

*Instruments for Geometry, Drawing, &c.*

Variety of Pocket Cases of *Drawing Instruments*, in Silver, Brass, &c. Containing,

- 1 *Plain Compasses* for measuring Lines, &c.
- 2 *Drawing Compasses*, with three moveable Points, viz. an Ink Point for sweeping Circles, or Arches of any determinate Thickness, a dotting Point, and a black Lead Point.
- 3 A *Drawing Pen*, either with or without a protracting Pin.
- 4 A *Sector* for finding Proportions between Quantities of the same Kind, as between Lines and Lines, Surfaces and Surfaces, &c. either of Box, Ivory, Brass, Silver, &c.
- 5 *Plain Scales*, or,
- 6 A *square Protractor*, or,
- 7 *Parallel Ruler*, which is also a Protractor, &c. } either of Box, Ivory, Brass, Silver, &c.
- 8 A *Semicircle Protractor* of Brass.

In the best Cases, the *Compasses* are always made with Steel Joints, and the Knibs of all the Pens are made to turn up, or open with a Joint, in order to clean them, in which are also sometimes put,

- 9 A Pair of *Hair Compasses*, so contrived on the Inside of one of the Legs, that an Extent may be taken to an Hair's Breadth.
- 10 A Pair of *circular Compasses*, with which a Circle as small as a Pin's Head may be described.

In a *Magazine Case* of *Drawing Instruments*, is generally contain'd all the above Instruments, together with the following Particulars.

- 11 A Pair of *Drawing Compasses*, with moveable Legs longer than those of No. 2.
- 12 A Pair of *strong Compasses*, with Calliper and cutting Points.
- 13 A Pair of *Beam Compasses*, for drawing larger Circles, and taking larger Extents.
- 14 A Pair of *Proportionable Compasses*, for the ready diminishing Plans or Drawings, in any assigned Proportion.
- 15 A 12 Inch *Brass Sector*, of a peculiar Make.
- 16 A Pair of *Triangular* } *Compasses* for transferring three or four Points
- 17 A Pair of *Quadrangular* } at once, from a Map or any Drawing to another to be copied.
- 18 A Pair of *Compasses*, with two Pair of Points, whose shorter Legs are at all Openings always half the Distance of the longer ones.
- 19 A Pair of *Plat Compasses* for measuring Charts.



- 20 A *tracing Point* having at its upper End an oval Plate for clearing the Drawing Pen of any Dirt or Grit that may happen between the Knibs, and in the Middle thereof is a protracting Pin.
- 21 *Elliptical Compasses* for drawing Ellipsis or Ovals of various Sizes.
- 22 A *Bow* for drawing curved Lines.
- 23 A *Porté crayon*.
- 24 A large *Plain Scale*,
- 25 A *Plotting Scale*,
- 26 A *Protractor*,
- } Sometimes these are all made in one Instrument.
- 27 *Plain and Parallel Rulers*, of several Sizes.
- 28 Bottles and Shells of Water Colours.
- 29 *Ivory Pallates* for Indian Ink and Colours.
- 30 A *Pointrel and Feeder*.
- 31 A Pair of *Gunners Callipers*.
- 32 A *Recipient Angle* for measuring the external and internal Angles of Fortifications, Buildings, &c.
- 33 *Dialling Scales*, &c.  
In these Magazine Cases, Gentlemen may have what Number of Instruments they think proper.
- 34 The *Solids in Euclid's Elements* cut in Wood, with all their proper Sections, design'd on Purpose for the Ease of those Persons, who would inform themselves demonstratively in the Practice of *Perspective*, *Mensuration*, *Sphericks*, &c.
- 35 The five *regular Solids*, or *Platonick Bodies* cut in Wood.
- 36 A *Cylinder* bisected.
- 37 A *Cone* with all its proper Sections.

### Rules of all Sorts,

For Measuring of Timber, Stone, Painting, Brick-work, Plaistering, Glazing, Gauging, &c. *Viz.*

- 38 *Carpenters Rules*.
- 39 *Folding Rules*.
- 40 *Coggeshall's Sliding Rules* for measuring Timber.
- 41 *Scamozzi's Rules*.
- 42 *Everard's Sliding Rule* for Gauging.
- 43 *Leadbeater's Sliding Rule*.
- 44 *Veroy's Sliding Rule*.
- 45 *Brenan's Rule*.
- 46 *Malt Canes*.
- 47 *Dimension Canes*.



- 48 *Four-Foot Gauging Rule* with Joints.  
 49 *Five Foot Ditto*.  
 50 *Tape Boxes*.  
 51 *Five Foot Rods*, for measuring Brick-work, Wainscotting, Painting, &c.  
 52 ————— *Ditto*, in Canes.  
 53 *Horse Measures* in Sticks and Canes, &c.

*Surveying Instruments.*

- 54 *Plain Tables*, with an Index and Sights, whereby the Draught or Plan is taken on the Spot, without any future Protraction, having a Compass fitted to one of its Sides, and the whole fixed upon a Ball Socket, with a three legg'd Staff, upon which it may be turn'd round, or fasten'd with a Screw, as Occasion requires.
- 55 *Plain Tables improv'd*, with an Index of a peculiar Make, whereby the Line of Sights in viewing, is always over the Center of the Table, which also is readily set over the Station Hole, the Station Lines are likewise drawn parallel to those measured on the Land; and the Table is set horizontal by a Spirit Level, &c.
- Plain Tables are very useful in taking the Ground Plot of Buildings, and measuring Gardens, or small Enclosures (where the Shortness of Lines, and Multiplicity of Angles are apt to breed Confusion in protracting) but by no Means fit for surveying large Tracts of Land, because the least Moisture, or Dampness in the Air, makes the Paper not only sink, but run up when dried again, and thereby the Lines drawn thereon, make the Content less than it should be, and in the least Rain or Mist the Instrument is not at all to be used, which Reasons has induced most Persons to use fitter Instruments for large Tracts of Ground. As the
- 56 *Theodolite*, for measuring Angles, Distances, Altitudes, &c. Those Instruments are made various Ways, some being more simple and portable, others more accurate and expeditious.
- 57 *The Plain Theodolite*, which consists of four plain Sights, two fasten'd to the Limb, and two on the Ends of the Index, with a Compass on the Index Plate, divided into Degrees, and the Limb subdivided into Minutes by a Nonius Division, the whole fitted on a Ball and Socket, and that placed upon a three-legg'd Staff.
- 58 *Theodolites*, with all the above Particulars, and the Addition of a Telescope.
- 59 *Theodolites of the latest Improvement*, being the most accurate Instrument yet invented for surveying Land, which by a peculiar Contrivance



trivance in the Head of the Staff, may be set truly horizontal. On the Index, and over the Compass-Box is fixed a double Sextant, to move exactly in a vertical Circle, within which is a Spirit Level, and over that a Telescope, so contrived, that when the Bubble rests in the Middle of the Spirit Tube, the Interfection of the Hairs in the Telescope will cut an exact Level, the double Sextant is divided in such a Manner as to shew on one Side thereof the Degrees and Minutes of any Altitude or Depression within the Extent of its Divisions. On the other Side are Divisions for taking the Height of Timber standing in Feet; and on the Limb there are also Divisions for measuring its Breadth. It must be also observed here, that both horizontal and vertical Angles are observed at the same Time, which is extremely useful in laying down Plots, when the hypothenusal are to be reduced to horizontal Lines; when the Telescope is directed to any Object, the whole Instrument is fixed in so firm a Manner, that on directing the Telescope to the next, the Limb remains entirely steadfast, which in other Instruments of this Sort, is very difficult to be effected.

- 60 *Circumferentors*, the principal surveying Instrument used in the *West Indies*. It is very simple, yet expeditious in the Practice, and consists only in a Brass Circle, with a Compass divided into 360 Degrees, on the Center of which is suspended a magnetical Needle, and an Index, on whose Extremities are two Sights; the whole is mounted on a Staff, and sometimes for Convenience of its Motion, on a Ball and Socket.
- 61 *Gunters*, or four Pole *Chains*.
- 62 *Offset Staves*.
- 63 Sets of *Arrows* for the Chain.
- 64 *Air Levels* which shew the Line of Level, by Means of a Bubble of Air and Spirits of Wine hermetically inclosed within a Glass Tube, which is mounted in a Brass Tube, on a particular Frame, and may be included in a Case for the Pocket.
- 65 *Air Levels*, with Sights, which consist of an Air Level set in a Brass Tube, with an Aperture in the Middle, being fixed on a straight Ruler on whose Ends are Sights for taking the Level of any Place.
- 66 *Air Levels*, with Telescope Sights, are somewhat like the former, but with this Difference, that instead of plain Sights it carries a Telescope to determine the Point of Level precisely, at a good Distance, these Levels are mounted on a three-legg'd Staff, and have a particular Contrivance; by which they may be adjusted (if put out of Order) to a true Level at any one Station.
- 67 *Artillery Levels*.
- 68 *Gunnery Levels*.



- 69 *Levelling Staves.*
- 70 *Plotting Scales.*
- 71 *Sets of feather-edg'd Scales.*
- 72 *Hair Scales.*
- 73 *Parallel Rulers for Plotting.*
- 74 *An improv'd Protraſtor, and Plotting Scale, in Form of a Beam-Compaſs.*
- 75 *Parallelograms, for the ready and exact Reduction, or copying of Deſigns, Schemes, Prints, &c. which is done hereby without any Knowledge or Habit of Deſigning.*
- 76 *Pedometers, ſomewhat like a Watch, by which the Way may be meaſured in Walking.*
- 77 *Meaſuring Wheels for Surveying of Land.*
- 78 *Way-Wiſers, for Coaches.*
- 79 *Way-Wiſers of a curious and particular Contrivance for Chaiſes, &c.*
- 80 *Gunners Quadrants, Heights, &c.*
- 81 *Surveying Quadrants, made of Braſs, or Wood, &c.*

### *Navigation Instruments.*

- 82 *Gunter's Scales.*
- 83 *Sliding Gunter's.*
- 84 *Davies Quadrants.*
- 85 *Mr. Hadley's reflecting Quadrants.*
- 86 *Mr. Smith's reflecting Quadrants.*
- 87 *Mr. Smith's, Capt. Middleton's, and Capt. Harriſon's improv'd Azimuth Compaſs.*
- 88 *The common Azimuth Compaſs.*
- 89 *Azimuth Compaſs, on Friction Wheels.*
- 90 *An artificial Horizon of a new and curious Contrivance.*
- 91 *Mariner's Compaſſes, either for the Binacle or Cabin.*
- 92 *Noſturnals, adapted to the Polar Star, and the firſt of the Guards of the little Bear; and alſo to the Polar Star, and the Pointers of the great Bear.*
- 93 *Noſturnals, which are a Projection of the Sphere, ſuch as Planiſpheres, Hemifpheres, &c.*
- 94 *Reſtiſers for determining the Variation of the Compaſs, in order to rectify the Ship's Courſe.*
- 95 *Plane Scales.*
- 96 *An Inſtrument for taking the Latitude of a Place at any Time of the Day. May be eaſily underſtood, it immediately ſhews the Latitude*



tude of the Place, and gives the Time of the Day at Sea, when no other Instrument will.

- 97 A *Machine* to measure the *Strength* of the *Wind*.  
 98 A *Machine* to found the *Depth* of the *Sea* without a *Line*.  
 99 A *Contrivance* to fetch up *Water* from any *Depth* of the *Sea*.  
 100 *Marine Barometers*, for foretelling *Storms* at *Sea*.  
 101 *Sinical Quadrants*.  
 102 *Telescopes*, *Prospects*, and *Spy-Glasses*.  
 103 *Navigation Books*, *Charts*, &c.

*Instruments for shewing the Motion, Attraction, Weight, and Equilibrio of Bodies, &c.*

- 104 A *Machine* and *Glass-Planes* for the *Drop* of *Oil* of *Oranges*.  
 105 Two *Planes* in a *Frame* to be set in a *Vessel* of *tingid Liquor*.  
 106 *Capillary Tubes* and *Apparatus*.  
 107 A *Column* with *sliding Arms*, *additional Pieces*, *Nuts*, *Screws*, *Hooks*, *Pullies*, &c. of a very *useful*, *curious*, and *particular Contrivance*, adapted to support a *great Number* of the *Apparatus*, in which *Pullies*, *Leavers*, *Ballances*, *Weights*, *Pendulums*, &c. are used both in *Mechanicks* and *Hydrostaticks*.  
 108 A *strong Ballance* graduated, for explaining the *Properties* of *Leavers*, in which the *Power*, *Resistance*, and *Point* of *Suspension* are *moveable*; and may be readily placed in any given *Proportions*.  
 109 A *Prism* with a *Steel Edge*.  
 110 *Awls* in *Brass Handles* to illustrate the *Center* of *Gravity*.  
 111 An *Instrument* and *Apparatus* for 3 *Leavers*.  
 112 *Compound Leavers*.  
 113 An *Axis* in *Peritrochio*.  
 114 A *double Cone*, that runs up an *inclin'd Plane*, which is two *Rulers*, so dispos'd as to be *inclined* to each other, and to the *Horizon*, which *double Inclination* may be varied as the *Experiment* requires.  
 115 A *Cylinder* that runs up an *inclined Plane*.  
 The two last *Machines* prove, that a *Body* cannot remain at rest, when its *Center* of *Gravity* is not *lowermost*.  
 116 A *Machine* to demonstrate the *Properties* of an *inclined Plane*, so contrived, that its *Inclination* may be changed from an *horizontal Plane* to that of a *vertical one*, and the *acting Power* may be placed in any given *Direction*.  
 117 A little *Carriage*, and its *Appendages*, for shewing the *Advantage* great



great Wheels have over little ones, and that in all Sorts of Roads, as Clay, Gravel, Sand, Pavements, &c.

118 Machines for oblique Forces.

119 *Blocks*, or *Sheaves of Pullies*, after all the various Sorts of Combinations and Constructions, curiously framed, and turned in Brasses, and running either on Steel Arbors, or Pivots, in which all possible Care is taken to diminish their Friction.

120 A Machine to explain the Nature and Properties of the *Wedge*. In which the *Wedge* is formed of two jointed Rulers, that may be set to any Inclination from each other, by which Means the Base of the *Wedge* is varied, as may also its Force and Resistance, by a new and curious Contrivance.

121 A Collection of several Wheels and Pinions, to shew that either of these act as *Pullies*, and their Proportions as *Leavers*.

122 A Model of *Archymedes's Screw*, the Effect of which becomes sensible, by the rising of several little Balls therein.

123 A Machine for explaining the Nature of the *Watch-Spring* and *Fussey*.

124 An Instrument to explain the Effects of *Friction* in Machines.

125 A Machine for shewing the Acceleration of *falling Bodies*.

126 A *strong Balance*, and its Appendages for the same Uses.

These two last Machines do not only shew that Bodies are accelerated by falling, but also makes the Laws of this Acceleration evident.

127 An Instrument to illustrate *Motion* and *Velocity*.

128 A double Pendulum, mounted on a Trough, divided into two equal Parts by a Partition, for shewing the Proportions of *resisting* Mediums.

129 An Instrument for comparing the Swiftnes of a Body falling in a *Cycloid*, with that of another Body, down an inclined Plane.

130 Another Instrument for comparing the Descent of two Bodies, from any Part of an inverted *Cycloid*.

131 A *Machine* to shew the Direction of a Body that is impressed with a perpendicular and horizontal Motion.

132 Another *Machine*, by which is also shewn a Motion produced from two Directions.

133 A *Machine* for shewing the Line that a Body describes in falling, after having received an horizontal Direction.

134 A *Machine* for shewing the Motion of a Body, neglecting its proper Weight, after having received by falling, a Direction oblique to the Horizon.

As the Curve in Question depends upon the Obliquity of its Direction, the Instrument is constructed in such a Manner, that the Degrees of its Obliquity may be varied.

135 A *Machine* for explaining the Theory of *central Forces*; contrived in such a Manner, that its Friction makes no sensible Error: The



- Celerity and Bulk of the Bodies may be varied at Pleasure. Their Times are shewn by Sound, and the Spaces run through by an Index.
- 136 A *Glass Globe* fixed to a double Axis, which may be whirl'd with any Degree of Velocity, both in a vertical and horizontal Direction.
- With this Machine the Effects of central Forces may be seen on Fluids of different specifick Gravities, when mixed together, or on Solids which float therein.
- 137 A *flexible Globe, or Sphere*, whose Poles are capable of being depressed, on its being turned, by which Means the centrifugal Force raises the Equator, and represents the Form of an oblate Spheroid to the Eye, which is the Figure attributed to the Earth from the late Discoveries.
- 138 A Machine for the *Congress of Bodies*, both elastick and non-elastick. Its Parts are adapted in the most convenient Manner, to facilitate a Contact which does not change the Direction of the Bodies, whose Solidities or Masses are in known Proportions; the Points of Suspension are advantageously disposed, and their Effect made sensible by an Index.
- 139 A *Chronometer*, or Instrument to measure small Spaces of Time.
- 140 A *Machine* and Table for *compound Motion*, in which the Hammers are suspended in such a Manner, as to regulate the Quantity of Motion, either by their Celerity or Weight.
- 141 A graduated *Arch*, and *swinging Scale*, for shewing that a Body thrown up perpendicular from any other Body in Motion, will fall exactly on the same Place, notwithstanding both the Bodies are moved.
- 142 An Apparatus to strain Wires or Strings a-cross a Room for Experiments of the like Nature.
- 143 An Instrument to explain the Force of *Springs, &c.*
- 145 Models { of a Press.  
of a Capstan.  
of Cranes of various Sorts.  
of Mr. *Allen's* Crane at *Batb.*  
of an Engine to drive Piles, &c.  
of an Engine to saw off the Tops of Piles under Water.
- Many other Models of Machines, which are principally designed to explain the Application of simple Machines, in those which are combined, in all which Care is taken to leave those Places expos'd, where the chief Motions are to be observed.
- 146 An Instrument to explain the Laws of *Elasticity*, on Springs and Wires, &c.



- 147 *Large Weights*, for several Experiments.
- 148 *Smaller Weights*, of a peculiar Shape, from half an Ounce to Six Pounds.
- 149 A *moveable Table* for various Experiments, that may be rais'd or lower'd.
- 150 A Pair of *Scales* for various Experiments.

*Instruments for Experiments on the Motion, Weight, and Equilibrio of Fluids.*

- 151 **A** *Trough* lin'd with Lead, and furnished with a Cock; for several Hydrostatical Experiments.
- 152 A *Glas Phial*, with a solid Stopper, which in this State is heavier than a like Bulk of Water.
- 153 Several Tubes bent in different Forms.
- 154 'An Apparatus for proving how Fluids press against the Bottom and Sides of their containing Vessels, being composed of several Vessels, which may be successively placed upon one common Base; the Piston, which is the Bottom hereof, is so adjusted, as to cause no sensible Error by its Friction, the Columns of the Fluid remain always at the same Height, and the Weights act in a uniform Manner.
- 155 *Hydrostatical Bellows*.
- 156 A *Glas Tube* with a Bladder fixed at one End.
- 157 A *Glas Bucket* and wooden Cylinder.
- 158 An *Hydrostatical Ballance* of a commodious Structure.
- 159 An hollow *Glas Ball* with a Cock to it, to prove that Water weighs in Water.
- 160 *Arcometers*, or *Liquor Proofs*, of *Glas*.
- 161 *Hydrometers* of *Brafs* or *Copper*.
- 162 A *Glas Vessel* for changing Water into Wine, and *vice versa*.
- 163 A *Brafs cylindrical Vessel*, with a Solid of the same Size, to shew that Bodies plunged in Fluids become lighter.
- 164 A *Glas Vessel* to be suspended to the Arm of a Ballance, for Experiments of the same Kind.
- 165 Two Balls of the same Weight, but of different specifick Gravity, to be hung to the Arm of a Ballance, for shewing, that what Bodies lose of their Weight, on being plunged into Water, is in Proportion to their Bulk.
- 166 A Machine for shewing that a Body emerged in a Fluid, changes its relative Weight, when the Bulk of the Fluid in which it is, is either condensed or rarified.



- 167 A Syphon, open at Top, to which may be fixed an exhausting Syringe, mounted on a Frame with a graduated Scale, for comparing the Denfities of two Fluids at the same Time.
- 168 A cylindrical Glafs Veffel, and hollow Images.
- 169 Two cylindrical Glafs Veffels, mounted in a Frame, in which the hollow Glafs Images may be moved by Comreffion, without being perceived by the Spectators.
- 170 A Model of the *diving Bell* and Apparatus.
- 171 A common Syphon, and others of different Forms.
- 172 A double Syphon.
- 173 A Syphon, whose Arms are moveable by Means of a Knee-like Joint.
- 174 A *Tantalus Cup* of feveral Fafhions.
- 175 Glafs Models of *Sucking* } *Pumps*, (with or without Air-Veffels)  
                                   *Forcing* } which fhew the Reafons of Fire-Engines,  
                                   and *Lifting* } playing with a continual Stream.
- 176 A Fountain of *Command*.
- 177 ————— *Hiero*.
- 178 ————— *Double*.
- 179 A large Fountain by *compressed Air*, with Variety of Jet d'Eaux, to which alfo may be applied an Apparatus for fhewing the various Curves that are made by Projectiles.
- 180 A *Ballance to weigh Levity*.
- 181 An Apparatus to make Lead fwim.
- 182 An Apparatus to make Cork fink.
- 183 A Column and *Refervoir* for *spouting Water*, with Tubes that may be inclined to any Angle Jet d'Eaux's, &c.
- 184 Two tall cylindrical narrow Jars, and feveral folid Cylinders of different Woods, to fhew that they will fink differently according to their fpecifick Gravities.
- 185 A Glafs-Bottle full of Holes.
- 186 Glafs Bubbles, which, on being immerged in Water, become fpecifically heavier, lighter, and of the fame fpecifick Gravity of the Water fucceffively.
- 187 A Machine for fhewing that Bodies emerged in Fluids, change their relative Weight, and will fink or rife therein, as the Fluid in which they are become more denfe or rarified.  
 This may be called an hydroftatical Thermometer.
- 188 Two Glafs Bubbles, one fwimming at the Top, and the other lying at the Bottom of the Water in a Glafs Jar, fo contrived, that by pouring in more Water, the Bubbles fhall change Place.
- 189 A Machine for *spouting Mercury*, which fhews the various Parabola's that are made by Projectiles, and particularly the Truth of the feveral



veral Rules in the Art of Gunnery, being constructed in such a curious Manner, that the Force may be varied as Occasion requires.

- 190 A peculiar Sort of Syphon, the Orifices of its two Legs being in the same Line, and yet the Water will run out, and tho' the Orifices be but in Part immersed, yet the Water will rise. This Machine produces its Effects tho' continuing dry for a long Time, that either of the Apertures being open'd, and the other remaining shut for Hours, or a whole Day, and then opened, the Water will flow out, and will rise and fall indifferently in either Leg.

N. B. All the Models of Pumps, Fountains, Syphons, &c. are made of Glafs, in which all the Parts of Action may be easily seen.

*Instruments for Pneumatical Experiments.*

- 191 A Small single Barrel *Air-Pump*.  
192 A large double Barrel standing, or tall *Air Pump* and *Apparatus*.  
193 A double Barrel *Table Air-Pump*, which is the most useful of any, with a large Apparatus.  
194 A Machine particularly applicable to the double Barrel *Table Air-Pump*, for whirling Bodies in *Vacuo*, of a new Contrivance, by which all the electrical Experiments on whirling Globes, either exhausted of their Air, or not, may be repeated.  
195 An Apparatus for the Experiments of Fire in *Vacuo*.  
196 An Apparatus for the Experiments on Electricity in *Vacuo*.  
197 A Sortiment of necessary Things for Experiments on Electricity in *Vacuo*.  
198 A very tall Receiver composed of several Pieces, with a curious Machine at Top, by which Experiments on falling Bodies may be five Times repeated in *Vacuum*, when the Air is only once exhausted.  
199 A double Transferer for communicating a *Vacuum* from one Receiver to another.  
200 Two Bras Hemispheres, with a Stop-Cock and Rings.  
201 A Bottle with a Jet d'Eaux, and a long Tube with a Receiver, for shewing that a small Quantity of included Air, presses equally with the whole correspondent Column of the Atmosphere.  
202 A Glafs with a wooden Vessel at its Top, to prove the Porosity of Vegetables.  
203 A proper Vessel for proving the Skins of Animals are porous, and that an abortive Skin is not so.



- 204 A Machine to shew that dense Air will drive a yielding Solid into a Space occupied by rarer Air.
- 205 A Machine to strike two Hammers against a Bell in Vacuo, and compressed Air.
- 206 A Machine of a new Contrivance for making Experiments in compressed Air, and Apparatus thereto belonging.
- 207 An injecting Syringe.
- 208 A Wind-Gun, with a condensing Syringe in its Stock, having a Magazine of six Balls, from which one Ball at a Time may be put into the Barrel, without letting the Air escape, and once charging it with Air is sufficient for the Discharge of all the Balls.
- 209 Capillary Tubes of various Sizes.
- 210 An Apparatus for the *Mercurial Phosphori*.
- 211 An *Eolipile*.
- 212 An *Eolipile* on a Carriage.  
A solid Globe to be heated, and a Frame to receive the same.
- 213 } *Thermometers*, for { of Spirits of Wine.
- 214 } measuring the In- { by Sir *Isaac Newton's*.
- 215 } crease, and Decrease { by *Farenheit's*,
- 216 } of the Heat, and { by *Reaumer's*.
- 217 } Cold of the Air, { by *D'Lisle's*, &c. } Standard, { Spirits, Oyl, or Mercury.
- 218 *Monf. Azont's* Apparatus, for determining that it is the Air's Pressure which raises the Mercury in the Barometer.
- 219 Diagonal
- 220 Stagnant
- 221 Portable
- 222 Marine
- 223 *Dr. Moreland's* Statical
- 224 *Mr. Caswell's* Baroscope. } *Barometers*.
- 225 An Apparatus for an *artificial Storm*.
- 226 An Apparatus for the Explosion of Gun-powder in Vacuo.
- 227 A *Pyrometer* of a new and curious Contrivance, for measuring the Expansion of Metals.

### Optical Instruments.

- 228 *Spectacles* ground on Brass Tools, set in Silver, Tortoiseshell, Horn, &c.
- 229 *Reading-Glasses*, set in Variety of curious Frames.
- 230 *Concaves* for Myopes, or short-sighted Persons.
- 231 *Prospect-Glasses* of all Lengths.
- 232 *Opera Glasses*.
- 233 *Diagonal Prospects*.



- 234 *Telescopes* of all Lengths.
- 235 *Newtonian* reflecting *Telescopes* } The Speculums of which are finished  
 236 *Gregorian* reflecting *Telescopes* } with the greatest Care.
- 237 *Microscopes*, *Wilson's*
- 238 ———— Opaque
- 239 ———— Double
- 240 ———— *Adams's new invented* Universal One. And,
- 241 ———— solar Apparatus to do.
- 242 *Camera obscura* of various Sorts.
- 243 *Camera obscura*, of a peculiar Contrivance, by which the Images of external Objects, are exhibited distinctly on a Sheet of Paper, each clothed in their native Colours, perfectly like their Objects; and at the same Time all their Motions are expressed, which last no other Art can imitate. By Means of this Instrument, a Person unacquainted with Drawing, will be able to delineate Objects, to the last Accuracy and Justice; and another well vers'd in Painting, will find many Things herein to perfect his Art.

*Instruments for Experiments on Lights and Colours.*

- 244 **A** *N Helioſtata*, or Machine for directing the Sun's Rays into a dark Chamber, which of itself directs the Mirrour in a proper Manner, to cast the Rays in the same Line for several Hours together.
- 245 A Machine for shewing Experiments on the Attraction and Repulsion of the Rays of Light. Several Machines for Experiments on the Laws of the Refractions of the Rays of Light, viz.
- 246 Boxes with Glass Sides.
- 247 A wooden Box with sliding Sides, and changeable Ends.
- 248 Boxes, with Segments of Spheres, fixed in their Sides.
- 249 A solid Glass Cube.
- 250 A particular Stand to manage these Boxes upon, by which they may be rais'd, depressed, or turn'd round at Pleasure.
- 251 An artificial Eye, furnished with Lens's of different Foci or Ages, to shew the Reasons how Glasses help decayed Sights and Myopes.
- 252 A Semicircle and *Prism*, with Glass Sides to determine the Angles of Refraction.
- 253 Three *Prismatick* Boxes.
- 254 Solid Glass *Prisms*, mounted on Feet, by which Means they may be raised, depressed, inclined, or turned upon their Axis.
- 255 Other *Prisms*, mounted on a vertical Foot, which may be raised, or depressed, and turned upon their Axis.



- 256 *Prisms* of solid *Glass* not mounted.
- 257 A *Plane metalline Speculum*, mounted on a *Foot* that may be rais'd, depressed, inclined, or turned round at *Pleasure*.
- 258 A *plain Glass Mirrour*, mounted in the same *Manner*.
- 259 Several *Glass Lens's*, mounted in *Frames*, on *Feet*.
- 260 An *Instrument* to open a *Passage* for the *Sun's Rays*, with *Holes* of different *Sizes*.
- 261 A large double *Convex Lens* composed of two *Segments*, and mounted on a *Foot* for *Experiments*, on the *Refraction* of different coloured *Liquors*.
- 262 A large *Paper Screen* for *Experiments* on the *Prisms*, and the *Solar Microscope*.
- 263 *Concave* } *Mirrours* of all *Sizes*.
- 264 *Convex* }
- 265 } *Cylinders,*
- 266 *Metalline* { *Cones,*
- 267 { *Pyramids,* } with deformed *Pictures*.
- 268 { *Octagons,*
- 269 *Pictures* for a *pyramidical Glass*.
- 270 *Magick Lanthorns*.
- 271 *Pictures* to *Ditto*.
- 272 *Hollow Prisms* that may be exhausted.
- 273 An *Instrument* to determine the *Refraction* of *Fluids*.

### *Instruments, &c. for Experiments on Electricity, &c.*

- 274 **N**atural armed *Load-Stones*.
- 275 *Artificial Loadstones*.
- 276 A *Box* of *Filings*, and *Bits* of *Iron Wires*, little *Iron Balls*, and *Cylinders*.
- 277 A *Trough* with enamelled *Swans* and *Frogs*.
- 278 An *Iron Rod*.
- 279 A polished *Iron Blade*.
- 280 A *Compass Dial*.
- 281 A long *Needle* in an oblong *Box*.
- 282 A *Sea-Compass*.
- 283 Several *Steel Needles* touched on the *Load-stone*.
- 284 A large *Glass Tube*, open at both *Ends*.
- 285 Another that may be exhausted.
- 286 A *Glass Globe* for whirling.
- 287 Another that may be exhausted and applied to the whirling *Machine*.
- 288 *Glass Plates*.



- 289 Several little Stands.  
 290 A solid Stick of Sealing-Wax, of a proper Length and Diameter.  
 291 A Tube of Ditto.  
 292 A Stick of Brimstone.  
 293 A Cone of Ditto, cover'd with a Glafs.  
 294 A little Amber Ball, and another of Coral.  
 295 Several little Ivory Cups.  
 296 A Metal Pyramid for the Communication of Electricity.  
 297 A Suspensor furnished with Ribbands of different Colours.  
 298 A Rosin Cake.  
 299 A Cake of Rosin and Gum Lac.  
 300 A Suspensor furnished with Silk Lines for communicating Electricity to living Bodies.  
 301 A very long Packthread String, with Balls for communicating Electricity a great Way.  
 302 Silken Lines for the same Purpose.  
 All the Apparatus necessary to perform electrical Experiments, as well in the open Air, as in Vacuum, are, if desired, carefully disposed in one Box to makè them portable.

### Instruments for Astronomy, Geography, &c.

- 303 **G**lobes, celestial and terrestrial, of all Sizes, neatly fitted up, viz. of 3, 9, 12, 17, and 28 Inches Diameter, from the latest Observations.  
 304 Globes, fitted up in such a Manner, that the Poles of the diurnal Motion in a celestial Globe, pass in a Circle round the Poles of the Ecliptick, and serve the Purposes of Chronology and History for Times past, and will also answer the same Things for any succeeding Times to come; by which Means a View of the Heaven is obtained suitable to every Period, and will answer the antient Descriptions, as *Eudoxus*, who is supposed to have borrowed his from the most early Observations, and of *Hipparchus*, &c. Nor can any Contrivance better enable the meanest Reader to judge of the Merits of the Controversy about the *Argonautick* Expedition, as far as it depends on this, for it will verify to the Sight, the Place of the Colures, &c. at any Time. By this Contrivance the celestial Globe may be so adjusted, as to exhibit not only the Risings and Settings of the Stars in all Ages, and Latitudes, but the other Phænomena, likewise, that depend upon the Motion of the diurnal Axis round the annual ones.  
 305 *Armillary Spheres* of any Size.



- 306 Large *Astronomical Quadrants*, fitted with a Telescope for taking the Declination of the Sun, Moon, and Stars, in the Meridian.
- 307 *Transit Instruments*, for determining their right Ascensions.
- 308 *Portable Astronomical Quadrants*, that have both a true horizontal and vertical Motion, for observing the Altitudes of the Sun or Stars in any Position, with which (having a good portable Pendulum) the Meridian and Latitude of the Place will be readily determined; which may be of great Use on the Sea-Coast, and in the Surveys of Countries.
- 309 *Equal Altitude Instruments* for observing Stars of equal Heights, with which having a good portable Pendulum, the Meridian and Latitude of a Place may be very accurately found.
- 310 *Telescopes*, fitted with a *Micrometer* for observing the apparent Magnitudes of the Sun, Moon, and Planets, with the Apulses of the Moon and Planets to the fixed Stars.
- 311 Mr. Gray's Instrument for drawing a Meridian Line and Telescope for observing the Time of the Night by the Pole Star.
- 312 *Helioscopes*, or Instruments for observing the Spots in the Sun.
- 313 *Parrallactick Telescopes*.
- 314 An *Astronomical Sector*, which is a very commodious and accurate Instrument, for taking such Differences of right Ascension and Declination, as are too large to be observed thro' a fixed Telescope, being very useful for observing the Places of the Planets or Comets when they are near any known Star.
- 315 *Meridian Telescopes* for correcting the Motion of a Clock or Watch, and finding the ascensional Differences of any Objects in the Heavens, by taking the Times of their Transits over the cross Hairs. The Differences of Declination of two such Objects as will pass over the Apertures of the Telescope, may be also found.
- 316 Large *double Instruments*, containing two chief Parts connected together, having four several Motions, all moved by Rack Work. 1. A circular Motion to shew all horizontal Angles. 2. A Semicircular vertical Motion. 3. A circular equinoctial Motion, or for any Place at right Angles to the Vertical. 4. A Motion thro' a double Sextant, at right Angles to the Third, that has a refracting Telescope fixed to it. By this Instrument, all Angles, either horizontal, or of Elevation or Depression, the Azimuth and Altitude of any Star, the Meridian and Latitude of the Place, with the Hour of the Day and Night, are directly given; also the right Ascension and Declination of the Moon, a Planet, Comet, or any Star, at one Observation; which, if a Comet of quick Motion should appear, may be repeated every five or six Minutes, and thereby its Path well known.



- 317 A new *Universal Sun Dial*, having all the abovesaid four Motions but performed in a different Manner, with a particular and curious Contrivance for finding the Time of the Day, within a few Seconds of Time.
- 318 *Horizontal Sun Dials* of all Sizes and Sorts, for Pedestals in Gardens, or elsewhere.
- 319 *Portable Sun Dials* of various Kinds.
- 320 *Gnomonick Polyhedrons*, with several Faces, whereon various Kinds of *Dials* are projected; of this Sort, that in the *Privy-Garden, London*, now gone to Ruin, was antiently the finest in the World.
- 321 *Sutton's* or *Collins's Quadrants*.
- 322 *Gunter's Quadrants, &c.*
- 323 Two *Hemispheres*, projected on the Plane of the *Ecliptick*, containing all the Stars in *Mr. Flamsteed's Catalogue*.
- 324 Two *Hemispheres* on the Plane of the *Equator*, shewing the right Ascension and Declination of the Stars in the same Catalogue.
- 325 The *Zodiack*, containing all the Stars in the Way of the Planets, with *Dr. Halley's* Method for finding the Longitude at Sea.
- 326 *Planispheres*, or Projections of the celestial Sphere, upon the several Planes, viz. that of *Ptolemy*, where the Plane of the Projection is parallel to the *Equator*; that of *Gemma Frisius*, where the Plane of Projection is the *Colure*, or solstitial Meridian; that of *John de Royas*, or *Annelemma*, whose Plane of Projection is a Meridian, and Place of the Eye in the Axis of that Meridian, at an infinite Distance; that of *M. de la Hire*, the Plane of which Projection is also a Meridian, and Place of the Eye in that Point where the Divisions of the Circles projected are sensibly equal.
- 327 *Orreries*, or *Planetariums*, of about 12 Inches Diameter, which shew the Motion of the Earth and Moon about the Sun.  
*Orreries*, about two Foot Diameter, which shew the Motion of the Earth and Moon together, with the Inclination of the Moon's Orbit, the Retrogradation of the Nodes. The annual and diurnal Motions of the Earth, and Motion of the Sun round his Axis, &c.
- 328 A *Planetarium*, about two Foot Diameter, with all the Motions of the last Number, and the Addition of the two inferior Planets *Mercury* and *Venus*, the former having its annual, and the latter both its annual and diurnal Motions. By this Instrument the Situations of the Planets, with Respect to the Earth at different Times, as they appear direct stationary or retrograde, are plainly visible, as is also the Eclipses of the Sun and Moon, and the Vicissitudes of the Seasons, &c.
- 329 A *Planetarium*, of two Feet and an half Diameter, with all the Properties of the two foregoing Numbers, and the Addition of the



the three superior Planets, *Mars*, *Jupiter*, and *Saturn*, with their annual Motions.

- 330 A *Planetarium* of about three Feet and an half Diameter, handsomely ornamented, containing all the Particulars of the three foregoing Numbers, and the Addition of the diurnal Motions of *Mars*, and *Jupiter*, together with the Motions of all the secondary Planets round their respective Primaries in their proper Periods, &c.

All these Planetary Machines are so constructed, as to render all the Phænomena (they are intended to demonstrate) very easy and intelligible.

- 331 The famous *Glass Sphere* of the Reverend and Learned Dr. *Long*'s Invention, which exhibits at one View both the real and apparent Motion of the Heavens.

- 332 The *Uranium* invented by the Reverend Dr. *Long*.

- 333 *Astronomical Clocks*, or Regulators carefully performed.

- 334 A particularly new and curious Machine, containing a Movement which plays either an Organ, or Harpsichord, (or both if desired) in a masterly Manner; shews the exact Time of the Day and Night, and sets a going a transparent Firmament, which exhibits the apparent rising, southing, and setting of the Sun, Moon, and Stars, their right Ascensions, Declinations, Altitudes, and Amplitudes, &c. the Times of their Appearance and Disappearance to an Inhabitant on any Part of the terraqueous Globe, the Place of the Sun and Moon in the Zodiack, and amongst the fixed Stars, whereby the cosmical, heliacal, and achronical Risings and Settings thereof, are easily discover'd, and the natural apparent Face of the Heavens, at all Times of the Day and Night, and that in any particular Part of the World, and many other Observables of the Earth, &c. In short, it is a most beautiful, instructive, and ornamental Piece of Furniture, not unworthy the grandest Apartment in any Gentleman's or Nobleman's House.

- 335 A *COSMOTHEORION*, or Machine, of a new Invention, which at present is without a Parallel.

It is about four Feet and a half Diameter, standing upon a Pedestal of curious Workmanship.

In its Center the Sun is seen to perform a Revolution about its own Axis in 25 Days, its Axis being at the same Time inclined to the Plane of the Ecliptick, in an Angle of  $66\frac{1}{2}$  Degrees. The other Planets, move round it, in which Motion, particular Regard is had both to their proportionable Distances and Eccentricities, as well as to their respective Inclination in the Plane of the Ecliptick. Their proportionable Times and Magnitudes are likewise



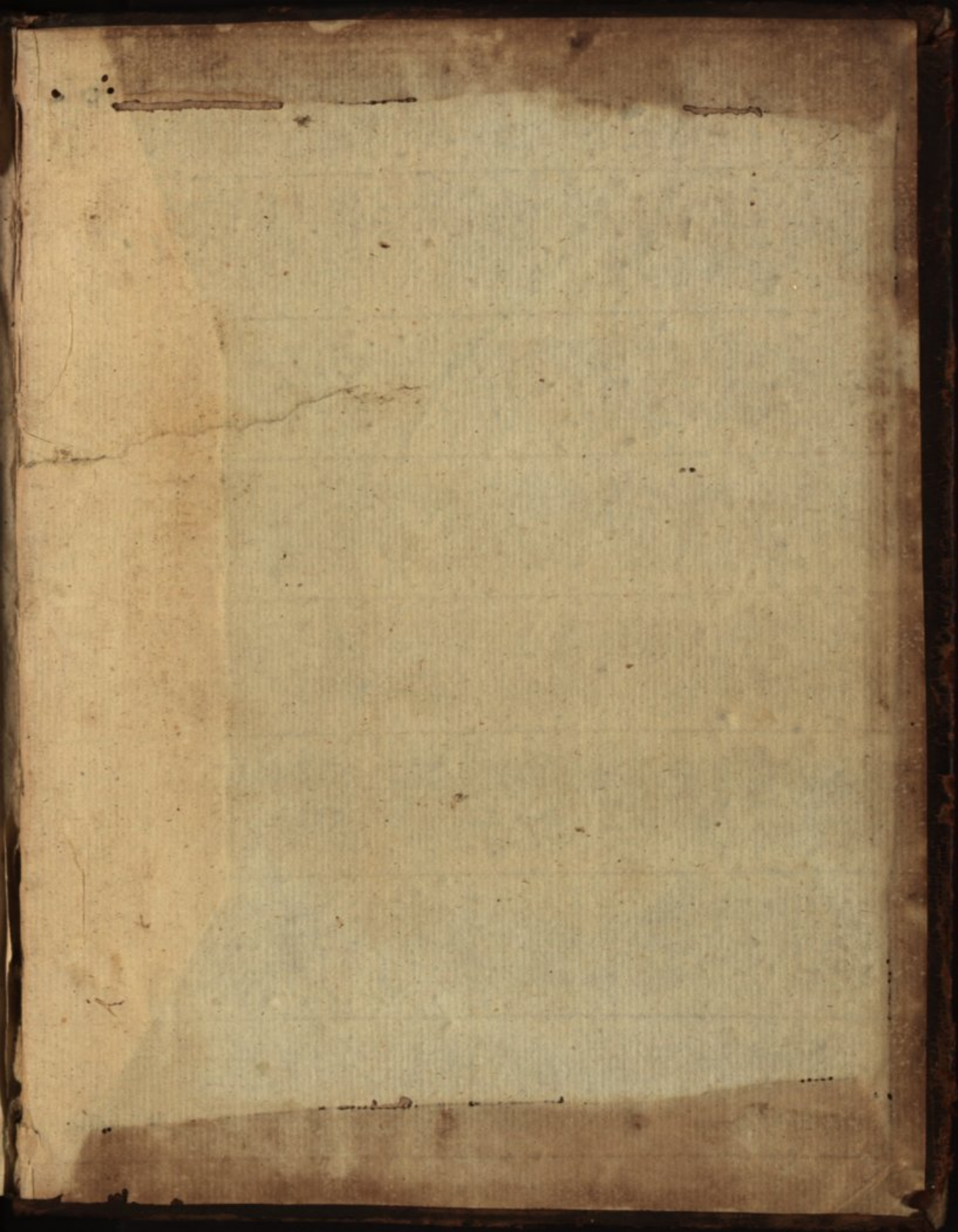
wife remarked; (according to the System generally received among Astronomers) and the Planets themselves are surrounded by a transparent Firmament, whereon the several Constellations are delineated, by which Means the Variety of Aspects the Planets appear under to a Spectator in either of them, with Respect to their Motions and Situations amongst the fixed Stars, are plainly seen, sometimes direct, sometimes stationary, and at other Times retrograde. The Earth (on which the principal Kingdoms are described, is accompanied by a natural Horizon, and a representative Inhabitant, which may be set to any Latitude) makes its Revolution in the Plane of the Ecliptick. Besides its diurnal Motion about its Axis, its Axis remaining parallel to that of the World, shews the Causes of Day and Night, and the Mutations of the Seasons. Round this Globe revolves the Moon, in an inclined elliptick Orbit (in one of whose Foci the Earth is placed) the Apfides of which advance and recede every Luration, so as to perform a Motion in Consequencia in its proper Period, whilst the Nodes move round in Antecedentia. The Eccentricity of this elliptick Orbit, is continually changing into a new Curve, and its Latitudes both northern and southern are fully shewn. It also shews the periodical and synodical Month, the several Phases of the Moon, her Age, and Place in the Zodiack, which gives a clear Idea of the Manner in which lunar Eclipses are occasioned, and may be very ingeniously demonstrated. The Tides are also accounted for in a very intelligible Manner, and as the Observations of the Eclipses of *Jupiter's* Satellites is of great Use in Astronomy, a particular Regard hath been had to construct their Motion in inclined Planes, as well as those of the Satellites of *Saturn*; and their Distances, Magnitudes, and true Periods, are also shewn, together with their Immersions into, and Emmerfions out of the Shadow of their respective Primary. A Celidography of *Venus* is also exhibited.

All the Planetary Bodies are put in Motion at once, and the Movement that sets them a going, is regular, and easy, and capable of being continued for a very considerable Time. In short the Contrivance of the whole Machine is such, that all the Problems of Astronomy, Geography, &c. (the Physicks excepted) may be either explain'd or illustrated by it.

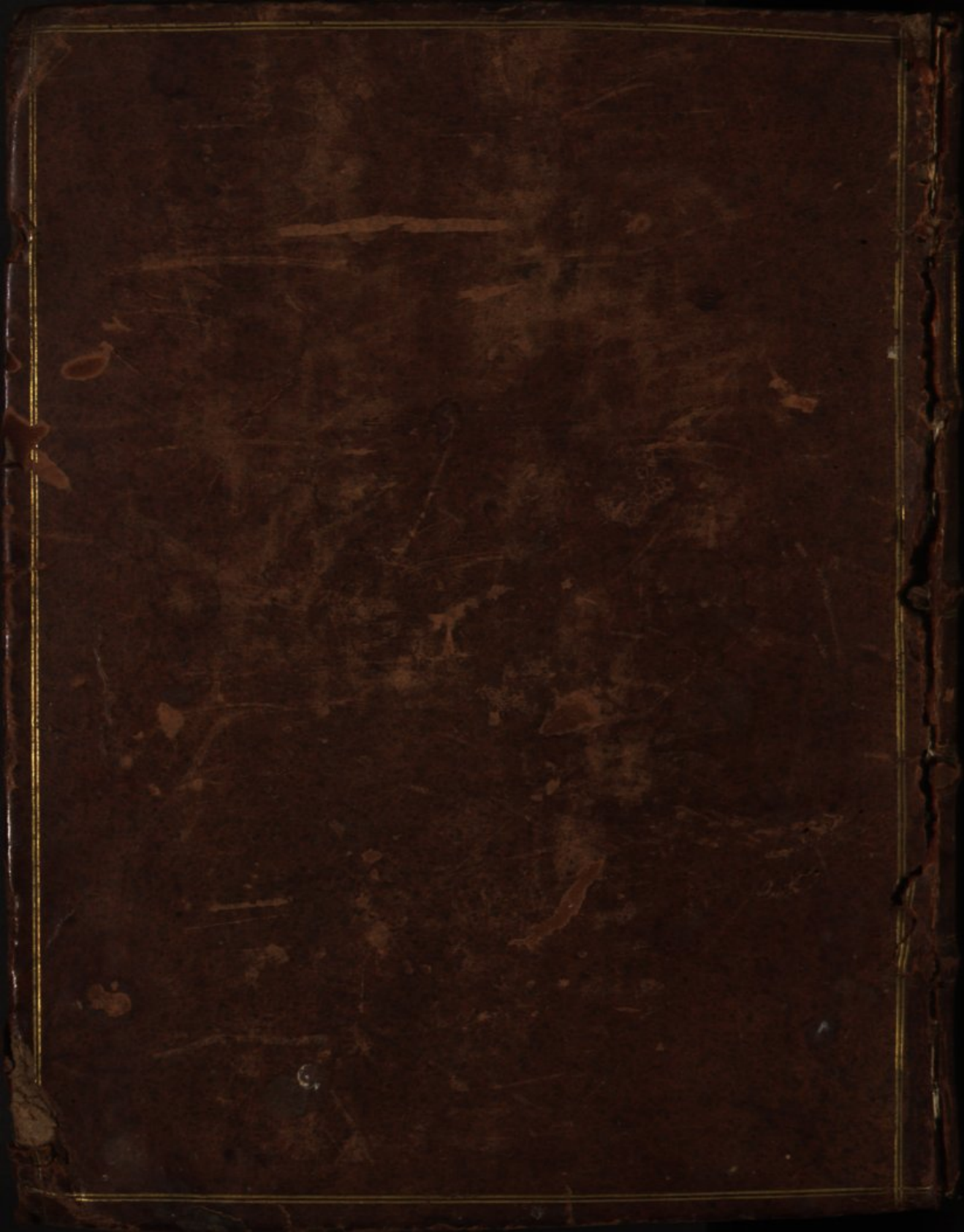














A D A M S ' S  
M I C R O G R A P .  
I L L U S T R A .