame abſolute Dimenſions which they were of, when firſt ſettled and adjuſted. And for this Purpoſe I ſhall here propoſe ſome new Principles, with the Conſtruction of an Inſtrument, which will ſerve univerſally for meaſuring all the minute Variations which Bodies of all Kinds ſuffer in their Dimenſions from the Influence of Heat and Cold, or any other Cauſes whatſoever.

5. For this Purpoſe *Vide* Vertical Section, Fig. 1. Plate 3. which repreſents an Inſtrument compos'd of two parallel vertical Pieces or Cheeks A a, and B b, join'd together at Top and Bottom by two horizontal parallel Pieces A B, and a b, which four Pieces compoſe a rectangular oblong Frame; r r is a perpetual Screw, apply'd to the Pinion or Wheel u u, in the Center or Axis of which Wheel there is form'd a female Screw 2, 3, 4, 5; with a male Screw s n, adapted thereto, upon turning the Wheel u u round, the male Screw s n becomes thereby either rais'd or lower'd perpendicularly; to one End of the perpetual Screw r r, there is apply'd an Index z x, the angular Motion whereof is computed and meaſur'd by the Diviſions and Numbers upon the Limb of the graduated circular Plate x x, fix'd to the Side B b of the Frame. Fig. 2. is another vertical Section of the ſame Inſtrument, ſeen with the Side B b preſented and turn'd towards the Eye. And Fig. 3. is an horizontal Section or Plan of the ſame Inſtrument, as if ſeen and look'd upon by the Eye plac'd directly above, all the Parts of the Inſtrument being ſuppos'd pervious to the Rays of Light and perfectly tranſparent. Now it is propos'd that ſuch an Inſtrument will ſerve to meaſure all the moſt minute Changes that can happen in the Dimenſions of Bodies, let them be produc'd from what Cauſes ſoever, as I ſhall ſhew hereafter; but in the firſt Place I will ſuppoſe this Inſtrument to be uſed and apply'd as all other Inſtruments and Meaſures are, and obſerve what will be the Conſequence. Suppoſe then it was requir'd with this Inſtrument to meaſure the exact Length of the Iron Rod or Bar E 2, when expos'd to the greateſt natural Heat of the Air in Summer, for that Purpoſe let the cylindrical Bar E 2, (as mark'd by the outermoſt real Lines, in Fig. 1.) be plac'd vertically with its lower End 2, reſting on the Foot or Stand a b, of the Inſtrument or Pyrometer, and exactly underneath the Point n of the Screw s n; if now the Inſtrument or Pyrometer be put in Motion, and the Screw turn'd round until its lower Point n, comes juſt into Contact with the upper End E of the Iron Rod or Eſſay Bar E 2, which being done let the whole Pyrometer be left in the very ſame Poſition, until the Air becomes as cold as it is in the Middle of Winter; ſuppoſing now the two Side-plates or Cheeks A a and B b, of the Pyrometer to be of Iron, and of a like Temper with the Eſſay Bar E 2, which is propos'd to be meaſur'd, in which Caſe upon applying the ſame Eſſay Bar E 2, to the Pyrometer, (which is ſuppos'd remaining in the ſame State as when uſed upon the firſt Eſſay, when the Air was ſuppos'd as hot as at any Time in Summer) there will be no Variation diſcover'd in the Dimenſions of the Iron Rod or Eſſay Bar, even though the ſame be now really ſhorter (which Difference in the Length of the Eſſay Bar, when try'd in thoſe two extream States of the Air as to the Degrees of its Heat, is expreſs'd in the Draught by the Lines E 2, and e 2, the former by real Lines, denoting the Length and Thickneſs of the Eſſay Bar, when expos'd to an Air as hot as in Summer; and the latter by prick'd Lines, repreſenting the Eſſay Bar contracted in its Length and Thickneſs, when expos'd to Air as cold as in Winter) for in this Caſe the Iron Bar upon being apply'd to the Pyrometer,

the ſame will fit in exactly again between the Point n, of the Screw s n, and the other Point 2, directly under it in the Foot of the Inſtrument, exactly in the very ſame Manner as it did in the firſt Trial and Experiment. And this ſerves plainly to ſhew the Error, Imperfection, and Deception of all common Meaſures and Inſtruments, as evidently appears from the Caſe of this Inſtrument, which however capable from its Compoſition and Structure of meaſuring the ſmalleſt fluxionary Increments and Decrements in the Dimenſions of Bodies, with as great Exactneſs as any Inſtrument hitherto invented, yet we ſee plainly that in this Manner of uſing and applying it, the ſame will not ſerve to ſhew or meaſure how much this Iron Bar varies in its Dimenſions, between the greateſt natural Heat in Summer, and Cold in Winter; the Reaſon whereof is, that the Inſtrument or Pyrometer itſelf varies in its Dimenſions, equally with the Eſſay Bar to be meaſur'd thereby; for the two Cheek Plates A a, and B b, of the Pyrometer, being ſuppos'd of Iron, and of a like Temper with the Eſſay Bar, the ſame will become equally lengthen'd and ſhorten'd with the Eſſay Bar, and the Point n of the Screw, will be likewiſe rais'd and lower'd equally therewith, in reſpect of the Point 2, underneath; and conſequently as the Point n of the Screw riſes and falls, or approaches and recedes to, or from the Point 2, in the very ſame equal Manner and Proportion, as the Eſſay Bar becomes longer or ſhorter, conſequently the ſame can never ſhew whether the Iron Bar be either lengthen'd or ſhorten'd, nor how much; and as ſuch can never be accounted a true Standard Meaſure for determining what Changes are produc'd in the Dimenſions of Bodies. And if the two Sides or Cheeks A a, and B b, of the Pyrometer be ſuppos'd of any other Metal or Materials, as Gold, Silver, Copper, Braſs, Wood, *&c.* in that Caſe the Pyrometer will ſhew that there has been an Alteration produc'd in the Dimenſions of the Iron Bar, but at the ſame Time it will not ſhew the true Quantity of this Variation, but only the apparent relative Quantity, that is, the Difference which there is in the Alteration of the Dimenſions of the Sides of the Pyrometer, compared with that of the Bodies to be meaſur'd thereby; which being ſuppos'd of different Metals and Materials, the ſame will become ſuſceptive of different Dilatations and Contractions, from the ſame Degree of Heat apply'd thereto.

6. Having ſhewn that this Inſtrument or Pyrometer, however fitted by virtue of its Compoſition and Structure, for meaſuring the Dimenſions of Bodies, with the Alterations produc'd therein, with the greateſt Exactneſs, and conſequently all other Inſtruments and Pyrometers of what Kind and Conſtruction ſoever; are utterly incapable of meaſuring thoſe ſmall fluxionary Increments and Decrements in the Dimenſions of Bodies. It remains then for to find a Remedy for this Caſe: Now for a Solution of this Problem, the following two ſimple plain Methods are propos'd, to effect which there is nothing more required, than to find a Method, whereby the Inſtrument or Pyrometer before deſcribed, may be ſo manag'd and order'd, as to be render'd at all Times, or only as often as it is wanted to be uſed, in the very ſame abſolute invariable State and Condition, which End may be obtain'd by placing the Pyrometer, before that it is uſed for making any Experiments, all under Water, in a Veſſel for that Purpoſe, ſuch as w w w w, Fig. 4. the Water in which Veſſel muſt be always brought to have the ſame Degree of Heat; and to know when it is ſo, there muſt be a very accurate ſenſible Thermometer T T, plac'd therein, obſerving to keep the Fluid always ſtanding rais'd up within the Tube to the very ſame Height and Diviſion, or Number D, upon the Scale thereto annex'd; the Water being thus always brought to the ſame Temper and Degree of Heat, let the Pyrometer before it is to be uſed be always immerg'd therein, whereby all the Parts of the Pyrometer having an equal uniform Degree of Heat communicated thereto by the Water, will become thereby render'd always of the ſame invariable Dimenſions; and conſequently become endow'd and poſſeſs'd with what is the moſt eſſential Property for to conſtitute a true perfect Standard Meaſure, as is ſhewn by the Section, Fig. 4.

7. But whereas the Immerging the whole Inſtrument or Pyrometer into Water, every time before it is uſed, may be thought troubleſome and unartful; the following Method is therefore propos'd as a more ſimple, neat, expeditious, perfect Method: To which Purpoſe it is to be obſerved, that to ſolve this Problem, there is nothing more requir'd, but to find a permanent, fix'd, immutable Point in the Pyrometer, from whence as a conſtant Radix and Epocha, the Motion of the Screw and Index may always in all Experiments be reckon'd for to commence, and to be computed therefrom: Thus, if the Inſtrument or Pyrometer can be ſo order'd, that the Point n, of the Screw s n, *(Vide* Fig. 1.) can be at all Times, when any Experiments are to be made therewith, ſet at the ſame abſolute Diſtance from the Point 2, in the Foot of the Inſtrument, upon effecting whereof the Problem will become perfectly ſolv'd, and the Pyrometer be fitted for all the Purpoſes and Uſes intended thereby; now to effect this Problem, namely, That the Point n of the Screw may, upon all Occaſions whenſoever the ſame is to be uſed, be ſet exactly at the very ſame immutable fix'd Diſtance from the Point 2, directly underneath in the Pedeſtal of the Inſtrument, which End and Intention can never be gain'd by applying any Scale, Inſtrument or Meaſure whatever thereto, the common Way, how accurate and exact ſoever, for the Reaſons already aſſign'd; but however the ſame may be effected thus, by making uſe of a cylindrical Iron Rod R I, repreſented as ſtanding upon the Pedeſtal a b of the Pyrometer, the upper End whereof R is in the ſame Plain with the lower Point n of the Screw, and conſequently

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at the ſame Diſtance from the Point 2, or the Pedeſtal of the Inſtrument, as the Point n of the Screw: If now this Iron Rod R 1, which may be of a cylindrical Form, and of any Thickneſs and Length requir'd, can be kept and render'd always, or as often as the ſame is to be uſed, of the ſame unalterable fix'd Length; which being done, if the ſaid Iron Rod be plac'd perpendicular upon the Foot of the Inſtrument, with its lower End 1, ſtanding upon the Point 2, and turning the Screw s n, until the Point thereof n, comes juſt for to touch the upper End R, of the Iron Rod R 1, upon doing which the Point n of the Screw may at all Times, and in all Experiments, be moſt exactly ſet to the ſame abſolute immutable Diſtance from the Point 2, or the Pedeſtal a b of the Pyrometer; now to the End that the Iron Rod R 1 (which I ſhall name the Regulator, as being always neceſſary for adjuſting the Inſtrument before it is uſed for making any Experiments of this Kind) may upon all Occaſions be render'd of the ſame fix'd unchangeable Length, it will be neceſſary for that Purpoſe, before it is apply'd for Regulating the Pyrometer, that it be plac'd firſt in a Veſſel w w w w, fill'd with Water (as is ſhewn by the Section, Fig. 5.) the upper Surface whereof is denoted by the prick'd Line w w, with the Regulator or Iron Rod R 1, wholly immerg'd therein, now the Water in this Veſſel muſt upon all Occaſions, be brought to have the ſame abſolute Degree of Heat, and to know how to render it ſo, there muſt be a very ſenſible accurate Thermometer T T plac'd in the Veſſel, obſerving to keep the Spirit or Fluid always rais'd up to the ſame fix'd Height and Number D, upon the Scale affix'd to the Tube, ſo that the cylindrical Iron Rod or Regulator R 1, having by this Means the ſame abſolute Degree of Heat communicated thereto, will become thereby render'd of the ſame abſolute Length and Dimenſions, and conſequently ſerve as a proper Regulator for to adjuſt and ſet the Point n of the Screw, always when wanted, to the ſame abſolute Diſtance from the Point 2, which is all that is requir'd to the Solution of this Problem, whereby this Inſtrument will become fitted for meaſuring with the greateſt Exactneſs, all the aforeſaid Changes in the Dimenſions of all Bodies, let the ſame be produced from what Cauſes ſoever.

8. The Point n of the Screw, being by Means of this Regulator, in all Eſſays and Experiments, ſet exactly to one fix'd unalterable Diſtance from the Point 2, or from the Plain and Surface of the Pedeſtal a b; and the Screw s n, before it is apply'd for meaſuring any Bodies, muſt be turn'd round, until its lower Point n is brought to ſtand at this abſolute fix'd Diſtance, to be determin'd by applying or placing the Regulator R 1 upon the Foot of the Inſtrument, directly underneath the Screw, ſo that the Axis of the Screw and Regulator may coincide, and turning the Screw until the Point thereof n comes juſt into Contact with the upper End R of the Regulator; obſerving when the Point of the Screw is thus adjuſted and regulated, for to ſet the Hand or Index z x, pointing to the firſt beginning Number or Diviſion upon the Limb of the graduated Plate x x: This being done, the Space deſcrib'd and gone over by the Point of the Screw, in moving from this fix'd Point of Diſtance, until it comes into Contact with the Body to be eſſay'd or meaſur'd, will ſerve to ſhew and meaſure what Mutations the ſaid Bodies have undergone as to their Dimenſions; and this Motion of the Screw is to be reckon'd and eſtimated by the Number of entire Revolutions, and Parts of Revolution deſcrib'd by the Index x z, in moving round the Circumference of the graduated circular Plate x x, the outer Limb whereof is divided into a Number of equal Parts, more or leſs, as is moſt convenient. So that the Screw s n of the Pyrometer, being render'd thus capable of being ſet as often as wanted to one and the ſame immutable fix'd Point of Diſtance by means of the Regulator R 1, this Inſtrument becomes thereby endow'd with all the requiſite Properties of a moſt perfect, univerſal, Standard Meaſure, which conſiſts in its being at all Times, or as often as the ſame is to be uſed, invariable and unalterable as to its own Dimenſions, or in its having ſome fix'd unchangeable Point, from whence its Motion is always reckon'd to commence, and to be computed in all Eſſays and Experiments.

9. Having thus found an invariable permanent Inſtrument, and univerſal Standard Meaſure, I ſhall proceed next to exemplify the Application and Uſe thereof, for Meaſuring the ſmall Increments and Decrements produc'd in the Dimenſions of Bodies, by the different Degrees of Heat. The firſt Uſe then that I ſhall make of this Pyrometer, ſhall be for to meaſure the true Quantity of Expanſion and Condenſation produc'd in Metals by the Influence of Heat and Cold thereupon: In relation whereto it may be obſerv'd, that the chief Deſign of making ſuch Experiments upon Metals, is with a View to find thereby a Method for Correcting and Regulating the Errors and Irregularities to which Pendulums are ſubject, of being lengthen'd and ſhorten'd according to the different Degrees of Heat in the Air; now if the true Quantity of this Expanſion in the ſeveral Metals and Fluids was exactly found, and in what Ratio or Proportion this Effect in one Metal or Fluid, differs from that of any other, a Method may from thence be found for conſtructing and compounding the Pendulums of Clocks, in ſuch a Manner, as to keep it always of one immutable Length, and thereby become a perfect Chronometer and equable uniform Meaſure of Time. How this Problem may be effected relating to the adjuſting and compounding the Pendulums of Clocks, ſo as to render them permanently of the ſame Length, and likewiſe how the other Inconveniencies to which Pendulums are ſubject, upon being carried into different Latitudes, from the different Quantities and Powers of Gravity, and the centrifugal Force,

Force, ariſing from the diurnal Rotation of the Earth about its Axis, may be alſo remedied, I have endeavoured to ſhew in another miſcellaneous Paper relating to ſome Subjects in Mechanicks, *&c.*

10. Now in order to diſcover the true Quantity of Expanſion in Metals from the different Degrees of Heat apply'd thereto for that Purpoſe, *Vide* Fig. 6. Plate 3, wherein the Pyrometer before deſcrib'd is made uſe of. Thus let w w h h, be a Veſſel either of Copper, Braſs, Tin, or Glaſs, to the upper End whereof is fix'd a Cover w w; this Veſſel being fill'd full of Water, which may be heated to any Degree, between the greateſt natural or arteficial Cold, and that of boiling Water; which ſeveral Degrees of Heat communicated to the Water in the Veſſel may be known and exactly regulated, by having a Thermometer t t placed therein. The Water in the Veſſel being brought to have the Degree of Heat intended, let a Piece of any kind of Metal e i, in Form of a cylindrical Rod (and which for greater Truth and Exactneſs may be drawn through an Engine, ſuch as is uſed for drawing of Wire, in order to give it a more regular Form) let the ſaid cylindrical metallick Rod (which for better Diſtinction I ſhall call the Eſſay Bar) be put into the Veſſel of Water, through the ſmall round Hole in the Middle of the Lid or Cover w w of the Veſſel, with its lower End i, reſting upon the Bottom h h, whilſt its upper End e, appears juſt coming out through the Hole in the Cover; which Hole needs be no wider than juſt to permit the Eſſay Bar e i to go eaſily in and out thereat. Now before that the Veſſel with the Eſſay Bar is plac'd upon the Foot a b of the Pyrometer, let the Point n of the Screw s n be ſet very exactly to its fix'd Standard Point of Diſtance from the Pedeſtal a b of the Pyrometer, by applying the Regulator thereto (the Manner of doing which has been ſhewn in the former Numbers) the Screw being thus accurately adjuſted, let the Veſſel of Water with the Eſſay Bar therein be plac'd upon the Foot of the Pyrometer, upon the two Pieces of Iron h h, for to keep the Frame of the Pyrometer from being affected by the Heat of the Veſſel, which being done let the Screw s n be turn'd round, until its lower Point n comes juſt into Contact with the upper End e, of the Eſſay Bar, noting how many entire Revolutions and Parts, the Index z x deſcribes, from the firſt Commencement of the Motion of the Screw, until it comes to touch the Eſſay Bar; this firſt Experiment being finiſh'd, let the Water in the Eſſay Veſſel be brought to ſome other Degree of Heat, either greater or leſs than what it had at the firſt Operation; which being done let the Screw s n be again adjuſted anew, by bringing the Point thereof n, to ſtand at the ſame abſolute fix'd Diſtance from the Foot a b of the Pyrometer (which Adjuſtment of the Screw muſt always be done before any Operation is made therewith) then let the Veſſel with the Eſſay Bar be ſet again upon the Pedeſtal of the Inſtrument, and turning the Screw as before until it comes juſt to touch the upper End of the Eſſay Bar, noting the Number of whole Revolutions, and the Parts, deſcrib'd by the Index, as in the firſt Experiment; and by comparing the Motion of the Index at the firſt Operation, with the Motion of the ſame at the ſecond, or any other Operation, the different Effects produc'd in the Dimenſions of the Eſſay Bar, by thoſe different Degrees of Heat apply'd thereto, will become exactly known and meaſur'd. And by repeating the like Operation and Proceſs, the Experiments may be carried on as far as requir'd, and that through all Degrees of Heat, from that of boiling Water, down to that of the greateſt natural or artificial Cold; in all which ſeveral deſcending Degrees of Heat, as the Eſſay Bar will become ſhorter and ſhorter, ſo the Screw will have the longer Space to move, before it comes into Contact with the Eſſay Bar; which different Quantities of Motion deſcrib'd by the Screw and Index, being compar'd together, the different Elongations and Contractions of the Eſſay Bar may be exactly meaſured in paſſing through all the deſcending Gradations of Heat, from that which cauſes Water to boil, down to that which produces freezing, or even further upon Occaſion. And by ſubmitting all the ſeveral Metals to be thus eſſay'd, by applying the ſame abſolute Degree of Heat thereto, which may be done this Way with the greateſt Truth and Exactneſs by means of the Thermometer, the comparative and relative Expanſion produc'd in the ſeveral Metals, by the ſame Degree of Heat, may be moſt accurately determin'd and moſt exactly meaſur'd.

11. Now with reſpect to this new Method of eſſaying and meaſuring the Changes that Bodies undergo in their Dimenſions from the Influence of Heat and Cold; I obſerve that by this Method and Proceſs I have gain'd two capital Points, and upon which alone the whole Truth and Succeſs of all Experiments of this Kind abſolutely depend; the firſt principal eſſential Point to render Experiments of this Sort of Uſe, conſiſts in communicating the Heat to the Eſſay Bar in an equable uniform Degree, ſo that the whole Bar and every individual Part and Particle therein, ſhall have the Heat equally diffuſed and apply'd thereto; whereby all the ſeveral Parts and Particles, elaſtick or unelaſtick, which enter into the Compoſition of the Eſſay Bar, may exert themſelves with an equal Endeavour and Effort; now Water being a fluid Body will beſt of all anſwer this Purpoſe of communicating Heat to Bodies in an equable uniform Manner, in all the ſeveral Degrees from that of boiling Water, down to that Degree of Heat or Cold which produces freezing, or even further, which may be done by Art. And as to this Point relating to the communicating the Heat to the Eſſay Bar, it is abſolutely impoſſible for many Reaſons to propoſe doing of that effectually and truly by any other Method, ſuch as applying the Flame of one or more Lamps thereto, or by the Application of any ſolid heated Body, *&c.* for in all thoſe Methods the Heat will be always directed and communicated unequally to the Eſſay Bar, notwithſtanding all the Care

and Precaution poſſible; there being many Circumſtances concurring in all thoſe Methods of communicating the Heat, any one of which being wanting will render the whole Experiment precarious, uncertain and falſe. So that in all the Methods hitherto attempted for communicating the Heat to the Eſſay Bar, ſome Parts thereof will neceſſarily become more heated than others, ſo that all its Parts will not have an equal Endeavour to dilate and expand, which they ought all to have equally alike, in order to render the Experiment true, uſeful and concluſive. And it is for want of this principal Point, that all Experiments that have hitherto been made upon Metals, to find out the abſolute or comparative Quantity of their Expanſion, can be no ways depended on with any Certainty, nor any uſeful Concluſions or Rules drawn therefrom, to direct to Practice.

12. Moreover, beſides the Errors and Imperfections that muſt neceſſarily follow from the Methods heretofore practiſed relating to the communicating Heat to the Bodies to be eſſay'd; the very Inſtrument or Pyrometer itſelf, though conſtructed in the moſt exquiſite Manner, will be the Occaſion of ſundry material Errors, by reaſon of its being ſubject to have its own Dimenſions chang'd by the different Degrees of Heat apply'd thereto, upon which Account, as has been already obſerv'd, the ſame can never ſerve to meaſure truly the like Changes produc'd in other Bodies from the ſame Cauſe, unleſs the Inſtrument can by ſome Contrivance be renderd permanently, or as often as wanted, of the ſame fix'd unalterable Dimenſions and State. Now as the Pyrometer which I have before deſcrib'd hath this Property of being capable to be adjuſted and regulated to one and the ſame fix'd Point and State, whereby it has in all Operations and Experiments but one unchangeable fix'd Point, from which its Motion always commences, conſequently the ſame becomes poſſeſs'd with what is the moſt eſſential Property and Criterion of a moſt perfect univerſal Inſtrument or Standard Meaſure, which Property no Inſtrument hitherto invented can lay Claim to, and therefore can't ſerve as a true and perfect Meaſure for determining the abſolute or relative Changes produc'd in Bodies, by the different Degrees of Heat. And this is the ſecond capital Point which I propoſe will be obtain'd from the new Method here deſcrib'd.

13. Now in order to ſhew with what Exactneſs and Accuracy the Pyrometer here explain'd will ſerve to meaſure the Degrees of Expanſion and Contraction produc'd in all Bodies, from the Effects of Heat and Cold thereupon, for which End ſuppoſe the Screw s n, to have four Threads in every tenth Part of an Inch, and let the dented Wheel u u, have twenty-five Teeth, ſo that for every four Revolutions of the Wheel (in the Center or Axis whereof is a female Screw) the male Screw s n, will advance or move the Diſtance of one tenth Part of an Inch, either upwards or downwards, and the perpetual Screw r r apply'd to the Wheel, with the Index z x fix'd to one End thereof, will make one hundred entire Revolutions, ſuppoſe then the circular Plate x x to be eight Inches Diameter, which will give about twenty-five Inches for the Circumference, if now each Inch upon the Limb of the Plate, be divided into forty equal Parts, the whole Circumference will contain one thouſand ſuch Parts, which being ſuppos'd; whilſt the Male Screw s n moves only one tenth Part of an Inch, the extream Point of the Index or Hand x z, will have mov'd one hundred Times round the Limb of the Plate, which being divided into one thouſand equal Parts, conſequently if the Eſſay Bar becomes either lengthned or ſhortned only ten hundred Thouſand Part of an Inch, the ſame will become ſhewn and meaſur'd by the Index; and if the Circumference of the Plate x x be ſuppos'd larger, and to have its Limb divided into a greater Number of equal Parts, as ſuppoſe two thouſand, in that Caſe this Pyrometer will ſerve to diſcover and meaſure all Mutations that happen in the Dimenſions of Bodies, to the twenty hundred thouſand Part of an Inch, *&c.* which is a Degree of Exactneſs ſufficient for any Purpoſes and Practices.

14. The Pyrometer before deſcrib'd may be apply'd for making Experiments, either with the Screw s n, and Eſſay Bar e *i*, both plac'd perpendicular to the Horizon, as is ſhewn at Fig. 6. before explain'd; or the Pyrometer may be plac'd upon one Side, with the Screw and Eſſay Bar both parallel with the Horizon, as is ſhewn by Fig. 7. differing from Fig. 6. only in reſpect of its Poſition. And in this laſt Situation, as the Veſſel w w h h, with the Water and Eſſay Bar therein, is plac'd with its Axis parallel to the Horizon, for to prevent the Water from eſcaping out at the Hole in the Cover of the Veſſel, at which the Eſſay Bar is put in, and taken out of the Veſſel, for that End the ſaid Hole muſt be ſecur'd round with Leathers. Within the Veſſel is plac'd a Thermometer t t, ſerving to meaſure the Degrees of Heat communicated to the Water, and by that to the Eſſay Bar at each Operation and Experiment, *&c.*

15. However Water has been here propos'd as the Medium and Vehicle for communicating Heat to the Eſſay Bar, in the Experiments before deſcrib'd, nevertheleſs any other Fluid as Air, Oil, Mercury, *&c.* may be uſed for that Purpoſe; but for all Degrees of Heat, from that of boiling Water, down to that which produces Froſt, Water appears to be the beſt ſuited for communicating all the ſeveral Gradations of Heat to Bodies, between thoſe two Extreams. It is true that Oil, Mercury, or Lead, will receive and communicate a much greater Degree of Heat before they come for to boil, than what Water will, but then the gradual Encreaſe of Heat can't be ſo well aſcertain'd by any of thoſe Fluids, as Oil, *&c.* as it can by Water, becauſe Oil acquiring a greater Denſity and Spiſſitude, the longer it is expos'd to the Action of Fire, the Degrees of Heat which it receives and communicates, becomes different and very unequal; wherefore all Experiments that are made to diſcover and meaſure the true Expanſion of Metals, in order to eſtabliſh and ſettle ſome Rules for directing to Practice, in what relates to the regulating and

correcting the Pendulums of Clocks, had much better be try'd, by having the Heat communicated to the Eſſay Bar, either by Means of Water, or Air.

16. Having ſhewn how metalick Bodies of all Kinds may have the exact Quantity of their Expanſion eſſay'd and meaſur'd, when ſubmitted and made to paſs through all the Degrees of Heat that Water can communicate thereto, from that of boiling Water, to that which produces freezing; now by the ſame Pyrometer any metalick, or other Body, may have all the Changes that are produc'd therein by the different Degrees of Heat in the Air, as exactly ſhewn and meaſur'd, as in the other foregoing Caſes, wherein the Heat was ſuppos'd to be communicated to the Eſſay Bar, by Means of Water. Now this is a Caſe and Problem that I don't remember ever to have known or heard of any Solution to have been given thereto, nor of any Inſtrument or Pyrometer hitherto invented, that is capable of ſhewing and meaſuring the true Quantity of Expanſion and Condenſation produced in Bodies, from the different Degrees of Heat in the Air alone; all the Pyrometers heretofore invented ſerving only to ſhew (and that too but very imperfectly, for the Reaſons already alledg'd, what Changes Bodies undergo, by applying of actual Fire and Flame thereto, by ſolid Bodies made intenſely hot; all which are Degrees of Heat much above boiling Water. But the Method for diſcovering and meaſuring the Alterations produced in Bodies by the different Degrees of Heat naturally in the Air alone, is the principal Queſtion and Problem ſtill wanting to be reſolv'd, as being what ſuits beſt with the Intention and Deſign of accommodating ſuch Experiments for rectifying the Irregularities in the Pendulums of Clocks, foraſmuch as the Changes which they ſuffer in being lengthen'd and ſhorten'd proceeds from the different Degrees of Heat in the Air only. How this moſt uſeful Problem relating to the meaſuring the true Quantity of Expanſion which Bodies undergo from the Degrees of Heat in the Air alone, may be ſolv'd and effected, I ſhall endeavour for to ſhew by ſundry Examples following. And, in the firſt Place, I will ſhew the Method of meaſuring the Changes produced in metalick Bodies, when expoſed only to the Influence of the Air. For this End, *vide* vertical Section, Fig. 1. Plate 3. wherein the Eſſay Bar E 2, is plac'd perpendicular upon the Pedeſtal a b of the Pyrometer, directly underneath the Screw; ſo that the Axis of the Screw s n, and that of the Eſſay Bar, become coincident, the Eſſay Bar being fully expoſed to the open Air; wherein let the outermoſt real Lines E 2, repreſent the Dimenſions which the Eſſay Bar is ſuppoſed to be of, when the Air is as hot as any Time in Summer; let now the Screw s n of the Barometer be adjuſted, by applying the Regulator R 1 thereto (the Manner of doing which has been already ſhewn) which being done, let the Screw and Index be turn'd round, until the Point n of the Screw, comes juſt to touch the Top of the Eſſay Bar E 2, noting the Number of whole Revolutions, with the Parts deſcrib'd by the Index, whilſt the Screw is performing this Motion and Operation: This firſt Trial and Experiment being finiſh'd, ſuppoſe now the very ſame Eſſay Bar to be expos'd to the open Air, when as cold as it is ever found to be in Winter, in which Caſe the Eſſay Bar will be contracted in all its Dimenſions both in Length and Thickneſs, as is repreſented by the inner prick'd Lines e 2; let now the Screw s n, be accurately adjuſted, and ſet to the fix'd immutable Point of Diſtance, as in all Operations; then placing the Eſſay Bar directly underneath in a Line therewith, let the Screw and Index be turn'd round, until the Point n of that Screw comes juſt to touch the upper End e of the Eſſay Bar; obſerving the Number of whole Revolutions, with the Parts deſcribed by the Index, whilſt the Screw is moving from the fix'd unalterable Standard Point of Diſtance, until it comes into Contact with the Eſſay Bar: If now the Quantity of Motion or the Space gone over by the Screw and Index in the firſt Experiment, be compar'd with the Motion deſcrib'd by the Screw and Index in the ſecond Operation and Experiment, the Difference between thoſe two Quantities of Motion, will be the Meaſure, and ſhew the true Quantity of the Elongation or Expanſion and Contraction of the Eſſay Bar, when expoſed to the Heat of the Air in thoſe two extream States or Seaſons of Summer and Winter. And by repeating the like Operation and Proceſs with the Eſſay Bar, when expoſed to all the intermediate Degrees of Heat in the Air, the Effects produc'd thereby in the Eſſay Bar may in like Manner be found and meaſur'd, ſo as to ſhew the Difference to the ten hundred thouſandth Part of an Inch, or with ſtill further Exactneſs if required, as has been ſhewn before; and that without any Error or Poſſibility of Deception, for as the Screw of the Pyrometer is capable of being thus ſo accurately adjuſted and regulated, ſo as to commence its Motion in all Experiments always from one and the ſame abſolute immutable Point; this ſerves as an unerring Rule and Baſis, like to what ſome certain well known Period Radix or Era in Time is, in Reſpect of Hiſtory and Chronology, to which future Facts are referr'd and examin'd, *&c.*

17. The other Section, Fig. 8. Plate 3. ſhews how this Pyrometer may be apply'd for meaſuring at any Time the Changes, as to the lengthening and ſhortening of Pendulums, from the different Degrees of Heat in the Air alone; now in this Caſe the Pyrometer is ſhewn in an inverted Poſition, in Reſpect to what it was in the foregoing Experiments, the Screw s n being in this Caſe preſented with its Point n directed upwards towards the Zenith; whereas in the foregoing Eſſays made with this Inſtrument, the ſaid Point n was directed downwards towards the Nadir Point and Center of the Earth; to the upper Part of the Frame of the Inſtrument let there be ſuſpended an Iron Rod or Wire c P, of the ſame Length as a Pendulum ought to be

be to meaſure Seconds of Time; c is the Center of Suſpenſion, and let the prick'd Arch Line 10, denote the Oſcillations of the Pendulum; if now the Point n of the Screw be nicely adjuſted juſt for to touch the under Part of the Ball of the Pendulum P, and ſuppoſing this to be done when the Air is as hot as ever it is obſerved to be in Summer; if again, when the Air is as cold as at any Time in Winter, the Point n of the Screw be ſet at the very ſame abſolute Point of Diſtance from the Center of Suſpenſion c, as it was upon the firſt Tryal and Operation, when the Air was ſuppoſed to be as hot as any Time in Summer; the Rod or Pendulum being now in this ſecond Operation contracted, will not reach the Point of the Screw by ſome ſmall Diſtance (as ſuppoſe the Pendulum in this ſecond Caſe to vibrate along the Arch 20. inſtead of 10.) and the Motion deſcrib'd by the Index x z, whilſt the Screw moves from the fix'd Standard Point, until it comes juſt to touch the lowermoſt Part of the Pendulum, will ſerve to determine and meaſure the true Quantity of its Elongation and Contraction, by thoſe two extream States of the Air as to its Heat; and by the like Proceſs all the other intermediate Increments and Decrements in the Pendulum, from the other intermediate Degrees of Heat in the Air, may likewiſe be ſhewn and meaſur'd; none of which Changes in the Pendulum can be diſcover'd or meaſur'd by any other Sort of Inſtrument whatſoever.

18. This ſame Pyrometer will ſerve alſo for meaſuring the Alterations produc'd in the ſolid Parts of animal Bodies, as the Bones, Cartilages, Ligaments, Tendons, Arteries, Veins, Membranes, muſcular Fibres, *&c.* upon their being expos'd to Air render'd poſſeſs'd with all Degrees of Gravity, Heat, Cold, Humidity, Dryneſs, *&c.* Thus in the Section, Fig. 6. Plate 3, let e r repreſent a humane Bone, inclos'd in the Veſſel w w h h, in the Middle of the Cover of the Veſſel is a Hole, by which the Bone is put in, and taken out, the upper End of the Bone juſt appearing at the Orifice or Hole; now this Veſſel may be underſtood to be fill'd either with pure Air, or with Air impregnated with Vapours and Effluvia of all Sorts, or the ſame may be fill'd with Water, or with any other Fluid or Liquor, ſimple and compound; and whether the Veſſel be fill'd with Air alone, or with Air and any other Fluids, *&c.* the ſame may have all Degrees of Heat, *&c.* communicated thereto; and the Effects or Alterations that become produc'd in the Bone, by the Action and Influence of the aforeſaid, and all other Cauſes that can be apply'd thereto, and whether they be ſuppos'd for to operate ſingly or jointly, and that in all Degrees, Proportions and Combinations, may be moſt exactly meaſur'd by this Pyrometer, according to the Methods already ſhewn in other the like parallel Caſes.

19. Moreover in the Section Fig. 8. Plate 3, let c P, (which before was underſtood to repreſent a Pendulum) be now conceiv'd to be either a humane Tendon, Ligament, or a Piece of any Membrane, Artery, Vein, Inteſtine, or a ſmall Bundle of muſcular Fibres or Nerves, *&c.* which let be expos'd to the Action and Influence of Air, render'd poſſeſs'd with all Degrees, either of Gravity, Heat, Cold, Humidity, Dryneſs, *&c.* which Air may alſo be impregnated with Vapours and Effluvia rais'd from Bodies of all Kinds, *&c.* in all which ſeveral Caſes, the Mutations that become produc'd in the ſeveral Parts above mention'd of the animal Body, from the mechanical Influence and Effects of any one of the above Cauſes, or any Number of the ſame, operating thereupon either ſingly or jointly, and that in all Degrees, Proportions, Alternations and Combinations, may be exactly ſhewn and meaſur'd; as has already been ſhewn in the Caſe of the Pendulum. And if the aforeſaid Parts of the animal Body be laid to ſoak in any Fluid, as Water, Wine, Vinegar, Spirit of Wine, Milk, Urine, Mercury, *&c.* for any Space of Time, the abſolute and relative Changes that become produc'd therein from the Action of thoſe, or any other Fluids apply'd either ſingly or jointly thereto, may alſo be moſt exactly ſhewn and meaſur'd, in like Manner as has been already ſhewn in other parallel Caſes. And from a Series of ſuch Experiments thus accurately made upon the ſolid Parts of animal Bodies, it is propos'd that many uſeful Obſervations and general Rules may be deduc'd, by ſhewing what Effects either relating to Health or Diſeaſes may be produc'd from the like Cauſes acting either ſingly or jointly upon the humane Body; and thereby direct to the proper Indications of Cure, according to the ſeveral analogous States and Circumſtances of Perſons. And it may be farther obſerv'd, in the Proſecution of the aforeſaid and other the like Experiments upon the ſolid Parts of animal Bodies, in ſo far as it is done with a View to promote the Knowledge and Cure of Diſeaſes, that it will never be neceſſary to ſubmit the Parts to be eſſay'd to any greater or leſs Degree of Heat, (let what Fluid ſoever be made uſe of, whether Air, Water, Wine, Milk, *&c.*) above or below the greateſt and leaſt Degree of Heat, compatible with animal Life.

20. Having in the preceding Numbers ſhewn how the Alterations produced in Bodies by the Influence either of Heat, Cold, or any other Cauſes whatever, may be exactly and univerſally ſhewn and meaſur'd, and that with Reſpect to all ſolid Bodies animal, vegetable, metalick, *&c.* I come now in the next Place to exemplify the Uſe of this Inſtrument farther, by ſhewing how the ſame will ſerve equally for to meaſure the like Changes in Fluids, as to their Rarefaction and Condenſation, whether produc'd by the Application of different Degrees of Heat to the ſame Fluid; or of the ſame Degree of Heat to different Fluids: The Manner of doing which may be underſtood by the Draught and Section, Fig. 9. Plate 3. wherein let q q h h, be a Veſſel of Braſs, Copper, Tin, or Glaſs, having a Cover q q fix'd on at Top thereof, which let be fill'd with Water, which may be made hot in all Degrees, from that which produces boiling, down

to

to freezing, all which ſeveral Degrees of Heat in the Water, will become known by obſerving the Thermometer T T, placed within the Veſſel; in the Middle of the Cover q q, of this Veſſel, there is a round Hole, through which the cylindrical Veſſel w w w w is put in, and plac'd ſtanding within-ſide upon the Bottom of the Veſſel q q h h; this Inner Veſſel may be of Glaſs or Tin, and is to contain the Fluids to be eſſay'd, either Water, Wine, Milk, Urine, Oil, Blood, Chyle, Serum, Bile, Saliva, Mercury, *&c.* upon the upper Surface of the Fluid; mark'd by the prick'd Line w w, there ſwims a Float F, which may be a hollow Glaſs-bubble of a ſpherical or cylindrical Figure, to which there is fix'd a ſmall Stem or Piece of ſtreight Iron Wire F P, the upper Part whereof moves freely, without Confinement upwards and downwards, within a ſmall round Hole in the Middle of the Cover w w, of the Eſſay Veſſel; now as the Fluid in the ſaid Veſſel becomes more or leſs rarefy'd, by the different Degrees of Heat communicated thereto, by the Water in the exterior Veſſel q q h h, the Float F, with its directing Rod or Iron Wire F P, will become rais'd and lower'd proportionally, which Motion or Space gone through by the directing Iron Wire of the Float, being caus'd by the Rarefaction and Condenſation of the Fluid to be eſſay'd, and being an Effect adequate and proportional thereto, conſequently the true Quantity of the Rarefaction and Condenſation of the Fluid to be eſſay'd, may be found and meaſured by applying the Pyrometer thereto, by firſt adjuſting and regulating the Screw s n, (the Manner of doing which has been ſhewn already) and then cauſing the ſame with the Index x z, to move round until the Point n of the Screw, comes juſt for to touch the upper End P of the Rod or Stem of the Float, and the Revolutions and Parts deſcrib'd by the Index in performing that Operation and Motion, will ſhew and meaſure the Quantity of Rarefaction produc'd in the Fluid, by applying ſuch a Degree of Heat thereto: And thus the ſame Fluid may be ſubmitted to all the ſeveral Degrees of Heat, from that of boiling Water, down to that which produces freezing; and the ſeveral Degrees of Rarefaction, conſequent from ſuch Degrees of Heat, become meaſur'd in like Manner, whereby the abſolute and comparative Degrees of Rarefaction and Condenſation in all Sorts of Fluids may be meaſur'd, *&c.*

21. As this Pyrometer will ſerve, as has been ſhewn, for making many uſeful Experiments upon the animal Solids, ſo in like Manner the ſame may be apply'd for making many luciferous Experiments upon the animal Fluids, from whence many uſeful Obſervations and Rules may be deriv'd to direct to Practice in the Cure of Diſeaſes, as alſo for diſcovering the comparative relative Forces of the Solids and Fluids, with Regard to the Relaxation and Contraction of the Solids, and the Rarefaction and Condenſation of the Fluids, the Knowledge of both which relative States of the Solids and Fluids is of the greateſt Importance to a Phyſician, and may with a good Degree of Certainty be judg'd of and determin'd, from a regular Series of ſuch Experiments, made with ſuch an Inſtrument, and carefully regiſter'd for future Obſervation and Practice. And after this Manner all the animal Fluids, as the Blood, Serum, Chyle, Urine, Saliva, Bile, Pancreatick Juice, *&c.* may have their abſolute and relative Expanſion and Condenſation examin'd and meaſur'd, when ſubmitted to all Degrees of Heat: And in like Manner may be meaſur'd the relative Rarefactions produc'd by Fermentation, or mixing either ſolid or fluid Medicines, with the Blood alone, or with any of the above Fluids ſeparated therefrom. And it is farther propoſed, that many curious uſeful Experiments may be made this Way, by mixing of Poiſons or deleterious Subſtances, either animal, vegetable, or mineral, with the Blood, *&c.* ſuch as the Poiſon of the Viper or of a mad Dog, *&c.* obſerving and examining with this Inſtrument what Changes have been produc'd therein, reſpecting the Rarefaction and Condenſation thereof, *&c.* from which and the like Experiments many uſeful Obſervations may be deriv'd to direct to Practice.

22. It may be farther remark'd, that in order to diſcover with greater Certainty and Truth the relative Expanſion of different Fluids, it will be neceſſary that they be all try'd in one and the ſame Eſſay Veſſel, for in uſing different Veſſels the ſame may vary conſiderably in the Diameters of their Bores or Capacities, and in the Thickneſs of the Glaſs or Metal whereof they are made, on both which Accounts the ſame Degree of Heat can't be communicated alike, nor produce the ſame or like Effects upon the Fluids to be eſſay'd therein: And moreover, as the Atmoſphere produces different Effects upon Bodies, not only by the different Degrees of Heat and Cold therein, but likewiſe in Reſpect to the different Degrees of its Gravity, Humidity, *&c.* Now as the Gravity, Heat, and Humidity of the Atmoſphere, are diſtinct Properties, Qualities and Cauſes, each of which produce ſeparate Effects proportional to itſelf, and independently of each other; wherefore in all Experiments and Operations where there is a conjunct Action of all thoſe diſtinct Cauſes,, namely, the Gravity, Heat, and Humidity of the Air, and more eſpecially in all the Experiments propoſed in the foregoing Numbers, relating to the animal Solids and Fluids, beſides having a Thermometer to meaſure the Degrees of Heat in the Air, or any other Fluid, at the Time of making the Experiment; it will be requiſite likewiſe to have a Barometer for to eſtimate the State of the Atmoſphere as to its Gravity: as alſo a Hygrometer, to ſhew the Quantity of aqueous Vapours or Humidity reſiding therein, *&c.*

23. The animal Machine conſiſting of two general Principles, the Solids and Fluids, which when duly proportion'd to each other, and having their moving Forces, Quantities and Qualities relatively well conſtituted, ſo as to produce a juſt Equilibrium between the moving Force of the

Solids, and the Re-action or Reſiſtance of the Fluids, Health will enſue as the neceſſary Conſequence of ſuch a State; but whenever this Balance between the ſaid two Powers becomes alter'd, by the one's prevailing over the other, Diſeaſes of all Kinds will thence ariſe. Thus a moderate Degree of Heat acting with a grateful Stimulus upon the ſenſitive Organs, tends greatly to relax the Solids, and at the ſame time by rarefying the Fluids, gives the latter an Advantage and Prevalence over the former; whereas Cold acting as a dolorifick diſagreeable Stimulus, contracts the Solids, and condenſes the Fluids, whereupon the Solids in their Turn gain an Advantage and Prevalence over the Fluids: And thus by the variable Degrees of Heat and Cold, the Equilibrium between the Solids and Fluids, becomes conſtantly chang'd from one Side to the other: And as thoſe Changes in the Gravity, Heat, and Cold of the Atmoſphere, are kept nearly equal and upon a Par, conſidering one Seaſon of the Year with another; ſo that in deſcending gradually from Summer to Winter, or from Day to Night; and in aſcending from Winter to Summer, or from Night to Day; the Balance, as to the Effects produc'd by Heat and Cold, *&c.* is kept pretty near equal and upon a Level; for as in Summer, or in the Day-time, the Fluids being much heated and rarefy'd, have thereby an Advantage over the Solids, which are then more relax'd, by the prevailing Heat of the Air and expanſive Force of the Fluids; ſo on the other Hand in the Winter Seaſon and at Night, the Solids being contracted by the Cold or diminiſh'd Degree of Heat in the Air, and the Fluids becoming by the ſame Cauſe more condens'd, in which Caſe the Balance becomes chang'd in Favour of the Solids, which now in their Turn gain an Aſcendant and Prevalence over the Fluids; and thus alternately and ſucceſſively during the Life of the Animal, this Equilibrium between thoſe two Antagoniſt Powers, the animal Solids and Fluids, is kept in a continual changeable State, by the variable Degrees of Gravity, Heat, and Cold in the Atmoſphere; the Balance inclining ſometimes in Favour of the Solids, and at other Times in Favour of the Fluids, and that pretty equally and alike.

24. Allowing the general Reaſoning and Obſervations foregoing to be true, it is thereupon propoſed, that if a Method can be found for meaſuring the Alterations which the humane Body is ſubject to from the Influence of the aforeſaid general Cauſes, very certain Indications and general Diagnoſticks may be thence deriv'd, for judging of the relative comparative Force and State of the Solids and Fluids, and to know to which Side the Balance ſeems to lean, and whether the Solids have the Aſcendant over the Fluids, or the Fluids over the Solids, either one or the other being the Caſe in all Diſeaſes; and is therefore the primary Point to be firſt regarded and known, in order to judge rightly of the Indications, with the Regimen and proper Method of Cure.

25. Having already ſhewn how the Effects produc'd by applying different Degrees of Heat, Cold, Moiſture, *&c.* to the animal Solids and Fluids, when taken out of the Body; and ſubmitted to be eſſay'd ſeparately, may be exactly found and meaſur'd; I come now in the next Place to ſhew how the ſame Inſtrument, with ſome Additions thereto, will ſerve to diſcover and meaſure with equal Exactneſs, all the fluxionary Alterations which the living humane Body undergoes, in its Dimenſions from the variable Gravity and Heat of the Air. For this End *vide* Draughts, Fig. 14. and Fig. 15. Plate 3. wherein the humane Body is repreſented as ſtanding in an erect Poſture, within a Frame C F D P, which may be all of Iron, conſiſting of two horizontal Pieces, one at Top, C F, and the other P D, at Bottom; which ſerves for the Foot or Stand of the Frame; thoſe two horizontal Pieces are join'd together by two vertical Pieces, C P, and F D, in the Middle of which laſt Piece there is a Slit lengthwiſe, within which Slit or Groove the Pyrometer is fitted to ſlide up and down by Means of a Dove-Tail, the Screw s n, paſſing through the Slit or Channel. A a B b, is the Pyrometer, conſtructed like to that of Fig. 1. Plate 3. already deſcrib'd; which Pyrometer by cauſing the ſame to ſlide up or down within the Groove, the ſame may be brought to bear with the End n, of the Screw directed pointing againſt any Part of the Body, from the Head to the Foot, and that either to the fore or back Part of the Body, or to either Side as requir'd; the Pyrometer being thus apply'd and properly directed to the Part of the Body to be meaſur'd, may be faſten'd to the Side of the Frame with Screws, in which Caſe it will ſerve to meaſure all the Alterations in the Dimenſions of any Part of the Body, let the ſame proceed from what Cauſes ſoever, whether from the changeable Gravity, Heat, Cold, Humidity, Dryneſs, *&c.* of the Atmoſphere; or from the Influence of ſome Diſeaſe, as Fever, Dropſy, *&c.* The Pyrometer being apply'd to the Side of the Frame as in Fig. 14. ſerves to meaſure the Alterations in all Parts of the Body conſider'd laterally, or as the Body becomes either dilated or contracted tranſverſly in Reſpect of its Axis; but when it is intended to meaſure what Alterations the Body undergoes as to the lengthening and ſhortening of the Axis of the whole Body, in that Caſe the Pyrometer muſt be taken off from the Side of the Frame of Fig. 14. and fix'd upon the Top of the ſame Frame as is ſhewn by Fig. 15. the Screw s n, paſſing through a Hole in the Top-piece C F, and directed with its End n directly over the Crown of the Head, ſo that the Axis of the Body, and Screw, become co-incident. The Pyrometer thus apply'd will meaſure with the greateſt Exactneſs all the Mutations, as to the lengthening and ſhortening of the Axis of the Body. Suppoſe then a Perſon wanted to meaſure what Alterations his Body underwent as to its Dimenſions conſider'd laterally, at one

Period

Period of Time, to be compared with what they are at any other Time; as ſuppoſe in Spring, Summer, Autumn, and Winter; or Morning, Noon, and Night; or in what Manner his Body is affected by the changeable States of the Atmoſphere, as to its Gravity, Heat, Cold, Humidity, &c. for that Purpoſe let the Pyrometer be fix'd to the Side of the Frame of Fig. 14. which being done, let the Screw s n be carefully adjuſted, by ſetting the Point n of the Screw, always in every Operation and Experiment, at one and the ſame abſolute Diſtance from the Inſide of the oppoſite Cheek or Side c p of the Frame, by applying a proper Regulator thereto, the Method of doing which has been already ſhewn; the Screw being thus regulated, let the Perſon preſent his Body ſtanding upright within the Frame of the Machine; ſuppoſe now he wanted to know or meaſure the Dimenſions of that Part of the Trunk of his Body lying over the Region of the Stomach, either before eating, or entering upon any Kind of Exerciſe, as bathing, walking, riding, vomiting, purging, bleeding, &c. or during the Remiſſion or Intermiſſion of any urging Symptom or Paroxiſm of any Diſtemper, Agues, Cholic, Iliac Paſſion, Hypocondriac and Hyſteric Affections, &c. For that Purpoſe having fix'd the Pyrometer to the Frame with the Point n of the Screw, directed to the Region of the Stomach, and having previouſly regulated the Screw as before deſcrib'd, let the Screw and Index x z, be turn'd round, until the End n of the Screw comes juſt for to touch his Body, (and for greater Exactneſs he may make a ſmall Mark with a black Silk Patch, upon that very Part of his Body where the End of the Screw touches, to the End that in any future Trial he may be more certainly directed, to bring the Point of the Screw to the very ſame Point of his Body again) then let the Number of Revolutions with the Parts deſcrib'd by the Index, whilſt the Screw is moving from the fix'd Standard Point of Diſtance, until it comes into Contact with his Body, be carefully noted and regiſter'd, after the Operation. If now the ſame Perſon wanted to know or meaſure the ſame Part of his Body at any other Time, either in Spring, Summer, Autumn, Winter, Morning, Noon, or Night; or after eating, or leaving off Exerciſe of any Kind, as bathing, walking, riding, vomiting, purging, bleeding, &c. or during the Continuance of any Symptom or Paroxiſm of a Diſtemper, as in the Height of a Fever, Cholic, Hypocondriac Diſorders, &c. having for that End firſt of all carefully adjuſted the Screw of the Pyrometer as before explain'd, let the Perſon preſent his Body again in the very ſame Attitude and erect Poſture within the Frame of the Inſtrument as at the firſt Experiment, with the Screw directed againſt the very ſame Point of his Body as at firſt; then let the ſame with the Index be put in Motion, until the End of the Screw comes juſt to touch his Body in the very ſame Part as in the firſt Trial, noting the Number of Revolutions, with the Parts, gone over by the Index. If now the Motion of the Index at the firſt Operation, be compar'd with its Motion in the ſecond; the Difference in the ſaid two Quantities of Motion, will ſerve to ſhew and meaſure what Difference there is in the Dimenſions of that Part of the Body, at the Times of making thoſe Experiments. And by the like Proceſs and Operation the lateral Dimenſions of any other Part of the Body may be meaſur'd at any Time, by ſetting the Pyrometer higher up or lower down, ſo that the Axis of the Screw s n, may be underſtood to be at the ſeveral prick'd Lines, 11, 22, 33, 44, &c. Suppoſe again, the ſame Perſon wanted to know or meaſure the exact Height of his Body, either in the Spring, Summer, Autumn, Winter, Morning, Noon, or Night; or either before his entering upon any Kind of Exerciſe, or after leaving the ſame off; or upon any Change that the Atmoſphere may undergo as to any of its Properties or Qualities; for this Purpoſe the Pyrometer muſt be fix'd upon the Top of the Frame, as at Fig. 15. and having adjuſted the Screw, by ſetting the Point thereof n, always to one abſolute invariable Diſtance from the upper Surface of the Foot or Pedeſtal d p of the Frame (by applying a proper Regulator thereto, as has been already ſhewn) the Screw being thus regulated, and the Perſon ſtanding within the Frame with his Body full erect, let the Screw and Index be turn'd round, until its lower End comes juſt to touch the Crown of his Head, noting the Number of whole Revolutions, with the Parts gone over by the Index, whilſt the Screw is moving from the fix'd Standard Diſtance, until it comes to touch his Head; and this will ſhew the true Meaſure of the Height or Length of his Body for this preſent Time and Operation: And by repeating the like Operation at any other Time or Caſe, upon comparing the Quantities of Motion deſcrib'd by the Index at each Operation, the Differences in the ſaid Motions will ſhew and meaſure the Increments or Decrements that happen in the Height or Length of his Body, and ſhew whether the Body has gain'd or loſt in its Height or Length, and how much, &c. And after this Manner may the Dimenſions of the Body in all its Parts be moſt exactly meaſur'd, let the Cauſes that produce thoſe Alterations therein be what they will, whether from the Properties or Qualities of the Air, or from Exerciſe or Reſt, or any morbid State of the Solids and Fluids, or Mal-Regimen as to the Uſe of the Non-naturals, &c.

26. Now with Reſpect to this Practice of meaſuring the humane Body, it is humbly propos'd, that ſundry uſeful general Indications and practical Rules may be deduc'd therefrom, to direct what Regimen a Perſon ought to purſue in Reſpect to Exerciſe and Reſt, Aliment, Air, Retention, Evacuation, &c. Thus for Example, ſuppoſe a Perſon, enjoying a confirm'd State of Health for ſome Time, let him at ſuch a particular Time when he finds himſelf in the moſt perfect Plight and Vigour both of Body and Mind, take the exact Meaſure and Dimenſions of

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the principal Parts of his Body with this Inſtrument, noting carefully the Temper of his Body, as alſo of the Atmoſphere as to the Degree of Heat in both at that very Time, which he may know with a Thermometer; let him alſo at the ſame Time note the State of the Air, both as to its Gravity, and Humidity; the firſt whereof he may learn by a Barometer, and the ſecond by a Hygroſcope; and let the Dimenſions which the Body is found to have at this particular Time (the Dimenſions being taken both in Length and Thickneſs in all the principal Regions and Parts of the Body, as the Head, Trunk, and Limbs) be carefully regiſter'd, noting the particular Degree of Heat in the Perſon's Body, with the Gravity, Heat, and Moiſture in the Air, *&c.* Now as the Perſon in this Caſe is ſuppos'd to be in a State of perfect Health, and that for ſome conſiderable Time, and the Perſon's Body being meaſur'd at ſuch a Time as he finds himſelf enjoying the greateſt Freedom, Strength and Vigour, for performing all Operations both of his intellectual and corporeal Faculties; the Dimenſions which his Body is found to be of in this Caſe, and at this particular Time, I ſhall call the Standard Meaſure or Criterion of perfect Health, with Reſpect to this particular Perſon; and as often as the ſaid Perſon upon meaſuring of himſelf finds his Body to recede and differ from this Standard healthful Meaſure, either with Reſpect to the Bulk or Dimenſions of his Body, or as to the Heat thereof, he will as often and neceſſarily find a proportional Alteration produc'd in his intellectual and animal Powers. And conſequently ſuch an Inſtrument whereby to take the exact Dimenſions of the principal Parts of the Body at proper Times, will ſerve as a very good Monitor to give timely and early Notice, by diſcovering the firſt Beginnings of ſuch approaching Changes in the animal Syſtem, before they become too far advanc'd and confirm'd, and break out into an actual Diſeaſe; juſt in like Manner as a Barometer, Thermometer, and Hygrometer, *&c.* ſerve to give previous Notice of the approaching Alterations and Storms that are a gathering and forming in the Atmoſphere, before they come to be actually felt and produc'd. Now to exemplify and illuſtrate this Reaſoning and Practice a little farther; ſuppoſe then the Perſon referr'd to in the foregoing Caſe, upon meaſuring himſelf with this Inſtrument at any Time afterwards, finds that his Body will not paſs within the Inſtrument, when ſet and adjuſted to the Standard Gage Meaſure of his healthful State, as found ſettled and regiſter'd before, from whence he will become furniſh'd with the following certain Obſervations and Facts, namely, that his Body is increas'd in Bulk and Dimenſions, above what it ought to be, compar'd with his Standard Meaſure of Health, taken and regiſter'd as above directed; let him next examine the State and Temper of his Body, as alſo of the Atmoſphere, as to the Degrees of Heat in both, with the very ſame Thermometer which he made uſe of before, obſerving alſo the State of the Air as to its Gravity, and Humidity, with the ſame Barometer and Hygrometer which he uſed at firſt ſettling of the Standard Meaſure for his Health; being furniſh'd with thoſe certain Facts and Experiments, ſuppoſe then that he finds the Heat of his Body, as alſo the Gravity, Heat, and Humidity of the Atmoſphere, to be the very ſame, or nearly ſo, as they were at the Time of ſettling and adjuſting the Standard Gage and Meaſure of his healthful State (of all which Particulars he will be inform'd from his Regiſter or Journal) and being now furniſh'd with thoſe Facts and Obſervations, he may proceed to Reaſon, and draw the following probable practical Concluſions and Indications therefrom, namely, that finding his Body to be thus ſenſibly augmented in Bulk and Dimenſions, and all other Cauſes and Circumſtances, ſuch as the Heat of his own Body, as alſo of the Air, together with its Gravity and Moiſture equal, or nearly ſo, with what they were at the Time when the Standard Meaſure of his Health was taken and regiſter'd; from whence he may reaſonably conclude, that this Increaſe and Augmentation in the Bulk and Dimenſions of his Body, muſt probably be the Effect of a real Plethora, Repletion, or Retention of ſome Matter that ought to have been diſcharg'd by ſome of the Secretions, either by Urine, Perſpiration, *&c.* But if the Gravity and Cold of the Atmoſphere ſhould be found conſiderably greater, than at the Time of ſettling his healthful Standard Meaſure, there is Reaſon then to conclude farther, that in this Caſe the Quantity of Matter retain'd and accumulated, whereby the Bulk of his Body is thus increas'd, is much greater than what there was Room to judge it to be in the Caſe before, and that from the joint Action of thoſe two other Cauſes, namely, a greater Degree of Gravity, and Cold in the Atmoſphere, both which Cauſes tend to condenſe and contract the Dimenſions of the Body. But if in Caſe he finds the Heat of his Body to be now conſiderably greater, than at the Time of ſettling his healthful Standard Meaſure, then there is reaſon to conclude, that this increaſed Bulk of his Body is not altogether owing to a real Quantity of Matter retain'd unduly in the Body, that ought to have been diſcharg'd, but that the ſame may reaſonably be produc'd as an Effect rather of the Rarefaction of the Fluids, and an Expanſion of the whole Body from this increas'd Degree of Heat now obſerv'd in his Body; and ſhould the Gravity of the Air happen to be at this Time leſs, and its Heat and Humidity both greater than at the Time of adjuſting his healthful Standard Meaſure, now as the three laſt States of the Atmoſphere tend all to relax the Solids, and thereby render them leſs capable to withſtand and reſiſt the diſtending Force of the circulating rarefy'd Fluids; all which diſtinct Cauſes conſider'd as co-operating with one Tendency, together with the increas'd Heat of the Perſon's Body, will afford reaſonable Grounds to conclude, that this augmented Bulk of the Perſon's Body is chiefly owing to a Relaxation of the Solids, and a Rarefaction of the Fluids, produc'd by the joint Action of the aboveſaid

Cauſes,

Cauſes, all which contributing to unbend and relax the Solids, which muſt thereupon give Way and yield to the expanſive Force of the rarefying heated Fluids, whereupon the Perſon's Body may become augmented, and not altogether from a real Plethora or Accumulation of Matter, that ought to have been ſecern'd, as was ſuggeſted to have been the Cauſe, from the firſt Circumſtances and Stating of the Caſe, *&c.* And again on the contrary, ſuppoſing the ſame Perſon upon meaſuring his Body at any other Time, inſtead of finding his Body to exceed, finds the ſame to fall ſhort of the Dimenſions which it ought to have, compar'd with his healthful Standard Meaſure; which Difference and Effect when duly weigh'd and compar'd with the State of the Perſon's Body at this Time, together with the Gravity and Humidity of the Air, may furniſh very good Obſervations, which when duly compared together, will ſerve to diſcover what are the true Cauſes of ſuch Diminution in the Dimenſions of the Body, at this Time, and whether the ſame be owing to any increas'd Secretion, or to any Contraction and Condenſation of the Solids and Fluids, from the increas'd Gravity, Cold and Dryneſs, *&c.* of the Air, or any of the other Non-naturals; from all which Experiments, Facts and Obſervations, proper Indications may be deduc'd, directing what Regimen and Meaſures to purſue, in order to reſtore the Equilibrium and Balance of Health, and bring the Perſon's Body to agree as near as may be with his healthful Standard Meaſure, obſerving in all ſuch Experiments, to make proper Allowance for the natural Increaſe of the Body, whilſt in a growing State, and aſcending towards the Meridian of Life, as alſo for the natural Waſte and Decays of the Body, in the other deſcending or declining Part of Life, *&c.*

27. Moreover in all Affections and Diſeaſes affecting the Head and Brain, as the Hydrocephale, Apoplexy, Epilepſy, Lunacy, Vertigo, Cephalalgia, Megrim, Mania, Palſy, *&c.* in which ſeveral Caſes it is reaſonable to think, that the Sutures, as well as the Subſtance of the Brain and Cranium muſt become ſenſibly affected and alter'd, by becoming either relax'd and dilated, or contracted beyond what they are in their natural healthful State and Standard Meaſure, whereby the Dimenſions of the Cranium or Head will in a healthy State be found very different from what it is when affected with any of the above or like Diſeaſes. Wherefore it is propos'd, that by taking the Dimenſions of the Head or Cranium, of a Perſon laterally, as alſo before and behind when in a State of perfect Health with the Inſtrument as before deſcrib'd, and comparing the ſame with the Dimenſions of his Head and Cranium when under the Influence and Dominion of any of the aforeſaid Diſtempers, or others of a like Kind retaining to the Region of the Head and Brain, that there will be a conſiderable Difference found, from whence may be drawn proper Indications and Obſervations, both to form a more certain Judgment concerning the original Cauſes, with the beſt Method of curing ſuch Diſeaſes.

28. By this Method of ſubmitting the humane Body to an actual Menſuration at any Time with this Inſtrument, together with the joint Aſſiſtance of a Barometer, Thermometer and Hygrometer, it is propos'd, that a much more certain Judgment may be made of the State of the Body, as to the relative comparative Forces of the Solids and Fluids, and much truer Indications, Diagnoſticks and Prognoſticks deduced therefrom, than what can be obtain'd from the Uſe of the once famous ſanctorian ſtatical weighing Chair, which Machine is in ſundry Reſpects very fallacious and deceitful, and therefore its Teſtimony with the Indications and Computations that have been grounded thereon not to be abſolutely rely'd on, as might be eaſily ſhewn.

29. Moreover, this Pyrometer having a convenient Apparatus, properly accommodated and apply'd thereto, will ſerve as the moſt perfect and accurate Barometer, Thermometer, and Hygrometer, *&c.*

F I N I S.

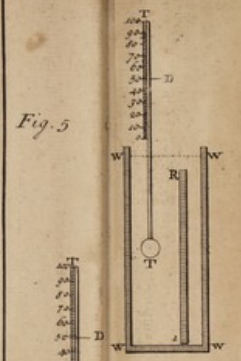
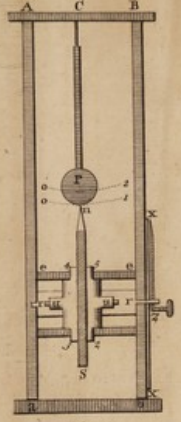


Fig. 5



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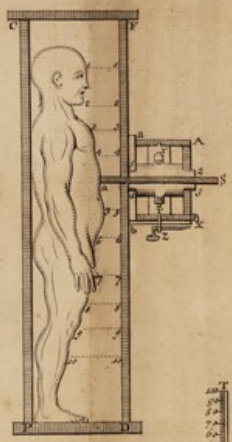
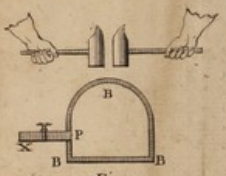


Fig. 14

Fig. 15

Fig. 11



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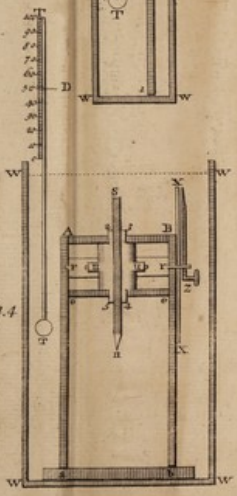

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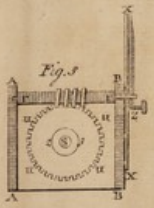

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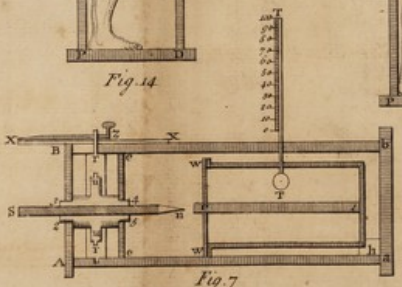

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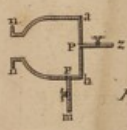

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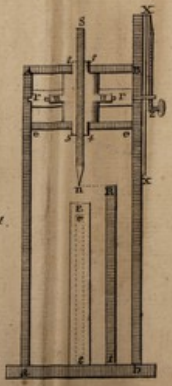
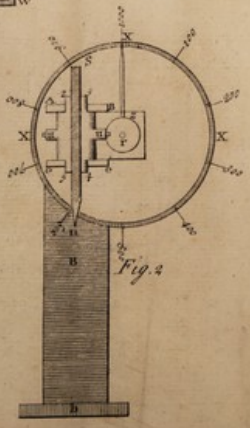


Fig. 1



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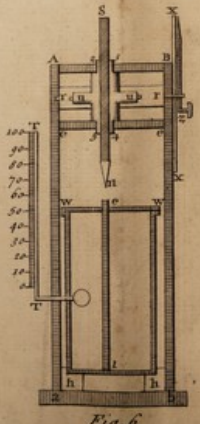

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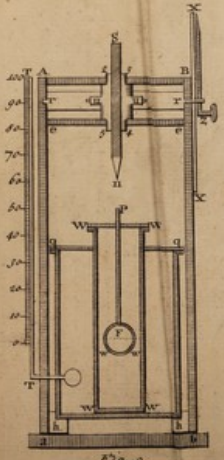

Fig. 9

Fig. 10

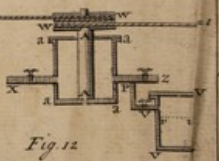

Fig. 12

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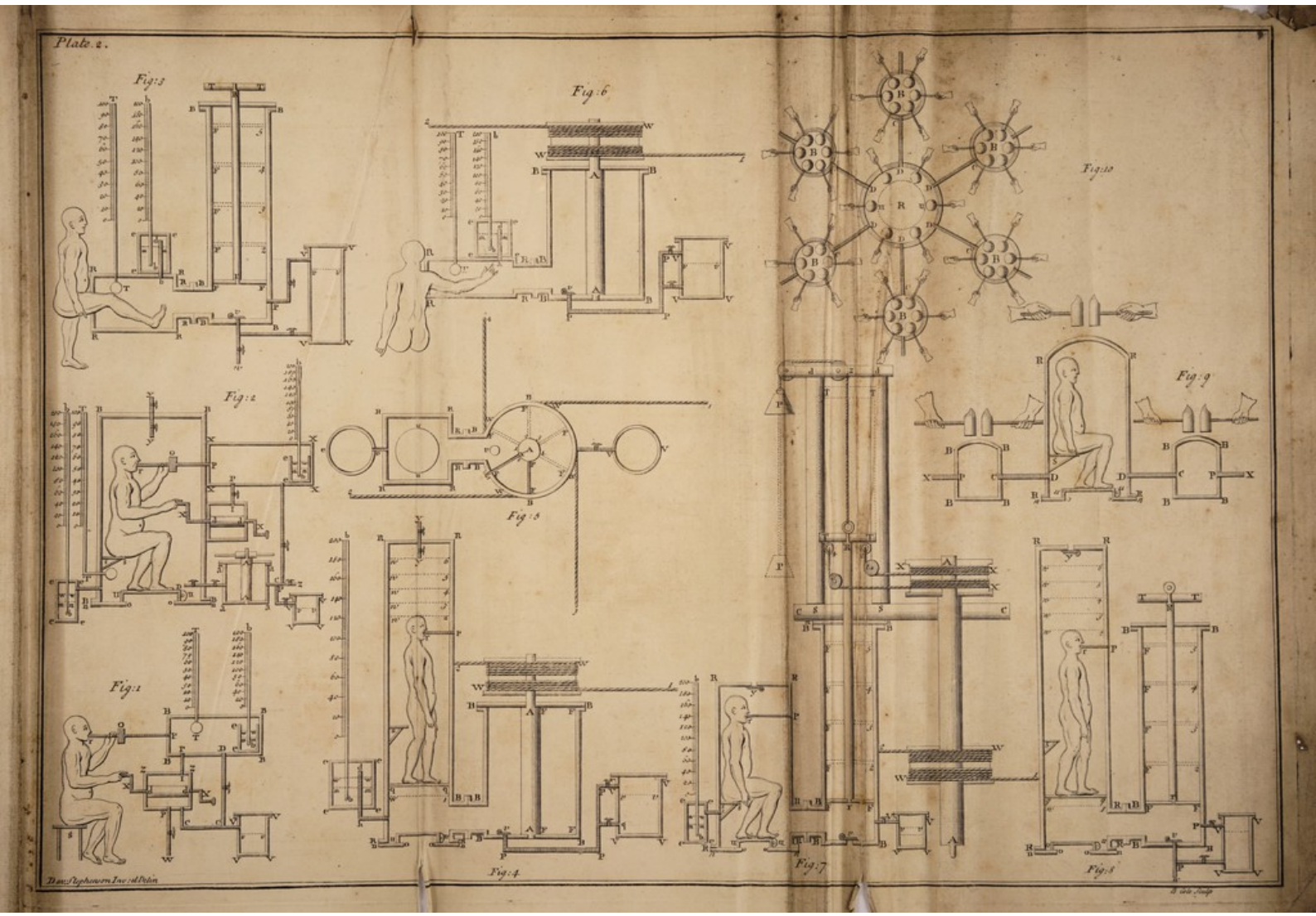
Plate 2.



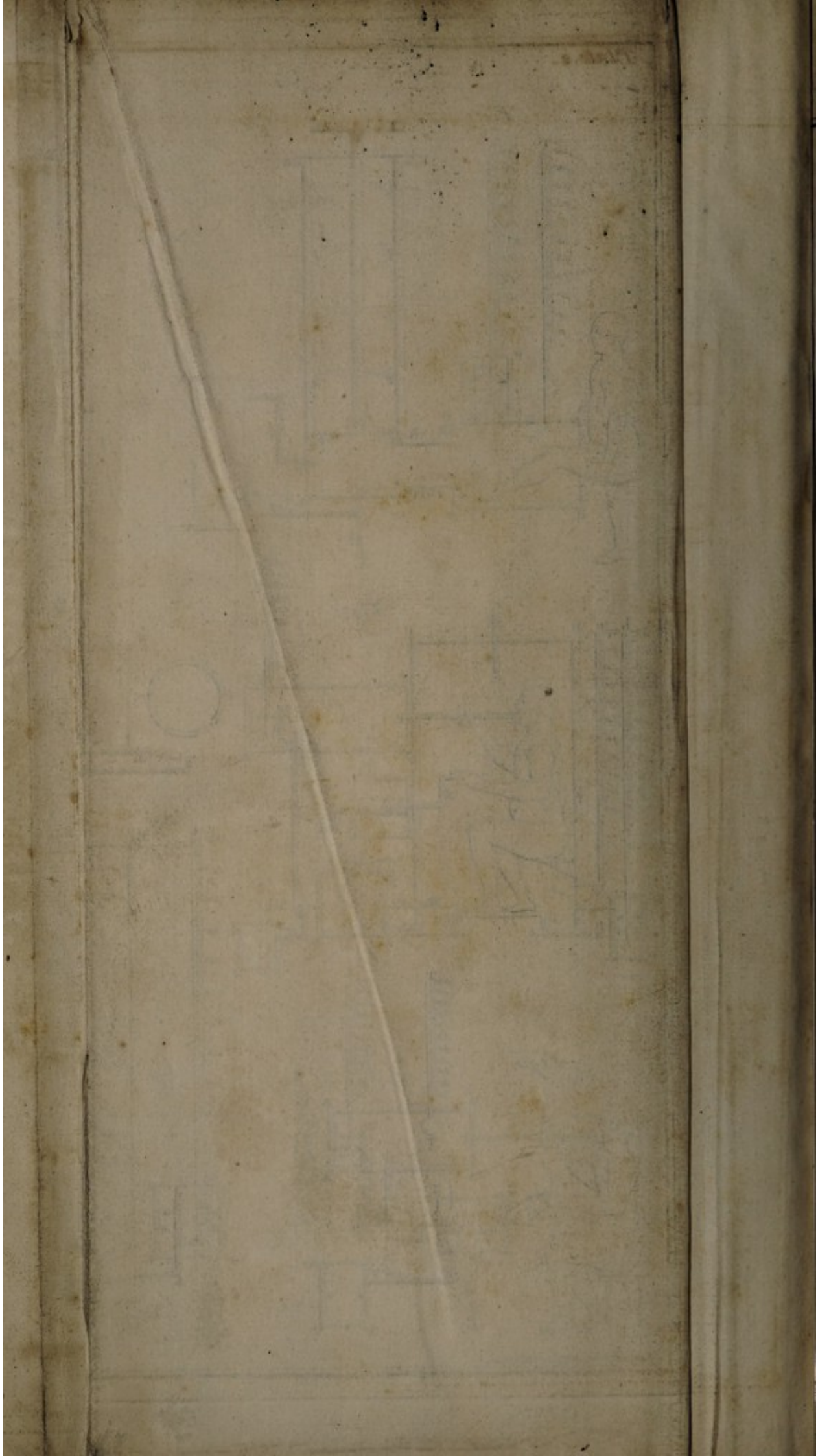
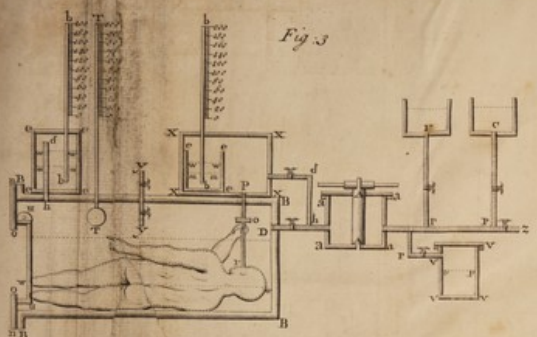


Plate 1.



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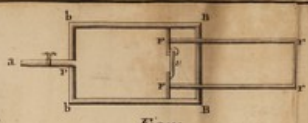

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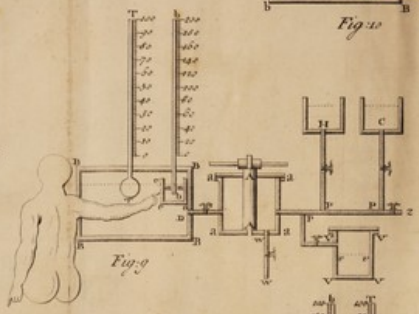

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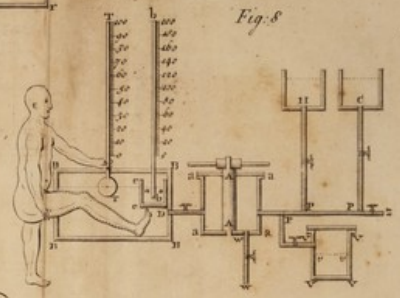

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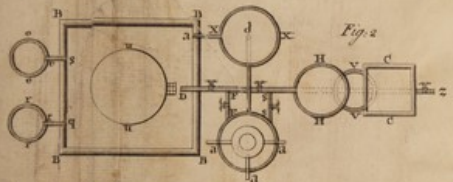

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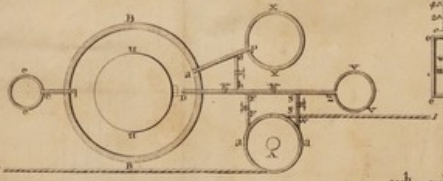

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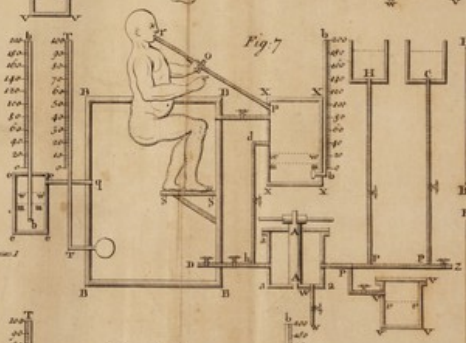

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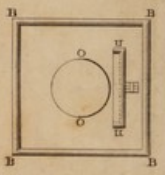

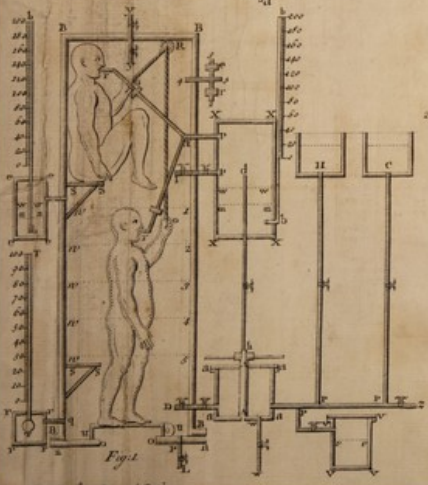

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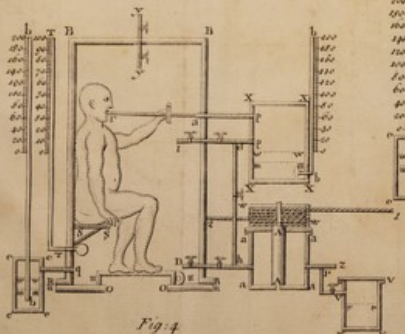

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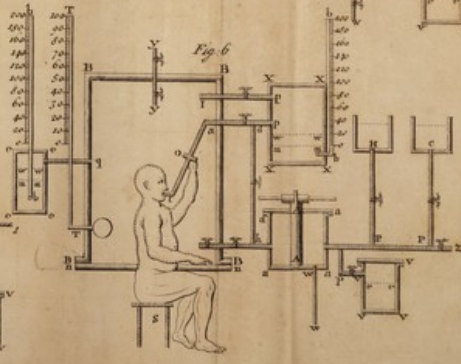

Fig: 6

Fig: 11

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S. Cole Sculp.