

**Lectures on natural and experimental philosophy, considered in its present state of improvement / By the late George Adams.**

**Contributors**

Adams, George, 1750-1795  
Jones, William, 1763-1831

**Publication/Creation**

London : Printed by J. Dillon and Co., for W. and S. Jones, 1799.

**Persistent URL**

<https://wellcomecollection.org/works/bpm96e54>

**License and attribution**

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection  
183 Euston Road  
London NW1 2BE UK  
T +44 (0)20 7611 8722  
E [library@wellcomecollection.org](mailto:library@wellcomecollection.org)  
<https://wellcomecollection.org>

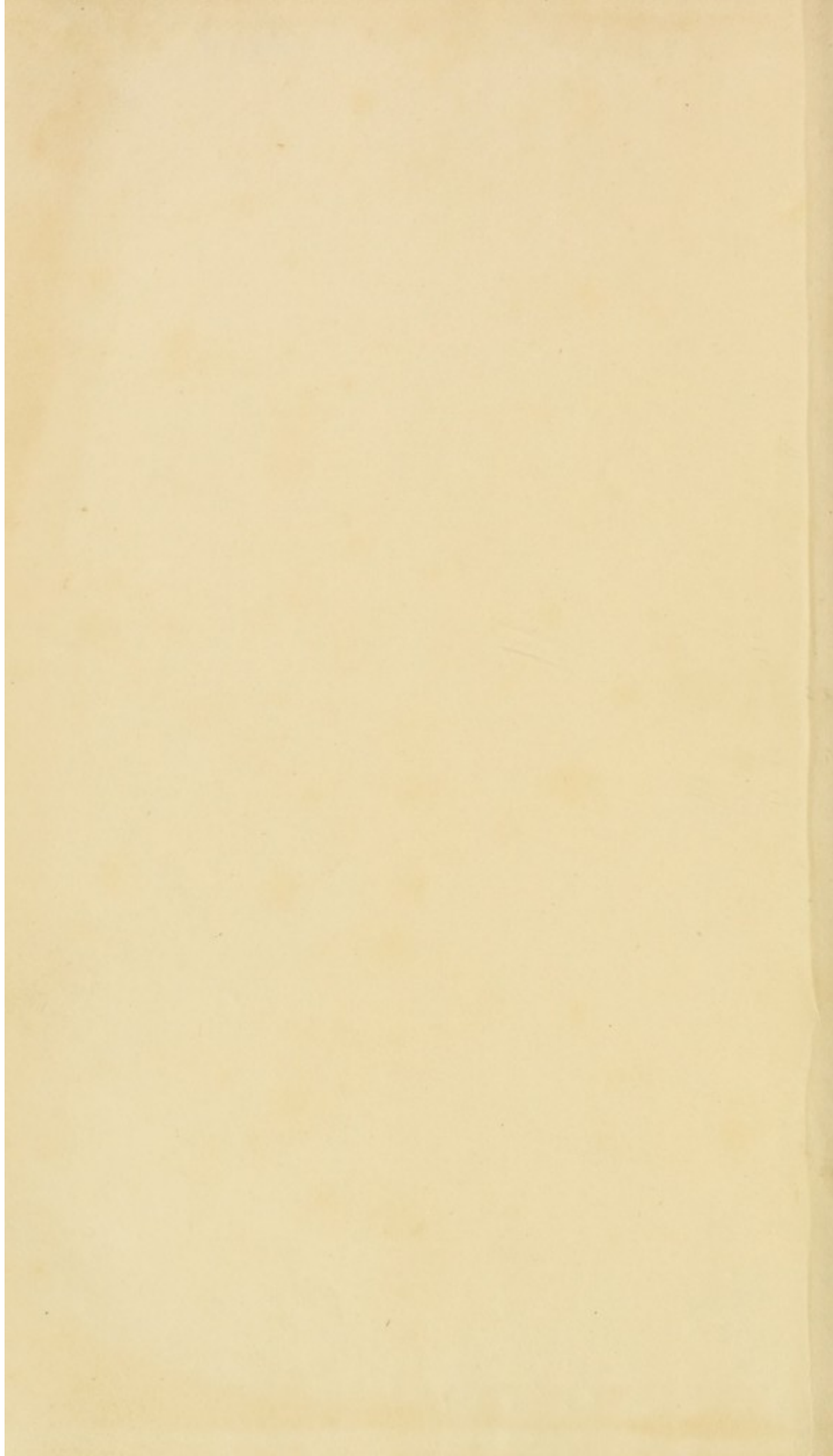


2.277/B.

30/11/05  
339

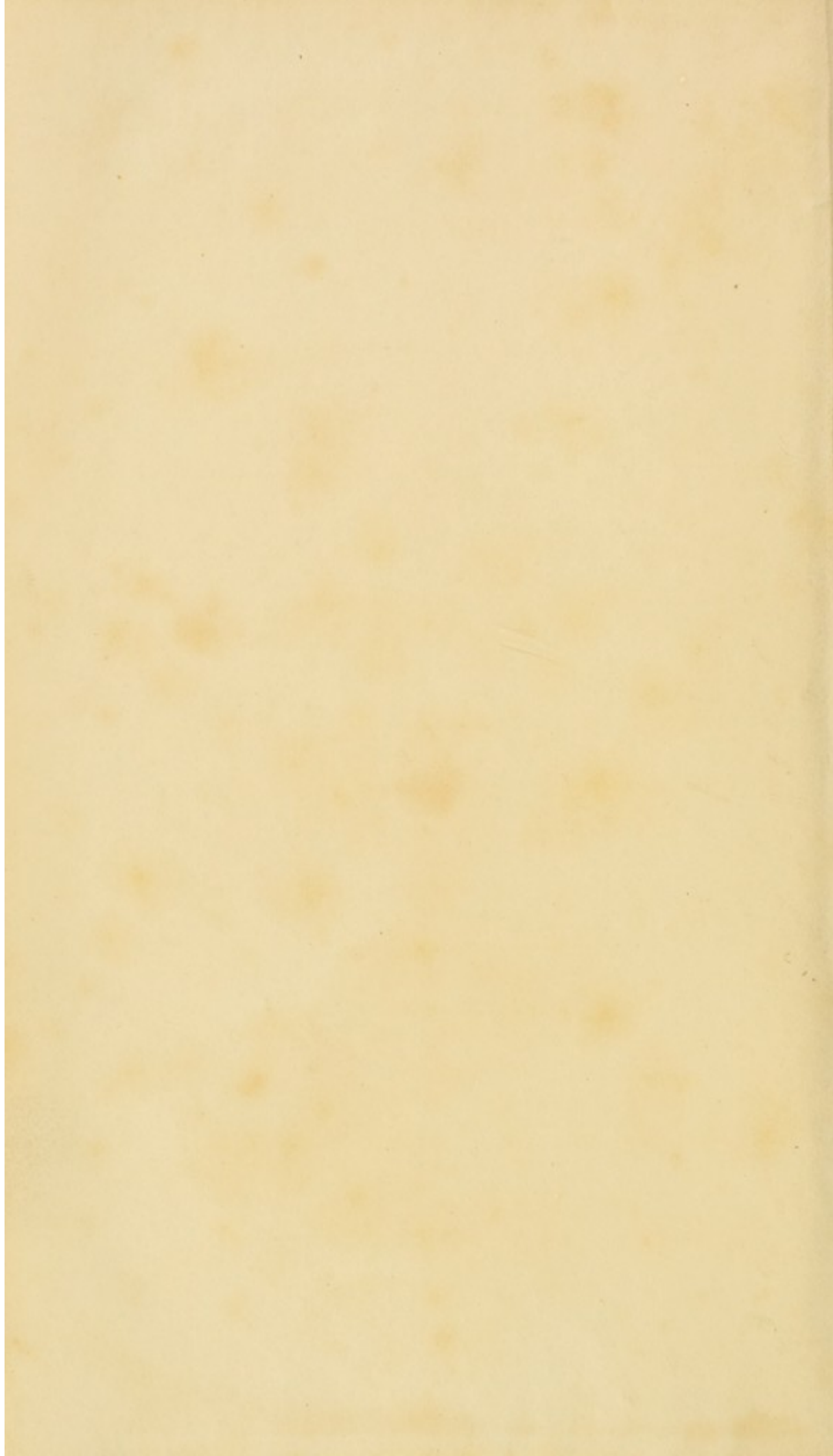
1957







Digitized by the Internet Archive  
in 2016 with funding from  
Wellcome Library



PLATES AND INDEX  
TO  
LECTURES  
ON  
NATURAL AND EXPERIMENTAL  
*PHILOSOPHY,*

BY THE LATE  
GEORGE ADAMS,  
MATHEMATICAL INSTRUMENT MAKER TO HIS MAJESTY, &c.

---

THE SECOND EDITION,  
WITH CONSIDERABLE CORRECTIONS AND ADDITIONS, BY  
WILLIAM JONES,  
MATHEMATICAL INSTRUMENT MAKER.

---

VOL. V.

---

LONDON:  
PRINTED BY J. DILLON, AND CO.  
FOR, AND SOLD BY, W. AND S. JONES, OPTICIANS,  
HOLEBORN.

---

1799.

LECTURES

ON

PHYSIOLOGY

AND

ANATOMY

GEORGE ADAMS



WILLIAM JONES

LONDON

1847

PRINTED BY J. JOHNSON, ST. PAULS CHURCH-YARD

AND SOLD BY W. JOHNSON, 10, ABchurch-lane

1847



---

## INDEX.

---

N. B. The Roman Characters denote the Volume: thus, i. ii. iii. iv.  
The Arabic Numbers, the Page: thus, 1, 2, 3, &c.

### A

*ACID Liquors*, the variety in their freezing, ii. 63.

*Agency active* in nature, iii. 238.

*Air*, a fluid, the nature and properties of it, i. 49. Effects produced by it, *ib.* Its resistance, *ib.* 54. Its weight, *ib.* 56. Its pressure in every direction, *ib.* 57, 81. Its force equally extended, *ib.* 61. By it is explained the suction of animals, *ib.* 69. Its weight sustains the column of mercury in the barometer, *ib.* 78. Its vast pressure on the earth, *ib.* 82. Its elasticity proved, *ib.* 83, 87. And differently accounted for, *ib.* 93. Is caused by fire, *ib.* 94. Is capable of raising great weights, *ib.* 85. The air in timber causes it to swim, *ib.* 91. Continued varieties in nature caused by air, *ib.* 92. Its elasticity is always equal to the force which compresses it, *ib.* 95. Its elasticity undestroyed, *ib.* 109. Air expands by heat and contracts by cold, *ib.* 111, 112. Is the cause of winds, *ib.* 114. The benefits of fresh and cool air, *ib.* 115. Carries off smoke, *ib.* 117. Enlivens fire, *ib.* 118. Different currents of air in chimnies in summer time, *ib.* 127. Effects of condensed air, *ib.* 129. Produces fountains and jets, *ib.* 135. Different calculations of the dilatation of air, *ib.* 137. Raises water thirty-four feet, *ib.* 139. Cannot be totally exhausted from the receiver of the air-pump, *ib.* 154. The quantities of air exhausted at every stroke are not equal, but are perpetually diminished, *ib.* 158. The different methods of extracting it from the bodies which contain it, *ib.* 206. By heat, by cold, by exhaustion, and by dissolution, *ib.* 207. Air is contained in water, *ib.* 208. In eggs, 209. In wood, *ib.* The pressure of it may produce the finest anatomical injections, *ib.* 211. Air condensed retards fermentation, *ib.* 213. Air is a resisting



medium, according to the surface exposed, *ib.* 214. Supports the flight of birds, *ib.* 216. Is of great importance in the theory of gunnery, *ib.* 217. Its great resistance to cannon balls, *iii.* 187. Its use in the animal economy, *i.* 218, 221. Is necessary for combustion, *ib.* 220. Is diminished by combustion, *ib.* 223. Vast quantities are consumed by fires and various other means, *ib.* 225. Nourishes the blood, *ib.* 230. Passes into the bodies of birds, *ib.* 235. Is the medium of sound, *ib.* 239, 241. Dense air conveys the sound best, *ib.* 242. Air is thrown into an undulating motion by sound, *ib.* 244. In what manner the pulses of the air are propagated by sound, *ib.* 245. The various effects in the atmosphere resulting from the air, *ib.* 269. Connexion between air and fire, *ib.* The benefits resulting from air, *ib.* 272. Is a general agent, *ib.* 273. Hippocrates, his remark on it, *ib.* Is not a solvent of water, *ib.* 391. Rarefied air a cause of dryness, *ii.* 77. Very different currents of air in the atmosphere, *iii.* 460. Hot air, its power to raise weights, *ib.* 468. Air produced by fire and light, *iv.* 432. The upper regions of it extremely dry, *ib.* 512. See *Fire, Light, Water*. An account of the discoveries of the different airs, *i.* 488. The manner of conveying them from one vessel to another, *ib.* 493. Methods of extracting air from several subjects, *ib.*

*Air, alkaline acid*, its nature and properties, *i.* 574.

*Air, atmospheric*, is a mixture of different fluids, *i.* 404, 534. Particularly of two elastic fluids of opposite qualities, *ib.* 537. Contains about seventy-two parts phlogisticated air, and twenty-eight parts vital air, *ib.* 538. Is an uniform compound, *ib.* 539. Air presses on fire, *ib.* 406. Air supplies the fire, *ib.* 408. Vital air, on inflammation, disengages much fire, *ib.* 409. Explanation of Argand's lamps, *ib.* Air, its effects on ignited iron, *ib.* 410. Contains great quantities of fire, *ib.* 480.

*Air, fixed*, its nature and properties, *i.* 545 to 556. Is found in subterraneous places, and is produced from fermentations, *ib.* 546. From the respiration of animals, *ib.* 547. Is combined with various substances, *ib.* 548. Its effects when breathed by various animals, *ib.* 547, 548. Is absorbed by water, *ib.* 549. The analogy between this and phlogiston, 588, 591.

*Air, fluor acid*, an account of, *i.* 573.

*Air, hepatic*, an account of, *i.* 567. Its nature and properties, *ib.* 568.

*Air, inflammable*, its nature and properties, how obtained, *i.* 558. Is produced from water by means of fire, *ib.* 561. Different manner of its burning, *ib.* 563. Inflammable air from marshes, *ib.* 570. An useful apparatus for making it, by the Editor, *ii.* 96.

*Air, cretaceous inflammable*, how obtained, *i.* 570.

*Air, pure inflammable*, its nature and properties, *i.* 564. Can form fire-works without smoke, *ib.* 566. Being mixed with different airs, it produces different colours, *ib.*



- Air, nitrous*, obtained by the spirit of nitre poured on various metals, i. 540. Is a combination of phlogisticated and vital air, *ib.* 541. Its nature and properties, *ib.* 543.
- Air, phosphoric*, its nature and properties, i. 563.
- Air, phlogisticated*, called also azotic gas, or atmospherical mephitis, is variously obtained, i. 531. Is light, tasteless, insoluble, *ib.* 532. Is improper for respiration or combustion, *ib.* 533.
- Air, sulphureous acid*, its nature and properties, i. 573.
- Air vital*, its singular effects on fire, i. 411. Amazingly increases its power, *ib.* 467. An account of it, *ib.* 509. Is extricated by heat from various substances, *ib.* Also by light from vegetables, *ib.* 512. But in different quantities, *ib.* 514. Water differently impregnated promotes the emission of it, *ib.* 516. The quantity of it extricated is a test of the quantity of food taken in by the plant, *ib.* 517. Is extricated from some metallic calces, *ib.* 524. Its weight supports combustion, *ib.* 520. The change it produces on phosphorus, *ib.* 521. Many combustible substances become acid by vital air, *ib.* 522. Metallic substances increase in weight as they absorb vital air, *ib.* 523. It forms one third of the atmosphere; is the acidifying principle, *ib.* 524. Is necessary for respiration, *ib.* 526. It takes from the blood its superabundant mephitis, and imparts its own fire, *ib.* The quantity of it absorbed in respiration, *ib.* 527. It gives the red colour to the blood in the lungs, *ib.* 528. By respiration it passes from an aerial to a concrete form, and is the source of animal heat, *ib.* 529. Its effects when taken medicinally, *ib.* 530. Is a constituent part of certain bodies, *ib.* 585.
- Air gun*, Editor's description of, i. 133.
- Air-pumps*, description of, i. 44, 47. History of, 49. An account of them, *ib.* 44, 45. An account of their improvement, *ib.* 148. By Mr. Smeaton, *ib.* 150. By Dr. Prince, who removed the valves, *ib.* 151. Means to obtain accurate exhaustion, *ib.* 167. American air-pump, *ib.* 44. Common double barrel, *ib.* 45. Editor's caution in cleaning them, *ib.* 47.
- Animals* possess a natural language, i. 233. Retain the same degree of heat in different climates, *ib.* 293. The wisdom exhibited in their form and magnitude, iii. 305.
- Ancients* supposed that nature dreaded a vacuum, i. 73. But this was confined within certain limits, *ib.* 74. Their knowledge in natural philosophy, ii. 474. Their knowledge of glasses, *ib.* 485. The just ideas which some of them entertained of God, iii. 62. Their opinion of the soul, *ib.* 63.
- Archimedes* set fire to the Roman ships at Syracuse, by means of his burning glasses of plane mirrors, i. 463. ii. 225. His knowledge in hydrostatics, iii. 386.
- Aristotle*, the influence of his authority, which impeded the progress of truth, i. 75. His idea of a plenum, iii. 33. His just remark concerning the Creator, iv. 295.



- Arithmetic, mechanical*, principles of, iii. 270.
- Armillary sphere*, iii. 550. The appearances of the starry heavens illustrated by it, *ib.* 566.
- Astronomy*, observations on; its design, iii. 522. Its general principles, *ib.* 523. Corrects appearances, iv. 1. Copernican system, *ib.* 2, 4, 168, 169. Ptolemaic, *ib.* 3, 78. Remarks on physical astronomy, *ib.* 249. The different analogies of the heavenly motions which have been pointed out, *ib.* 249, 250. Kepler's laws of it, *ib.* 261.
- Atmosphere*, height of; manner of ascertaining it, i. 97. Does not refract light above forty-five miles, *ib.* 98. The height not accurately known, *ib.* 100. Horseley's conjecture concerning its infinitude, *ib.* 102. Is a mixture of all, vegetable, mineral, and animal substances, *ib.* 268. Great causes always acting in it, iv. 474.
- Atoms*, considerations concerning them, iii. 13. Are indivisible, *ib.* 14. Are indefinitely small, *ib.* 16.
- Attraction*, how differently used by authors, iii. 24, 25. Observations on it, *ib.* 29. How falsely applied, *ib.* 30. Instances of attraction otherwise explained, *ib.* 32. In a column of quicksilver, *ib.* 34.
- Attraction of cohesion* examined, i. 307.
- Aurora borealis*, the different appearances of, iv. 540. Its flashes cross the magnetic meridian at right angles, *ib.* 541. Where they converge, *ib.*

## B

- Bacon, Friar*, is said to have discovered the telescope, ii. 483. His superior character and attainments, *ib.* 484.
- Bacon, Lord*, his reflexions on the philosophy of Aristotle, i. 20. Discovered the elasticity of the air, *ib.* 84. His observations on the senses, *ib.* 11. On the tendency of true philosophy, *ib.* 314. On the scriptures and the creatures, *ib.* 315. On second causes, *ib.* His method of reasoning on natural philosophy; his *novum organum*, *ib.* 1, 2. His uncommon merit, *ib.* 2. His character of a true philosopher, *ib.* 3. His account of the idols of the mind, *ib.* 5. The idols of the tribe, *ib.* 6, 11. Idols of the cave, *ib.* 3, 7. The idols of the market, *ib.* 18. The idols of the theatre, *ib.* 19. His account of different erroneous systems; the sophistical, *ib.* 20; the empirical, and the superstitious, *ib.* 21. His new logic, or art of interpreting nature, *ib.* 27. His comparison of natural philosophy to a pyramid, *ib.* 38. His suggestions for a history of winds, iv. 528.
- Balance*, its properties, iii. 273. How it should be constructed, *ib.* 273. Its fulcrum, *ib.* 275. The axis to be placed higher than the center of gravity, *ib.* 276. Weights to be used with, *ib.* 278. Helsham's property of the balance, *ib.* 279.
- Balloons, air*, iii. 455. Dr. Black and Mr. Cavallo discovered the principle of them, *ib.* 457. Were discovered and also executed



by the Montgolfiers, with rarefied air, *ib.* 458. The first ascended from Paris with M. Pilatre de Rozier and the Marquis d'Arlandes, *ib.* 459. Of air balloons filled with inflammable air, *ib.* 460. Description of them, *ib.* 462. An account of different excursions made in them by Messrs. Charles and Roberts, and Mr. Baldwyn, *ib.* 462, 464. Will rise from only the rarefaction of common air, *ib.* 469. Collect many vapours in the atmosphere, *ib.* 470. Are unmanageable from their size, *ib.* 471.

*Barometer* arose from the Torricellian vacuum, i. 73. The manner of filling its tube, *ib.* 76. Was first used by Pascal to measure mountains, *ib.* 77. Applied as a gage to the air-pump, *ib.* 79. On the best form for it, iv. 479. The principal requisites of a good barometer, *ib.* 480. To boil the mercury in the barometer tube, *ib.* 481. It requires a gage to regulate the quantity of mercury in the cistern, *ib.* 483. Is influenced by heat and cold, *ib.* 483. Of the portable barometer; how to use it, *ib.* 486. Its defects, *ib.* 487. Of the best portable barometer, *ib.* How to use it, *ib.* 489. Of the scale of correction of the excesses of heat and cold, and their influence on the barometer, *ib.* 490. M. de Luc's remarks on them, *ib.* 482, 556. The variations diminish as you approach the equator, *ib.* Remarks from the barometer, *ib.* 557 to 559.

*Battery, electrical*, iv. 364. Cautions in the using it, *ib.* 365. Effects produced by it, *ib.* 366 to 368.

*Battering rams* of the ancients, iii. 106.

*Bell*, the manner of its sounding explained, i. 243, 244.

*Birds*, the manner of their flying, i. 216; iii. 125. Provision made for this, in the air passing from their lungs into every part of their bodies, i. 235.

*Black*, Dr. his doctrine of latent and sensible heat, i. 342. His experiments on the melting of ice, *ib.* 346. His discoveries of airs, *ib.* 489.

*Blindness*, calamity of, ii. 277.

*Blood* is purified in the lungs, and nourished by air; receives its vermilion colour from vital air, i. 527, 528.

*Boerhaave*, his idea of fire, i. 286.

*Bones*, their great strength, iii. 342.

*Boyle*, Hon. Mr. his distinguished character, i. 51.

*Breezes, land and sea*, an account of them, iv. 535.

*Buffon* by plane mirrors burnt planks at a distance, ii. 225.

*Burning glasses*, or convex lenses, collect the rays of the sun, ii. 186.

Were known to the ancients, *ib.* 187. Effects produced by M. Tschirnhausen's burning glass, *ib.* Mr. Parker observed a rotatory motion in the rays at the focus of his burning glass, *ib.* 189.

## C

*Camera obscura*, its construction and use, ii. 191. Observations upon it, *ib.* 195.



- Cataract in the eye*, how caused, ii. 337. Means used to disperse it, *ib.* 338.
- Catoptrics*, on the laws of reflexion of light, ii. 145.
- Center of the solar system*, iv. 281.
- Charcoal*, reasonings upon experiments made with it for and against phlogiston, i. 583. M. Lavoisier's mistakes, from considering it as a simple principle, *ib.* 587.
- Chimnies*. High chimnies draw best, i. 119. Causes of chimnies smoking, *ib.* 120. The want of a fresh current of air, *ib.* 121. Chimnies too large, *ib.* 122. Funnels too short, *ib.* 123. The action of two chimnies on each other, *ib.* The position of the room door, *ib.* 124. Communication of funnels, *ib.* Narrowness of funnels, *ib.* 124. Low situation of the house, *ib.* 125. Violence of winds, *ib.* Chimnies modern inventions, *ib.* 128.—See *Air, Fire*. Count Rumford's improvements on, *ib.* 178. Common fire-places capable of improvement, *ib.* All smoky chimnies may be cured, *ib.* 179. Sketches of his improvements, *ib.* 186. His practical directions for workmen, *ib.* 190. His directions for laying out the work, *ib.* 198.
- Clarke*, Dr. his idea of the cause of motion, iii. 242.
- Clocks* differ in different degrees of heat, i. 296. The principles on which they are constructed, iii. 213. Their irregularities, *ib.* 214.
- Clouds*, indications of the weather from them, iv. 560.
- Coals*, objections against them at first, i. 128. The smoke from them considered by the Editor as injurious to the atmosphere of cities, *ib.*
- Cohesion* is produced by fire, i. 311.
- Cold, artificial*, accounted for, i. 350. Cold is produced by the absorption of fire, *ib.* 380. It depends on the degree and the rapidity of the evaporation, *ib.* 384.
- Cold* is the sensation caused by fire passing from one body to another, i. 319. Effects of extreme cold on the animal frame, ii. 41. Produces great sterility, *ib.* 42. It is not extreme cold, but humidity, which is fatal to plants, *ib.* 48. The extreme degrees of cold, *ib.* 53. On the sources of cold, iv. 543 to 545—See *Fire, Evaporation*.
- Collision*, a means of exciting fire, i. 455. Effects produced by this, *ib.* 456. Its use in New Holland, *ib.* 457.
- Colours* differently absorb the rays of heat, i. 396. The colouring substance is formed by the agency of light on the vegetables, *ib.* 431. On different tints of the rays of light, ii. 365. Sir Isaac Newton's theory of light and colours, *ib.* 366.—See *Newton*. The seven colours exhibited by the prism, *ib.* 369. The order of the colours, *ib.* 370. The rays of different colours are of different refrangibility, *ib.* 372. The colours of the rays are not changed by refraction, *ib.* 374, 384. The due mixture of the primary colours produces whiteness, *ib.* 382. Illustrated, *ib.* 385. The similarity between the seven primary colours and the seven notes in the scale of music, *ib.* 386. Different experiments on colours with the prism, *ib.* 388. Il-



- Illustrated by the phenomenon of the rainbow, *ib.* 393. The different colours appear under different angles, *ib.* 398. The different colours observed in a soap bubble, *ib.* 400, 405. On the circles seen in glass plates, *ib.* 401. Different colours exhibited by reflected or by transmitted light, *ib.* 403. The colours of bodies depend in some degree on the thickness of the particles that compose them, *ib.* 406. The colours of different bodies arise from their reflecting one colour, and imbibing all the rest, *ib.* 410. The colours tinging shadows in summer explained, *ib.* 414. The colours of the atmosphere, clouds, &c. *ib.* 415. The excellency of the colours used by the ancients, *ib.* 417. Mr. Delaval found that the tinging matter of all vegetables was always black when viewed by reflexion, *ib.* 420. The colouring particles of bodies appear black when they are dense, *ib.* 422. When the colouring matter is extracted from vegetables, &c. they appear white, *ib.* 423. Colours are destroyed by the rays of the sun, *ib.* 424. Animal and metallic colours are produced in the same manner as vegetable, *ib.* 426. The production of colour depends on fire, *ib.* 432. Colours are emitted from some phosphoric substances, *ib.* 445. They are produced by fire, *ib.* 446. Are not sensations, but secondary qualities of bodies, *ib.* 476.—See *Light*, *Fire*.
- Colure*, equinoctial and solstitial, iii. 561.
- Combustion*, an effect of fire, i. 401. The requisites for combustion, *ib.* 403. In combustion the pure air is converted into fixed air and aqueous vapours, and gives out its fire, *ib.* 480.
- Comets* are regular parts of one great system, iv. 241. Their use unknown, and the knowledge of them imperfect, *ib.* 241. Their number, orbits and motion, velocity and size, *ib.* 242. Their form and tails, *ib.* 243.
- Conductors*, and non-conductors, of electricity, iv. 306.
- Congelation*, phenomenon of, explained, i. 348.
- Constellations*.—See *Stars*.
- Copernicus*, his system, iv. 1. Was probably known to the ancients, *ib.* 2. A view of it, *ib.* 4. The truth of his system proved by the planetarium, *ib.* 168, 169.
- Crawford*, Dr. his excellent treatise on animal heat, i. 469, 481; and on combustion, *ib.* 481.
- Creation*, remarks on it, iv. 430. The order of it, *ib.* 433. Is a theatre for the divine goodness, *ib.* 434.
- Cruelty to animals* justly condemned, i. 221.
- Crystallization* explained, i. 452.
- Cupping*, the nature and operation of it, i. 62.

## D

- Dalton*, Mr. his account of the aurora borealis, iv. 539. His remarks on the weather from the barometer, *ib.* 557.



- Darkness* at our Saviour's crucifixion supernatural, iv. 124.
- Day*, astronomical or solar, iv. 143. Siderial, *ib.*
- Delaval*, Mr. his experiments on the permanent colours of opaque bodies, ii. 416. He found, that in transparent coloured substances the colouring matter does not reflect any light, *ib.* 419. An account of his experiments, *ib.* 420. He concludes that the colouring particles do not reflect any light, but that objects are reflected by a medium diffused over the surfaces of the plates, *ib.* 421. His observations on the colours of animal, earthy, and metallic bodies, *ib.* 426, 427.—See *Colours, Light*.
- Descartes*, his error concerning the universe, iii. 24.
- Digits*, iv. 112.
- Diodorus Siculus*, his weak idea concerning the speech of men at the beginning, i. 232.
- Dioptrics*, or the laws of refraction, ii. 145.
- Discoveries* of printing, mariner's compass, gunpowder, ii. 438, 439.
- Distance*, the appearance of, depends on the brightness of objects, ii. 347. On the number of intervening objects, *ib.* 349. Different degrees suggested by different apparent magnitudes of objects, *ib.* 351.
- Diving bell*, description of Dr. Halley's, iii. 474. The improvement of this by Triedwald, *ib.* 476; by Mr. Smeaton, *ib.* 477.
- Diving chest*, invented by Mr. Smeaton, iii. 477.
- Dollond*, Mr. John, the inventor of the achromatic telescope, ii. 524. The principles on which it is founded, *ib.* 528. The discovery attributed to Euler, *ib.* 529. The invention also ascribed to Mr. Hall, *ib.* 530.

## E

- Earth*, the equatorial diameter greater than the polar diameter, iii. 43. Its size, motion, distance, &c. iv. 22. Its revolution; its figure, *ib.* 44. The proofs of this, *ib.* 45. Its diurnal motion, *ib.* 48. The reasons for this, agreeable to analogy, *ib.* 50. The phenomena arising from this diurnal motion, *ib.* 51. Is half illuminated at a time, *ib.* 52. Of the earth's annual motion, *ib.* 55. It partakes of various degrees of heat and cold, *ib.* 71. The earth enlightens the moon, *ib.* 103. The shadow of the earth forms a cone, *ib.* 107. The eclipses of it, *ib.* 114. Its monthly motion about the common center of gravity between that and the moon, *ib.* 182. The matter of earth, how formed, *ib.* 433. The use of the earth, *ib.* 434. The magnetism of the earth, *ib.* 455. Earth a source of heat, iv. 542. Distance from it a cause of cold, *ib.* 543. The excellency of its distribution into seas and mountains, *ib.* 550.
- Ebullition* is caused by the action of fire on the bubbles of air in any fluid, i. 371.
- Echo*, nature of, i. 253. Explanation of its effects, *ib.* 257.—See *Sound*.



*Eclipses* were formerly superstitiously regarded, iv. 105. Are explained, *ib.* 106. Of the moon, *ib.* 107. Eclipses total and central, *ib.* 108. Of their limits, *ib.* 121. Of their periods, *ib.* 122.

*Ecliptic*, the sun's annual path, iii. 546. The obliquity of this, *ib.* 547. Is divided into twelve signs of thirty degrees each, *ib.* 559.

*Eeles*, Mr. his system of electricity, iv. 307.

*Eggs*, incubation of, greatly assisted by means of air, i. 209.

*Elasticity* (see *Air*, *Water*) is caused by fire, i. 93. Elasticity of bodies, iii. 227. Supposed to be caused by motion, *ib.* Its effects in different handy-works, *ib.* 235. In gunnery and rockets, *ib.* 236.

*Electricity* first discovered in amber, iv. 301. The uses derived from it, *ib.* Is a fluid universally diffused, *ib.* 303. Electrical appearances, *ib.* 304. Electricity is vitreous or resinous, *ib.* 305, 306, 307, 309, 311, 312, 318, 326, 346, 347. These are two distinct and active powers, *ib.* 308. They exist together conjoined, in their natural state, *ib.* Electricity is from the separation from these two powers, *ib.* 308, 312. Electrical atmospheres, *ib.* 309. Of the electrical machine, and its mode of action, *ib.* 311, 313. Cautions in using it, *ib.* 315, 316. Conductors must be insulated before they are electrified, *ib.* 313. The brilliancy of the spark depends on the pressure of the atmosphere and medium, *ib.* 313, 335. The solar and electric fluid are probably the same, *ib.* 317. On the momentum of its force, *ib.* 317. On its attraction and repulsion, *ib.* 318. On the afflux and eflux of the two powers, *ib.* 321. Gives a rotatory motion to small light balls, *ib.* 324. The electric fluid is universally disseminated, and in continued action, *ib.* 325. The smallest motion in nature disturbs its equilibrium, *ib.* 326. Observations on Franklin's system of electricity, *ib.* 330. On the electric spark, *ib.* 332. On the use of points, *ib.* 333. The electric spark will fire spirits of wine, *ib.* 337. The sparks are of different colours, *ib.* 338, 356. Motions produced by electricity, *ib.* 338. Promotes evaporation, *ib.* 340. Is a subject of general curiosity, *ib.* 342. To ascertain the quantity of the electric matter, *ib.* 344. The powers are reciprocally exchanged, *ib.* 350. It melts wires, beginning in the middle, *ib.* 355, 368. The electric matter is only luminous in a divided state, *ib.* 358. It perforated a quire of paper in opposite directions, *ib.* 365. Is discovered in rain, hail, snow, *ib.* 374. The immense quantity of it, *ib.* 379. Is real matter, proved, *ib.* 385. Its resemblance to fire and light, *ib.* 385, 386. It produces heat, *ib.* 387; and accelerates evaporation, *ib.* 388. Is communicated by the same substances which communicate heat, *ib.* 389. Electricity is procured by heat and liquifaction, *ib.* 390. Raises the thermometer, *ib.* 391. The electric state of the air in Russia, *ib.* 393.



393. Heat in summer becomes electric fluid in winter, *ib.*  
 394. Luminous experiments, *ib.* 395. The similar effects on the solar and electric light, by different media, *ib.* 400. On animal electricity; electricity the principal of animal heat and motion, *ib.* 413. The electric fluid and the solar fire are the same, *ib.* 417. Its agency in animated nature, *ib.* 419. Its influence on health and our feelings, *ib.* 420. Remarks on animal electricity, *ib.* 421. Electricity may be the same as the animal spirits, *ib.* 423. Experiments and results from animal electricity, *ib.* 426, 428. Remarks on atmospherical electricity, *ib.* 551. Its diurnal variations, *ib.* 553.—See *Sun, Fire.*
- Electrometer*, that described by Mr. Bennet, iv. 326. Experiments with it, *ib.* 327, 551.
- Elements*, active and passive, iv. 412. The importance of this agency, iv. 471.
- Engines*, constructions of different sorts, iii. 306. Compound engines, *ib.* 308. How to compute their powers, *ib.* 310.
- Equator*, of the, iii. 529, 557.
- Equatorial instrument* or universal sun-dial, description of, iv. 209.
- Equinoxes*, precessions of, iv. 141.
- Ether*, by evaporation, is capable of freezing water, ii. 50. Reduced mercury 29° below the freezing point, *ib.* 51.
- Evaporation* an effect of fire, i. 363. Different effects resulting from it, *ib.* 367, 381. Cools liquors, *ib.* 372. Is the same in open air and in vacuo, *ib.* 374. Evaporation of ether freezes water, *ib.* 383. Effects of it, *ib.* 385. Produces ice in the East Indies, *ib.* 385. Its effects on the health of the body, *ib.* 387. Spontaneous evaporations are also caused by fire, *ib.* 392. And are assisted by motion, *ib.* 392. Evaporation proceeds from grass, vegetables, trees, and shrubs, *ib.* 394. In a certain degree it contributes to health, *ib.* 395. Laws of evaporation by M. de Luc, ii. 81. Is a dissolution of water by fire, iv. 505. Is a great source of cold, *ib.* 545. Remarks on evaporation, *ib.*—See *Fire, Water.*
- Eudiometer tube*, and measure, i. 495, 496.
- Exhaustion*, successive degrees of, i. 153.
- Experimentalist*, character of, i. 203, 204, 206.
- Eye*, greatly assisted by optical instruments, ii. 143. Can be adapted to very different degrees of light, and size of objects, *ib.* 161. Benefits derived from it, *ib.* 276, 277. Short description of the eye and its various parts, external and internal, *ib.* 278. Its orbit, brows, *ib.* Of the two eye-lids, *ib.* 279, 282. Of the lachrymal gland, *ib.* Of the muscles of the eyes, *ib.* 282. Of the motions of the eye, *ib.* 285. Of its globe, *ib.* 286. Of its coats, sclerotica, choroides, *ib.* 288. Of the iris, *ib.* 289. The pupil, *ib.* 291. Of the retina, *ib.* Of the optic nerve, *ib.* 292. The advantages derived from two eyes, *ib.* 284. Of the three humours, *ib.* 292. The aqueous, *ib.* 293. The crystalline, *ib.* 294. And the



vitreous, *ib.* 295. Of the ligamentum ciliare, *ib.* Of the artificial eye, *ib.* 300. The different degrees of sensation in different people, *ib.* 311. Distinct vision formed on the retina and near it, *ib.* 314. The eye accommodates itself to different distances, *ib.* 318, 345. Illustrated, *ib.* 318. How accounted for by various authors, *ib.* 319. The eye sees best when surrounded by darkness, *ib.* 325. Is enabled to see with a very small quantity of light, *ib.* 326. Of the defects of the eye; of the long-sighted, *ib.* 327. Of the accidental conformations of the eye by habit, *ib.* 330. Rules for preserving the sight, *ib.* 333. Maladies of the eyes, how occasioned, *ib.* 334. Two remarkable cases, *ib.* 335. Of couched eyes; require convex glasses, *ib.* 338. Its powers are limited, *ib.* 346. Mistakes made by those who have but one eye, *ib.* The analogy between the eye and the understanding, *ib.* 353. Reflexions on the wonderful powers of the eye, *ib.* 363. Eyes of animals differently phosphoretic, *ib.* 442.—See *Light*.

## F

*Filtration*, Mr. Peacock's new apparatus for, *ii.* 24.

*Fire* produces elasticity, *i.* 95. Fire and air are different conditions of the same elementary matter, *ib.* 270. Plato's idea of it, 274. The different opinions entertained of it by the ancients and moderns, *ib.* 279. Proved to be a real material substance, acting in a fluid form, *ib.* 279, 280, 288. Is not created by motion, *ib.* 281. Is the cause of heat, *ib.* 285. Absolute heat and relative heat, *ib.* 286. Boerhaave's idea of fire; is universally diffused, *ib.* Penetrates all bodies, *ib.* 287. Continually tends towards an universal equilibrium, except in animal bodies, *ib.* 289, 292. Is differently conducted in different bodies, from their different capacities of retaining it, *ib.* 289. Is retarded by soft substances, *ib.* 290. Is rapidly conveyed by fluids, *ib.* 291. Dilates all bodies, *ib.* 294. Liberated, manifested, or thermometric fire, *ib.* 295. Different metals are differently expanded by fire, *ib.* 296. The very great force of fire in expanding them, *ib.* 306. Fire the grand agent in nature to dissolve and to unite all things, *ib.* 308, 309. Proved to be the cause of cohesion, *ib.* 312. Acts in two different modes, by dilating and compressing, *ib.* 313. Is the cause of cold, which is occasioned by fire passing from one body to another, *ib.* 318. Latent fire, *ib.* 324. A method to discover the quantity of fire contained in different bodies, *ib.* 325, 328. The action of fire depends on the re-action of the incumbent air, *ib.* 337. Fire is the cause of fluidity, *ib.* 339. Is extricated whenever water is congealed, *ib.* 349. Was formerly made an object of worship, *ib.* 362. Is a fluid never at rest, *ib.* Is the cause of vapours, *ib.* 362. Its extreme violence when confined, *ib.* 364.



Is the cause of ebullition, *ib.* 367. Much fire is absorbed in vapours, *ib.* 375. Fire expands or separates the parts of water, *ib.* 378. Specific fire of any body, *ib.* 379. Fire is differently absorbed by different coloured substances, *ib.* 396.—See *Colours*. Fire maintains its dimensions, although greatly pressed by the air, *ib.* 407. The general effects it produces acting on different substances, *ib.* 433. Man alone understands the use of fire, *ib.* 440. Its effect on gunpowder, *ib.* 443. On fulminating powder, *ib.* 447; and fulminating silver, *ib.* 448. Produces solutions, *ib.* 449. Crystallization, *ib.* 452. Clarification, *ib.* 454. Odours, *ib.* 455. Fire is collected by collision, *ib.* By fermentation, *ib.* 459. By putrefaction, *ib.* 460. By the action of the solar rays, *ib.* By the resistance of the parts of a body on which light falls, *ib.* 463. Methods of increasing or diminishing the action of fire, *ib.* 466. Different bodies contain different quantities of fire, *ib.* 471. Fire constantly tends to diffuse itself over all bodies, till they are brought to the same temperature, *ib.* 472. It is contained in all bodies at the common temperature of the atmosphere, *ib.* 473. Atmospherical air contains a great quantity of fire, *ib.* 480. Fire is distinguished into diffusible and constitutional, *ib.* 483. Its agency in vegetation, *ib.* 486. Causes the grand differences in bodies, *ib.* 500. Is distinguished into sensible heat, the latent fire of fluidity, and the latent fire of elasticity, *ib.* Opinion of the Pythagoreans on fire, *ib.* 418. Fire is imponderable, *ib.* 58. Fire is the agent of all dissolution, *ib.* 70. Great quantity of fire is requisite to raise water into steam, *ib.* 71. Is subject to the same laws of reflexibility and refrangibility as the rays of light, *ib.* 236. Is the means of producing colours, *ib.* 432. Is retained in many bodies under the form of heat and light, *ib.* 428. Fire is necessary for producing the prismatic colours, *ib.* 445. The similarity between fire and light, *ib.* 466. Is the most important agent in nature, *ib.* 403. Natural life depends on its activity, *ib.* 403, 411. Is the active element within all bodies, *ib.* 407. Has been called by different names, *ib.* 408. Is every where present, *ib.* 409. Is only an instrumental cause, *ib.* 412. Its effects on the heart, *ib.* 414. Its influence in the animal economy, *ib.* 416. On this depends the health and activity of animals and plants, *ib.* Theophrastus's opinion on fire, *ib.* 418. The various effects produced by it, *ib.* Elementary fire, or the matter of light first formed, *ib.* 432. Fire, its expansive power, *ib.* 491.—See *Light*, *Heat*, *Colours*.

*Fishes*, the manner of their breathing, *i.* 236. Their manner of swimming, *iii.* 126.

*Flame*, an account of, *i.* 411. On the flames of candles and lamps, *ib.* 413.

*Fluids* of the least density expand most by heat, *i.* 307. Are caused by a degree of fire, *iii.* 388. Are not to be explained on mechanical principles, *ib.* 390. Their gravity in proprio loco, *ib.*



The parts of a fluid gravitate independently of each other, *ib.* 391. The surface of fluids is on a level, *ib.* 392. Their pressures, *ib.* 393. Fluids press in all directions, *ib.* 394. On their action against vessels of different sizes in which they are contained, *ib.* 396, 399. The hydrostatic paradox, *ib.* 402. On the action of fluids on bodies immersed in them, *ib.* 406. Fluids, when deep, press equally on all sides of a body, *ib.* 409. Bodies sink if specifically heavier, or swim if lighter than the fluid, *ib.* 413, 414. If of the same gravity, will remain in any part of the fluid, *ib.* 415. The weight lost by a solid immersed in a fluid is communicated to the fluid, *ib.* 421. Their spouting through small orifices, *ib.* 479. The velocity is as that of a heavy body falling from a similar height, *ib.* 480. The quantities discharged, *ib.* 481. The water contracts in flowing out, *ib.* 483. Of the discharge of fluids through additional tubes, *ib.* 485. Of jets d'eau; they never rise to the height of the reservoir, *ib.* 489. The position of the ajutage, *ib.* 490. of the motion of fluids in conduit pipes, *ib.* 505. The friction retards the velocity, *ib.* 507. If the pipes are curved, the discharge is less, *ib.* 508. Of the vibratory motion in fluids, *ib.* 511. Of the oscillatory motion of waves, *ib.* 512. Of the resistance of fluids, whether at rest or in motion, *ib.* 513. Mistakes of the moderns concerning this subject, *ib.* 514. Their ignorance of it, *ib.* 515.—See *Fire, Heat*.

*Fluids, elastic*, are combinations of fire with given substances, i. 500. M. Lavoisier's mistakes concerning them, *ib.* 501, 505. M. de Luc's observations on them, *ib.* 507. The difference between these and vapours, iv. 499.

*Fluidity* is caused by heat, i. 340. Absorbed or combined with the fluid substance, *ib.* 345.

*Focus*, real or imaginary, ii. 163.

*Forces*, of the composition or resolution of forces, iii. 115.

*Forces*, deflecting, of, iv. 262. Central forces, *ib.* 263.

*Fountain* by condensed air, description of, i. 133.

*Frame, human*, imbibes water from the atmosphere to supply the animal moisture, ii. 10. The great quantities of this daily exhaled, *ib.* 11.

*Franklin, Dr.* his system of electricity, iv. 328. Observations on his theory, iv. 328, 332. His principles, *ib.* 329. The negative and positive electricity denied, *ib.* 330.

*Friction*, iii. 328. Is an uniformly retarding force, *ib.* 331. It does not increase equally with the quantity of matter, *ib.* 332. The smallest surface has the least friction, *ib.* 333. General observations on frictions, *ib.* 335, 336.

*Fulminating powders*, their nature and operations, i. 447, 448.

*Furs*, their property of retaining heat, i. 292.



## G

- Gages* for the air-pump, i. 162. Their very different results, *ib.* 164. Explained by Mr. Cavendish, *ib.* 166.
- Galen*, his just remark on praise, i. 226.
- Galileo* could not discover the reason why water could not be raised by a pump above 32 feet, i. 74. Discovered the telescope, ii. 486. Applied the pendulum to measure time, iii. 198.
- Gas*, *inflammable carbonic*, an account of, i. 569.
- Gas*, *muratic acid*, its nature and properties, i. 571.
- Gas*, *muratic dephlogisticated*, an account of its effects, i. 571. Destroys all vegetable colours, *ib.* 572.
- Gases*; permanently elastic fluids, i. 499. Are of different kinds, *ib.* 564.
- Georgium Sidus* was discovered by Dr. Herschel, iv. 32. Its size, distance, revolution, *ib.* 33. Its moons, *ib.* 34. The length of its year, *ib.* 161.
- Glass*, its various uses, ii. 177. Different kinds of, ii. 527.
- Globe*, *new terrestrial*, the advantages of it, iv. 187. The absurdities resulting from the old ones, *ib.* 189. The construction and use of this new globe, *ib.* 190. How to rectify this globe, *ib.* 191. New celestial globe, *ib.* 192. Editor's vindication of globes mounted in the common manner, *ib.* 204. Advantages of the new-mounted globes shewn by him, *ib.* 206, and of the common globe, *ib.* 207.
- Glow-worm*, an account of the light in it, iv. 425.
- God*, the author of speech, i. 232. His end in creating the universe the greatest possible good, *ib.* 272. The author of all good to man, *ib.* 315. Is clearly indicated by final causes, *ib.* 354. The immensity of his works, *ib.* 31. Is the author of nature, ii. 269. The character of the Saviour, as delighting to communicate wisdom, *ib.* 417. His divinity and character, *ib.* 478, 479. The infinity of his works, *ib.* 480. Has impressed on matter some faint characters of his own beauty, iii. 62. The ancients thought him to be goodness itself, and truth itself, *ib.* 62. The perfection of his wisdom, *ib.* 77. A hymn to his praise on the excellency of the soul of man, *ib.* 83, 84. His wisdom and power, as the divine mechanic; *ib.* 88; displayed in the natural and moral world, *ib.* 89, 90. Time cannot be predicated of him, *ib.* 219. God the original cause of all motion, *ib.* 251. His mercy, wisdom, and power are discoverable in his works, *ib.* 520. He alone sees the whole of nature, *ib.* 521. He is glorified by the inhabitants of innumerable worlds, iv. 246. Has probably peopled all the planetary worlds, *ib.* 248. Is the real cause who governs the mundane system, *ib.* 260. The knowledge of him is the most excellent wisdom, *ib.* 295. He is one, Jesus Christ, *ib.* 296. His universal government, *ib.* 297. Is in<sup>2</sup>



visible to us, *ib.* Is praised by all things which he has made, *ib.* 298. His perfections seen in his works, *ib.* The manner and the end of creation, *ib.* 434. The perfection of his word and work, *ib.* 565, 566.—See *Providence, Nature, Man.*

*Gravity*, and *gravitation*, an inquiry whether it is an essential property of matter, iii. 21. Considered as a fact, *ib.* 37. The proportion in which the force of gravity decreases, *ib.* 38. Gravity acts universally, but not uniformly in all places, *ib.* 39. A body falls about an hundred and ninety-three inches in a second of time, *ib.* 42. The difference respecting gravity resulting from different positions on the globe, *ib.* 43. Gravitation extends to the planets, *ib.* 44. Reflexions on gravity as a law, *ib.* 45. Gravity considered as a resisting and as a moving power, *ib.* 46. The weight of bodies is not in proportion to their quantities of matter, *ib.* 47. Powers acting contrary to gravity, *ib.* 48; observed in plants and light, *ib.* 49. Of the center of gravity in bodies, *ib.* 161. Of the center of gravity in the human body, *ib.* 165. Cautions arising from it, *ib.* 166. Of the situation of the center of gravity, *ib.* 170. To find the center of gravity of a trapezium, *ib.* 171; of a pyramid, *ib.* General observations on gravity, *ib.* 177. It extends to the moon, iv. 276. It produces a small irregularity in the motion of the planets, *ib.* 280.

*Gravity, specific*, of bodies, iii. 407; is as their density, *ib.* is measured by water, *ib.* 409. All bodies immersed in fluids lose the weight of an equal bulk of that fluid, *ib.* 417. How to obtain the specific gravity of bodies, *ib.* 424. To find the specific gravity of solids, *ib.* 430. If heavier or lighter than water, *ib.* 432. Of fluids, *ib.* 434. Different methods of ascertaining the specific gravity of fluids, *ib.* 449. A table of specific gravities, *ib.* 451, 452. Of several fluids in summer and winter, *ib.* 453.

*Green colour*, the universality and excellency of it, ii. 364.

*Gunnery*, the great difference between theory and practice, iii. 183. Mr. Robbins's application to this art, *ib.* 185. The imperfections in this art, *ib.* 188.

*Gunpowder*, the substances which compose it, i. 443. Manner of making it, *ib.* Derives its force from vital air, *ib.* 444. An estimate of its expansive force, *ib.* 445.

## H

*Hail* is water suddenly congealed, ii. 45.

*Halley*, Dr. his weak solution concerning the saltiness of the sea, ii. 29. His hypothesis to explain the variations of the needle, iv. 463.

*Heart*, its situation and mutual action with the lungs, i. 229.



*Hearts*, of different creatures, in what manner affected by heat, *iv.* 414.

*Heat*, the effect of fire, *i.* 285. Absolute and relative, the difference between them, *ib.* 286. Is conveyed through a medium more subtile than common air, *ib.* 288. Animal heat remains universally the same, although under the most opposite circumstances, *ib.* 294. The degree of heat is measured by the thermometer, *ib.* 319. Different subjects receive different degrees of heat, *ib.* 331. The progression of heat not easily ascertained, *ib.* 332. The relative heat in different bodies marked by Mr. Jones, *ib.* 334, 335. Latent and sensible heat, *ib.* 342, 379. More than eight hundred degrees of heat are absorbed in steam, *ib.* 376. Heat counteracts the influence of gravitation, *ib.* 436. The quantity of heat is diminished by the change it undergoes in the lungs, *ib.* 478. Light and heat are different modifications of the same matter, *ii.* 450. Without heat bodies do not emit light, *ib.* 452. The different sources of heat, *ib.* 541, 543.—See *Sun, Fire, Thermometer.*

*Herschel*, Dr. his discoveries of new stars, *ii.* 482. His idea of the construction of the universe, *iv.* 222. That the visible universe is only a nebula, *ib.* 223. Concerning a siderial stratum, *ib.* 224. The great powers of his telescope, *ib.* 228. On the origin of nebulous strata, *ib.* 229. Discovered volcanoes in the moon, *ib.* 236.—See *Stars, Moon.*

*Hippocrates*, his admirable observations on air, *i.* 273.

*Hire, M. de la*, his experiments on the distance which rain water penetrates into the earth, *ii.* 19, 21.

*Horizon*, *iii.* 528. Its uses, *ib.* 552. Is divided into rational and sensible, *ib.* 553.

*Horses*, their advantage in drawing from their weight, *iii.* 347.

*Horsley*, Bishop, his conjectures concerning the infinitude of the atmosphere of the earth and the planets, *i.* 101.

*Hour*, circle of the, *iii.* 558.

*Hurricanes*, an account of those in the West Indies, *iv.* 537. The signs of their coming, *ib.* 538.

*Hydraulics* treat on the motion of fluids, *iii.* 478.

*Hydrometer*, of measuring the specific gravity of fluids by it, *iii.* 443. A description of, *ib.* 444. The requisites for a good one, *ib.* 446.

*Hydrostatics*, their nature, *iii.* 384. The difference between theory and practice, *ib.* 385. Our ignorance relative to several particulars on this subject, *ib.* 386. Aerostation similar to hydrostatics, *ib.* 467.

*Hydrostatic balance*, its use in determining the quantity of gold, &c. *iii.* 427. How it is constructed, *ib.* 429. It varies with the heat and cold of the weather, *ib.* 430. How to find the proportion of alloy mixed with gold, *ib.* 438.

*Hygrometer*, its use: several substances affected by the moisture or dryness of the air, *iv.* 501. An account of M. de Luc's



hygrometer, *ib.* A further description and figure of it, by the Editor, *ib.* 569, 571. The good effects of an hygrometer, *ib.* 502. The discoveries made by means of the hygrometer, *ib.* 509.

*Hygroscopic substances*, different kinds of, *iv.* 506.

*Hypotheses*, observations on, *i.* 103. Conjectures discover no truths, *ib.* 104; but confirm men in prejudice and ignorance, *ib.* 105.—See *Truth*.

## I

*Ice* absorbs all fire until it is wholly melted, *i.* 327. It requires an hundred and forty degrees of heat to convert it into water, *ib.* 348. Is a combination of water, when deprived of its fire, *ii.* 34. Freezing is promoted by air and by agitation, *ib.* 35. A bit of ice produces instant congelation in water cooled below the freezing point, *ib.* 36. Its great expansive force, *ib.* 38, 39. The vast quantities of it in the northern seas, *ib.* 40. Ice is continually diminishing by the action of the air, *ib.* 42. The manner of rivers freezing, *ib.* 46. The great strength of ice, *ib.* Frost does not penetrate deep into the earth, *ib.* 47. Ice may be produced by the evaporation of ether, *ib.* 50. The chemical properties of ice, *ib.* 57.—See *Fire*, *Water*.

*Idols of the mind*, Lord Bacon's account of them, *i.* 4. Are of different kinds, *ib.* 5.

*Ignition*, an universal effect of fire, *i.* 400.—See *Fire*.

*Impulse* the only material cause of motion, *iv.* 254.

*Ingenbousz*, Dr. first discovered the power which plants have of emitting vital air, *i.* 512. His experiments confirmed by others, *ib.* 515.—See *Light*, *Air*, *Vegetables*.

*Insects*, the manner of their breathing illustrated in the larva of the musca pendula, *i.* 236.

*Instruments*, philosophical, described; general remarks on them, *i.* 338. Air-pump, *ib.* 44. An account of its improvements, *ib.* 148. Philosophical hammer, *ib.* 55. Cupping, *ib.* 62. Magdeburg hemispheres, *ib.* 63. Common pump, *ib.* 64. Transferrer of air, *ib.* 65. Fountain of command, *ib.* 66. Anti-gugler, *ib.* Common bellows, *ib.* 69. Gage to the air-pump, *ib.* 79. Bolt-head, *ib.* 87. Smoke-jack, *ib.* 117. Condensing engine, *ib.* 129. Wind or air gun, *ib.* 132. Artificial fountain by condensed air, *ib.* 133. Common pump, *ib.* 138. Forcing pump, *ib.* 141. Water-works at London bridge, *ib.* 142. Syphon, *ib.* 143. Tantalus's cup, *ib.* 144. Gages for the air-pump, *ib.* 159. Pear-gage, *ib.* 162. Pyrometers, *ib.* 296. Calorimeter, *ib.* 361. Wedgewood's thermometer for ascertaining intense degrees of heat, *ib.* 330. Another, invented by Mr. Jones, *ib.* 333. Papin's digester, *ib.* 364. Æolipile or wind-ball, *ib.* 365. Argand's or cylinder lamps, *ib.* 409. Pneumatic apparatus, *ib.* 492. Eudiometer tubes and measure, *ib.* 495. Dr. Nooth's machine



to impregnate water with fixed air, *ib.* 550. M. Bettancourt's contrivance to measure the force of steam, *ii.* 73. Steam engine, *ib.* 74. Inflammable air lamp, *ib.* 98. Animated optical balls, *ib.* 260. The boundless gallery; the magical mirrors, *ib.* 258. Simple camera obscura, *ib.* 251. Reflecting, *ib.* 253. Dioptrical paradox, *ib.* 256. Optical paradox, *ib.* 257. Real apparition, *ib.* 264. Optical perspective box, *ib.* 267. Cylindrical mirror, *ib.* 268. The prism, *ib.* 369. Telescopes, *ib.* 480. Microscopes, *ib.* 542. Atwood's friction apparatus, *iii.* 135. Directions for construction, *ib.* 151. Spirit level, *ib.* 163. Plumb-line, *ib.* Odometer or way-wiser, *ib.* 167. Whirling tables, *ib.* 362. Hydrostatic paradox, *ib.* 402. Hydrostatic bellows, *ib.* 404. Hydrometer, *ib.* 443. Discharging rods, *iv.* 342. Quadrant electrometer, *ib.* 344. Magic picture, *ib.* 362. Spotted bottle, *ib.* 363. Thunder-house, *ib.* 383.

*Jones*, Rev. Mr. his observations on nature, *i.* 205. His just reflexion on the origin of fire, *ib.* 458. On the improvements in philosophy, *iv.* 360. His remark on the electric matter and animal spirits, *ib.* 424. His observations on the superiority of the northern hemisphere over the southern in several particulars, *ib.* 561 to 574.

*Iris*.—See *Eye*.

*Jupiter*, his size, distance, revolutions, *iv.* 28. His four moons, *ib.* 29. His year, and motion round the sun, *ib.* 160. His belts, *ib.* 238. Their changes, *ib.*

## K

*Kepler*, his laws of astronomy, *iv.* 261 to 267.

*Knight*, Dr. his discoveries in magnetism, *iv.* 449.

*Knowledge*, its excellency, *i.* 70.

## L

*Language*, natural and artificial; language was not invented by man, *i.* 232, 233.

*Latent beat*, doctrine of, explained, *i.* 342, 379, 468. Is of two kinds, of fluidity and elasticity, *ib.* 427.—See *Phlogiston*, *Fire*, *Heat*.

*Lavoisier*, his opinion on fire, *i.* 286. His experiments with vital air, *ib.* 467. His mistakes concerning elastic vapours, *ib.* 502 to 507. A confutation of his system by Mr. Weiglib, *ib.* 575 to 587.

*Laughter*, how caused; good effects of moderate laughter, *i.* 234.

*Lens*, may be formed of different substances, 462. Various effects produced by them, *ib.* 464.

*Lenses* of various sorts, plano-convex, plano-concave, double convex, double concave, concavo-convex, *ii.* 177. Their different pro-



properties, *ib.* 179, 200, 201. Methods to find their focal lengths by experiments, *ib.* 206. The properties and phenomena of single lenses, *ib.* 210.

*Levelling*, the principle of it, *ib.* 47.

*Lever*, its nature and properties, *ib.* 257. Levers are of three kinds, *ib.* 257 to 263. Of the hammer lever, *ib.* 261. Its various applications, *ib.* 264 to 270. Its properties applied to various subjects, *ib.* 301.

*Leyden pbial*, *ib.* 341. How to charge it, *ib.* 342. The theory of it, *ib.* 345. On the discharge of this, the two electricities rush into union from opposite directions, *ib.* 353. Different shocks by means of it, *ib.* 354. Confirmed by the electric spark, *ib.* 356. The two powers act in contrary directions, *ib.* 357. Various effects produced by it, *ib.* 361 to 364.—See *Electricity*.

*Liberty*, singular panegyric on, *ib.* 441. The false pretenders to it, *ib.* 442. Genuine liberty, *ib.* 443.

*Life*, or the animating principle, *ib.* 60. The analogy between life and motion, *ib.* 242 to 250. Natural life depends on fire, *ib.* 403 to 411.

*Light* travels at the rate of 72,420 leagues in a second, *ib.* 251. Is the mediating substance between fire and air, *ib.* 270. Light combined with fire and water produces an aeriform fluid, *ib.* 507. Light extricates vital air from vegetables, *ib.* 512. Rays of light are extremely minute, *ib.* 138. Its operations and analogy, *ib.* 139. The advantages of it to man, *ib.* 140. Light a property of fire, *ib.* 142. Light is a material real substance, is progressive, may be stopped and diverted, acts on all bodies, *ib.* 144. Light moves in a straight line, *ib.* 147. Is successive and contemporary, *ib.* 148. The rays of it indefinitely small, *ib.* 149. They carry the image of the point from which they proceed, *ib.* 150. Their reflexibility and refrangibility, *ib.* 151. In different mediums, *ib.* 152. The light of the moon is 300,000 times fainter than the light of the sun, *ib.* 158. The quantity of light decreases as it recedes from the radiant, *ib.* 160. Light is suffocated by various bodies, *ib.* 161. A table of the quantity of light dissipated in the atmosphere, *ib.* 162. Rays of light are parallel, diverging or converging, *ib.* 164. Are reflected before they touch the body, *ib.* 217. Light contracts the pupil of the eye, *ib.* 323. Reflexions on light, *ib.* 363. The rays of light are not homogenous, *ib.* 366. The rays of the sun consist of seven different coloured rays, *ib.* 367. The compound of all the rays exhibits whiteness, *ib.* 368. The rays are of different refrangibility, *ib.* 371. Homogenous light suffers no alteration in any case, *ib.* 375. Rays which differ in their colour, differ also in their refrangibility, *ib.* 376. Bodies reflect rays of one colour, and transmit rays of another, *ib.* 406. The rays of light are



thought to be put in a transient state, and easily reflected and transmitted, *ib.* 407. This Sir Isaac Newton supposed was owing to the vibrations of a subtile fluid, *ib.* 408. The analogy between the reflexion and refraction of the rays of light, *ib.* 410. Is imbibed by all bodies, except water and metals, *ib.* 440. Is matter moving in a straight line from a body, *ib.* 449. Light and heat are different modifications of the same matter, *ib.* 450 to 457. Bodies are either luminous or illuminated, *ib.* 451. Without heat bodies will not emit light, *ib.* 452. The attractive gravitating matter in bodies has no power to resist light, *ib.* 457. Light is acted upon by bodies at a small distance by attraction and repulsion, *ib.* 459. The rays exhibit three fringes of coloured light round the shadows of small bodies, *ib.* 461. The influence of light in the vegetable kingdom; it produces colours and smells, *ib.* 469. Its influence on animals, *ib.* 471. Its effects in chemistry, *ib.* 472. Its effects on colours and on wood, *ib.* 472, 473. The opinions of the ancients concerning light, *ib.* 474, 475. Questions concerning light, *ib.* 559. The opinions of the ancients concerning it, *ib.* 559. Of Plato, *ib.* Its connexion with fire, *ib.* 562. And with electricity, *ib.* 386 to 387. Its energy and activity, *ib.* 405. Refraction of, *ib.* 129. Is different at different places, *ib.* 130. Effects resulting from it, *ib.* 131. Aberration of, discovered by Dr. Bradley, *ib.* 138. On the light which appears in the eyes of some animals in the dark, whence it comes? *ib.* 425. The matter of light first formed, *ib.* 432.—See *Fire, Heat, Colours, Refraction, Reflexion, Newton.*

*Light of inflammation and light of ignition*, their difference, *i.* 415.

*Lightning*, on the phenomenon of; varieties of it, *iv.* 369. Its peculiar property, *ib.* 370. Its effects are limited, *ib.* A remarkable instance of it, *ib.* 371. Produces whirlwinds, *ib.* The identity of lightning and electricity, *ib.* 372. There is a reciprocal exchange from the earth to the cloud, *ib.* The extent of their atmospheres, *ib.* 373. Causes concussions on the earth, *ib.* 376. Imparts magnetism, *ib.* 453.—See *Fire, Electricity, Magnetism.*

*Luc, M. de*, his admirable reflexions on the true end of philosophy, *i.* 355. His remarks on infidelity, *ib.* 358. His just observations on elastic fluids, *ib.* 507, 508. His observations on the change of ice into water and *vice versa*, *ii.* 56. On the state of aqueous vapour in the atmosphere, and laws of evaporation, *ib.* 75 to 89. His excellent philosophical works; his refutation of materialism, *iii.* 67. His observations on the hydrometer, *ib.* 434. An account of his whalebone hygrometer, *iv.* 501. Was in a storm on the Buet, *ib.* 527. His remarks on barometers, *ib.* 556.—See *Hygrometer.*

*Lunarium*, description of, *iv.* 179.



*Lungs* described, i. 226. Their situation and action, *ib.* 227. How much unknown, *ib.* 228. Receive great quantities of blood, *ib.* 229. Their correspondence with thought, *ib.* Their connexion with the circulation of the blood, *ib.* 230. Express various affections, *ib.* 231.

## M

*Magic lantern*, its construction and use, ii. 198.

*Magnetism* was observed by the ancients; is unknown, iv. 435. Acts universally; natural magnet; its contents, *ib.* 436. The artificial magnet is preferred, *ib.* 437. Its poles, *ib.* Its properties, *ib.* 438. It attracts iron, *ib.* 439. The sphere of its action is variable, *ib.* 440. The similarity between magnetism and electricity, *ib.* 468. On the magnetic center, *ib.* 445. To render iron and steel magnetic, *ib.* 448. The most magnetism may be communicated to steel, *ib.* 452. Is communicated by lightning and percussion, *ib.* 453. On the magnetism of the earth, *ib.* 455. Effects from it, *ib.* 457. The great uses of it, *ib.* 458. An hypothesis concerning it, *ib.* 469. Is probably supplied by the sun, *ib.* 470.—See *Electricity*.

*Magnets*, the manner of arming them, iv. 455.

*Man* received an untaught language from nature, i. 232. Does not require the brightest evidence of truth at all times, *ib.* 275. Is at first led by his senses, *ib.* 276. Is a compound being, *ib.* 316. Is an imperfect judge of heat and cold from his sensations, *ib.* 319. Is exposed to errors from various causes, i. 7. His knowledge is power, *ib.* 27. His limited views of Divine Providence, ii. 437. Collects his knowledge from experiments or observations, *ib.* 465. The variety of experiments he necessarily makes, *ib.* 466. His pride, *ib.* Religion is adapted to his nature, *ib.* 478. His want of a Redeemer, *ib.* 479. Is indebted to God for the discoveries which he makes, *ib.* 482. His unity; he continues the same being, although he should lose different members, iii. 77. His organs only channels of conveyance, *ib.* 78. How much he is indebted to the mechanical powers, *ib.* 88. Men do not naturally swim, *ib.* 127. On walking in different directions, *ib.* 177 to 179. On jumping, skating, and running, *ib.* 180, 181. Man considered as an artificial machine, *ib.* 337. The vain theories for ascertaining the strength of man, *ib.* 338. The strength of his frame, *ib.* 341. Is able to carry great weights, *ib.* 344. What depends on the posture of man, *ib.* 345. Methods by which he draws weights, and instances of great strength, *ib.* 346. His dependance; the advantages he derives from mechanics, *ib.* 360. A source of his errors, *ib.* 384. Of all animals, man is least able to swim, *ib.* 423. His limited powers and comparative ignorance, *ib.* 520. His rea-



son is to correct the fallacies of the senses, *iv.* 48. Is apt to be forgetful of the blessings he enjoys, *ib.* 72, 73. The benefits he derives from the animals, *ib.* 197. General remarks on man, *ib.* 565. The means of his understanding the works of creation, *ib.* 566.—See *God, Providence, Mind.*

*Mariner's compass*, a description of it, *iv.* 458. When discovered, and by whom, *ib.* 459. Its variations, *ib.* 461. When this variation was discovered, *ib.* 462.—See *Magnetism.*

*Mars*, his size, distance, diameter, revolutions, *iv.* 26, 27, 88. His year and motion round the sun, *ib.* 160. His atmosphere and poles, *ib.* 237.

*Materialism*, danger from the system of, *ii.* 276. Considered as a system, *iii.* 64. Its danger and misery, *ib.* 65. Particularly examined and confuted, *ib.* 65 to 78. Particularly by the unity of the percipient being, *ib.* 77. Perceptivity cannot be annexed to a system of matter, *ib.* 78.

*Matter* can never form an intelligent being, *ii.* 272. The use made of it by the ancient atheists, *ib.* 273; and some modern philosophers, *ib.* Is the object of the five senses, *iii.* 2. An inquiry concerning matter, *ib.* 3. The common properties ascribed to it, *ib.* 4. The properties allowed to matter are, impenetrability, extension, divisibility, and hardness, *ib.* 5 to 7. Matter is not infinitely divisible, *ib.* 10. Illustrated, *ib.* 11. The great divisibility of matter, *ib.* 12. Sir Isaac Newton's opinion of matter, *ib.* 13. Matter hath a capacity for motion, *ib.* 16. Concerning the inertia of matter, how understood, *ib.* 17. The absurdities resulting from this, *ib.* 18. Matter can only move as it is moved, *ib.* 19. Is gravity an essential property of matter, *ib.* 20. Matter and mind totally distinct, *ib.* 50. In what this difference consists, *ib.* 51. The opinions of the ancients concerning matter; its visibility is supposed to arise from its form, *ib.* 53. The first matter homogeneous, *ib.* 54. This original matter was represented by Saturn and Ops, *ib.* 55. The primary forms of matter are extension, figure, organization, *ib.* 56, 57. Matter is impressed with the marks of mind, *ib.* 59. Some have represented matter as without impenetrability and inertia, *ib.* 67.—See *Mind.*

*Mayow*, Dr. his discoveries of airs in the last century, *i.* 491.

*Measures*, philosophical, remarks on them, *i.* 338.

*Mechanics*, their antiquity, *iii.* 86. The wonderful machines of the ancients, *ib.* 87. The object of mechanics is motion, *ib.* 92.

*Mechanical powers*, on, *iii.* 252. Their use to man, *ib.* Postulata for the consideration of mechanical powers, *ib.* 254. The allusion of the Platonists and Pythagoreans to these, *ib.* 307. The advantages gained by them, *ib.* 319. Of power and time, *ib.* 320. Of the difference between practice and theory, *ib.* 327. Caused by the weight and friction, *ib.* 328. Their use to manufactures and merchants, *ib.* 358.



- Mercury* congeals at  $40^{\circ}$  below 0, ii. 53, 54. Mercury congealed by a frigorific mixture, *ib.* A long column of it is supported in a glass tube, iii. 35.
- Mercury*, his size, distance, annual revolution, iv. 17 to 19.
- Meridian*, iii. 531. The degrees on it, *ib.* 555.
- Metals*, a table of the different expansions of different metals, i. 305. The analogy between them and transparent media, ii. 430.
- Meteorological diaries*, importance of them, iv. 475.
- Meteors*, their appearance at great heights in the atmosphere; difficulty of accounting for them, i. 99.
- Microscopes*, their several kinds, ii. 542. The advantages to be derived from them, *ib.* 543. Of their optical effects, *ib.* 544. Of the single microscope, *ib.* 549. Its properties, *ib.* 551. Of the compound microscope, *ib.* 552. Its properties, *ib.* 553. Of the solar microscope, *ib.* 555. General observations on them, *ib.* Their imperfections, *ib.* 557.
- Milky way*, iii. 572. The computation of the number of suns in it, by Dr. Herschel, iv. 224.
- Mind and matter* totally distinct, iii. 50. Mind always has some end in view, *ib.* 51. The powers and qualities of mind, *ib.* 52. Mind, its strong desire after truth, *ib.* 59. Forms exist in mind before they are exhibited in matter, *ib.* 60. Every thing excellent is an emanation from mind, *ib.* 61. The mind of man is not a compound, *ib.* 79. Its immortality, *ib.* 83.
- Mirrors*, plane, ii. 222. Their nature and properties, *ib.* 223. Observations on them, *ib.* 249. How to judge of their goodness, *ib.* 250. Of convex mirrors, *ib.* 226. Of concave mirrors, *ib.* 227. Deceptions and experiments by these, *ib.* 230. Increase heat and kindle fire, *ib.* 235. Of pictures seen in them; to find the focal length of a spherical mirror, *ib.* 237. General properties of mirrors, *ib.* 238.
- Moisture* is invisible water, iv. 507. Totally absent; extreme, *ib.* 508.
- Monsoons*, or periodical winds, iv. 531. An account of them, *ib.* 532 to 533. How caused, *ib.*
- Montgolfiers*, M. discovered the air-balloon, iii. 457. Their experiments, *ib.* 458.
- Moon*, phenomena of; her periodical motion, iii. 541. Her various uses, iv. 23. Her diameter, distance, revolution, appearances, *ib.* 24, 25. Her orbit, *ib.* 97. Her nodes; her conjunction with the sun, *ib.* 98. The periodic month, and synodical, *ib.* 99. Her different phases, *ib.* 102. Eclipses of, when caused, *ib.* 107. The nodes of the moon, *ib.* 108. Is eclipsed by the shadow of the atmosphere of the earth, *ib.* 109. Sometimes the moon totally disappears, *ib.* Her appearance in an eclipse, *ib.* 111. The beginning or end discovers the longitude, *ib.* 112. On what the quantity and the duration of the eclipse depends, *ib.* 113. She moves 2077 miles in an hour, *ib.* 119. Is about 240,000 miles from the earth, *ib.* 120.



The moon only intersects the plane of the ecliptic in two points, *ib.* 121. General phenomena of the moon, *ib.* 181. Her different phases explained, *ib.* 182. Has always the same face to the earth, *ib.* 183. Is always half enlightened by the sun, *ib.* 184. Her days and nights equal  $14\frac{3}{4}$  of our days, *ib.* May be in conjunction or opposition without an eclipse; the cause of this explained, *ib.* 186. Her appearance when viewed through a telescope; consists of mountains and cavities, *ib.* 235. Volcanoes have been seen on her surface, *ib.* 236. Her atmosphere, *ib.* She gravitates towards the earth, *ib.* 267. Is acted on with the greatest force when nearest the earth, *ib.* 271. Her orbit equal to 60 times the earth's semidiameter, *ib.* 275. Her irregularities, *ib.* 288. Whence caused, *ib.* 289 to 295.

*Motion*, improperly considered as the cause of fire, i. 281 to 284. On the communication of motion by collision, iii. 224. Is supposed to cause elasticity, *ib.* 226. The laws of the communication of motion, *ib.* 230. In elastic and non-elastic bodies, *ib.* 232. The inexhaustible source of motion and impulse, *ib.* 236. The cause of motion, *ib.* 245. Impulse is the material cause of motion, iv. 254.

*Motion, apparent*, observation on it, ii. 356. In what degree it must be to become visible, *ib.* Is change of place, iii. 93. Involves the idea of space and time, *ib.* Velocity is the quantity of motion, *ib.* 95. The sources of motion, *ib.* 97. Of simple motion, *ib.* 99. Circumstances observed in this, *ib.* Of the quantity of motion, *ib.* 104. To compute the momentum, *ib.* 105. The laws of motion, *ib.* 108 to 110. Objection to the first law of motion, *ib.* 108. Motion is not a property of matter, *ib.* 18. Of compound motion, *ib.* 112. Its general laws, *ib.* 113. Instances of compound motion, *ib.* 122. Of accelerated motion, *ib.* 128. An inquiry whether motion be a cause or an effect, *ib.* 205, 206. On the permanent motions in nature, *ib.* 242. Fire and light are the instruments of motion in nature, *ib.* 249. The permanency of motions, *ib.* 246. There is no motion independent of the action of any medium, *ib.* 250. Motion, whence produced; varieties of motion, iv. 432.

*Munro*, Dr. his objections to the nervous and electric fluid being the same answered, iv. 423, 424.

*Musical sounds*, effects of, i. 262. Organs in man to produce these, *ib.* 266.

## N

*Nadir*, iii. 528.

*Nature*, the views of it infinite, i. 31. Is inexhaustible on every side, *ib.* 32. Is a mere name, when considered as independent of God, ii. 270. Is the benevolence of the Almighty providing for all the inhabitants of the earth, *ib.* 465. Appears more excellent the more it is examined, iii. 1. The opera-



tions in nature are carried on mechanically, *ib.* 16. There is nothing insulated in nature, *iii.* 240. A general circulation through all nature, *ib.* 247. The immensity of the works of nature, *iv.* 43. The perfection of them, *ib.* 159. All the works of nature are connected, *ib.* 299. Remarks on the chemistry of nature, *ib.* 474.—See *God, Providence, Man, Sun, Air, Water.*

*Nebulæ of fixed stars*, *iv.* 229. Planetary nebulæ, *ib.* 230.

*Needle, magnetic*, its diurnal variation, *iv.* 464. Is disturbed by the aurora borealis, *ib.* Its dip; by whom discovered, *ib.* 465. The variations in the dip, *ib.* 466. The needle is affected by the aurora borealis, *ib.* 467.—See *Magnetism, Mariner's compass.*

*Newton, Sir Isaac*, his first rule of philosophizing, *i.* 105. His discoveries of the aerial pulses; the manner in which they are propagated, *ib.* 245. His works; his rules of philosophizing, *i.* 35, 36. His grand discoveries concerning light and colours, *ii.* 366. His optics, *ib.* 375. His experimentum crucis, *ib.* 378. An eulogium on him, *ib.* 390. He supposed that bodies of different densities reflected different rays of light, *ib.* 399. His conjectures on the fits of easy reflexion and transmission of a ray of light, *ib.* 407, 408. He discovered that inflammable bodies possessed the refractive power, more than bodies not inflammable, *ib.* 432. Constructed a reflecting telescope, *ib.* 532. His great modesty, *ib.* 534. His opinion concerning the original atoms, *iii.* 14. His discoveries of gravitation, *ib.* 43, 44. Not very consistent in hydrostatics, *ib.* 387. His theories on the subject, *ib.* 514. An account of his principles, *ib.* 514. His observation on the curvilinear motion of the moon, *iv.* 270. His mathematical astronomy, *ib.* 261.—See *Light, Colours, Gravitation.*

*Nodes of the moon*, *iv.* 121. Go backwards nineteen degrees and an half in every year, *ib.* 124.

*Nonius*, scale to estimate the divisions on it, *iv.* 485.

## O

*Observer of nature*, character of, *i.* 203, 204, 205.

*Opacity* arises from the discontinuity of the particles of bodies, and the different density of the intervening medium, *ii.* 412. How destroyed, *ib.* 413. Different significations, *ib.* 448. Of opacity, considered as a positive quality in bodies, *ib.* 454. It does not depend on the solid matter in bodies, *ib.* 456.—See *Light.*

*Optics*, the excellency of the knowledge of them, *ii.* 142.

*Oxygenation*, or acidifying, is produced by the combination of any substance with vital air, *i.* 524.



## P

- Parallax*, annual diurnal, horizontal, iv. 131 to 136. The accuracy necessary in finding it, *ib.* 137.
- Pascal*, M. his character; he first applied the barometer to measure mountains, i. 77.
- Pendulum*, its vibration explained, isochronous, i. 246. The analogy between a pendulum and a musical string, *ib.* 247. Account of pendulums, iii. 194. Their oscillations, *ib.* 196. Their isochronism, *ib.* 198. Pendulums are simple and compound, *ib.* 201. Of the center of oscillation in compound pendulums, *ib.* Of the time of their oscillation, *ib.* 207. Are affected by heat and cold, *ib.* 209; by their place on the globe, *ib.* Huygens adapted them to clocks, *ib.* 212. Wooden pendulums, their properties, *ib.* 215. The gridiron pendulum, its construction and advantages, *ib.* 216.
- Penumbra of an eclipse*, iv. 110.
- Percussion*, center of, iii. 208.
- Perspiration*, great quantities of food carried off by it, i. 211.
- Philosopher*, the universality of knowledge which ought to form his character, i. 2. A picture of a true philosopher, *ib.* His character, as drawn by Lord Bacon, *ib.* 22. Studies the intention of nature, *ib.* 23. He proceeds by induction, *ib.* 24; and thus forms general axioms, *ib.* 25. He makes use of every help, particularly of analogy, *ib.* 31. He proceeds with great caution, *ib.* 34. The error of the modern philosophers, ii. 463. The weakness of vanity in a philosopher, *ib.* 480. —See *Truth*.
- Philosophy*, *natural*, excellence and advantage of it, i. 42, 109. Origin of the name, *ib.* 43. Its tendency to elevate the mind, *ib.* 146; and promote religion, *ib.* 147. The business of it, *ib.* 204. Its tendency to cultivate sublime taste, *ib.* 271. Its grand object, *ib.* 275. Is concerned with final causes, *ib.* 436. Is continually presenting scenes of beauty to the mind of man, *ib.* 314. It advances the cause of religion, ii. 2. The method of reasoning in it, i. 1. Leads us to the knowledge of God, *ib.* 23. Its connexion with religion, ii. 437. The discoveries of philosophy gradual, iv. 300.—See *Air*, *Astronomy*, *Colours*, *Elastic Fluids*, *Electricity*, *Fire*, *Gravity*, *Light*, *Magnetism*, *Matter*, *Mechanics*, *Meteorology*, *Microscopes*, *Phosphorus*, *Telescopes*, *Water*.
- Philosophy*, *inductive*, an account of, i. 29.
- Philosophy*, *false*, its errors and dangers, i. 22.
- Pblogiston*, or the principle of inflammability, i. 416. Denied by the French philosophers, *ib.* Is a substance *sui generis*; the matter of light and heat, *ib.* 418. Proved by the decomposition of water, and the luminous appearance then exhibited, *ib.* 319 to 425. It is the solar substance detained in the



- phlogistic composition, *ib.* 426. Is restored by animal and vegetable substances, *ib.* 428; particularly by the influence of light for the phlogistication of vegetable bodies, *ib.* 430; and by the mass of colour which they obtain, *ib.* 431. Is imparted from vegetables to animals, *ib.* 434. Is maintained by Mr. Weiglib, in opposition to the French chemists, *ib.* 575 to 586. Its existence proved, *ib.* 576; particularly by the re-production of the metallic calces, *ib.* 578. Other considerations in support of it, *ib.* 587. Its universality and energy, *ib.* 588. The analogy between phlogiston, or fixed fire, and fixed air, *ib.* 588 to 591.—See *Fire, Heat*.
- Phosphorus*, the several kinds of, *ii.* 433. The Bolognian phosphorus was discovered by Vincenzo Cascariolo; its properties, *ib.* 439. Artificial phosphorus, how formed, *ib.* Phosphori generally diffused, *ib.* 442. Of Canton's phosphorus, how prepared, *ib.* 443. Imbibes its property from light, *ib.* 444. Mr. Wilson's phosphorus exhibited vivid colours, *ib.* Phosphorus is an incipient ignition in certain bodies, *ib.* 446. Different kinds of phosphori, *ib.* They do not emit the identical light which they have received, *ib.* 447. The agreement and disagreement of phosphoretic and phlogistic bodies, *ib.* 448. The change it undergoes when burnt in vital air, *i.* 521.—See *Fire*.
- Physicians*, the error into which some of them have fallen, *ii.* 271.
- Plane, inclined*, descent of bodies upon it, *iii.* 152. Has a relative and absolute gravity, *ib.* 154 to 160. Its use, *ib.* 289.
- Planets*, on, *iii.* 548. They are spherical opaque bodies, *iv.* 13. Inferior and superior planets, *ib.* 17, 26. A table of their diameters and distances, *ib.* 35. Revolutions round the sun, *ib.* 36; and their own axes, *ib.* 37. Their proportional magnitude, *ib.* 38. Their heliocentric and geocentric latitude, *ib.* 75. Their conjunction and opposition, *ib.* 76. Appearances of the inferior planets, *ib.* 90; and of the superior, *ib.* 87. Their direct, stationary, and retrograde motion, *ib.* 88. Their satellites, *ib.* 91. Inferior planets, their superior and inferior conjunctions, *ib.* 163. Their apparent irregularities explained, *ib.* 166. Of the superior planets, as seen from the earth, *ib.* 167; are most probably inhabited worlds, *ib.* 247. They gravitate towards the sun, *ib.* 277. The irregularity produced among them by gravitation, *ib.* 282.
- Planetarium*, its antiquity and use, *iv.* 156. Proves the truth of the Copernican system, *ib.* 168. How to rectify it for the true places of the planets, *ib.* 169. To use it as a tellurian, *ib.* 170. To explain the changes of the seasons, *ib.* 171. The parallel, direct, and right spheres, *ib.* 175.
- Plants* are sensibly affected by light, *ii.* 470. Plants exposed to light emit vital air, *ib.* 471. Are affected by vital air, *ib.* 472.—See *Air, Light, Vegetables*.
- Plato's* idea of the intertexture of air and fire in the human frame, *i.* 274. His observation on colours, *ii.* 390. On the present state of human knowledge, *iii.* 55.



- Plenum*, a, necessary for motion by impulse, iv. 254. Bodies are able to move in a plenum, *ib.* 257.
- Plurality of worlds*, reasons for them, iv. 244.
- Pneumatics*.—See *Air*.
- Points*, cardinal, and points of the compass, iii. 527.
- Pole star*, iii. 525. Its position, *ib.* How to be found, *ib.* 526. It describes a small circle round the pole, *ib.* 540.
- Poles*, or arctic and antartic circles, iii. 562.
- Poles of the magnet*, iv. 441. Their action on each other, *ib.* Their action on steel filings, *ib.* 443. The poles should always be left connected, *ib.* 454.
- Prayer*, a, for wisdom and virtue, i. 38, 39.
- Prejudice*, its mischiefs and effects, i. 71.
- Priestley*, Dr. his discoveries of airs, i. 490. His system of materialism fully examined and confuted, iii. 64 to 78.
- Projectiles*, motion of, iii. 182. Galileo's discoveries in them, *ib.* 183. Are opposed by the air's elasticity, *ib.* 194. The great quantity of motion which they lose, *ib.* 191.
- Providence*, discoverable in the smallest as well as greatest events; no such thing as chance, ii. 434.
- Providence*, reflections on the wisdom and goodness of, in the suction of animals and the swallowing of food, i. 69. In the pressure of the air, *ib.* 83. In the universal good designed in all his works, *ib.* 108. In the admirable provision made for breathing, *ib.* 226. In the blessing of speech, *ib.* 232. In the singing of birds, *ib.* 239. In the admirable construction of the human ear, *ib.* 268. In the creation of the universe, and particularly of the air, for the most universal good, *ib.* 272. In the provision made for the warmth of different animals, *ib.* 293. In guarding against the too sudden changes of heat or cold, *ib.* 351. In the continued agency of the Divine Mind, *ib.* 357. In the insensible operations of the rise of vapours, *ib.* 393. In the provisions made for supplying heat and light, *ib.* 434. In rendering every part of matter active and useful, *ib.* 435. In the great and benevolent ends which are obtained in nature by simple means, *ib.* 439. In the agency and operations of fire, *ib.* 486. In the abundant production of vital air, and in the preservation of the equilibrium of the atmosphere, *ib.* 518. In the uses resulting from the vegetable kingdom, *ib.* 519. In the provision made against cold, *ib.* 529. In the ocean, and its inhabitants, ii. 93. In the various benefits bestowed by means of water, *ib.* 94. In the construction, form, and uses of the eye; and in the blessings of sight, *ib.* 283, 285, 286, 363, 364. In restoring the purity of the air by means of vegetables, *ib.* 471. In the simplicity and energy of his works, iii. 51. In the divine agency exhibited in nature, *ib.* 59. In the powers and excellency of the soul of man, *ib.* 84. In the regular order and establishment of the Divine Mechanic, *ib.* 88; both in the natural and moral world, *ib.* 89, 90. In the starry heavens, *ib.* 583. In the gradual progress of arts and



sciences, iv. 4. In the immensity of his works, and their continual preservation, *ib.* 43, 44. In the various changes of the seasons, *ib.* 72. In the clear discoveries of divine intelligence and design, and in the supplies of the numerous wants of man, *ib.* 193, 195. In the wonderful structure of the human frame, *ib.* 196. In the vegetable kingdom, *ib.* 196, 197. In the animal kingdom, *ib.* 197. In the universal distribution and management of fire, *ib.* 411. In the degree of heat which every country enjoys in the course of the year, *ib.* 549. In the arrangement of mountains and seas, *ib.* 550. In the perfection of the word and work of God, *ib.* 565.—See *God, Man, Natural Philosophy.*

*Pulley*, its properties, iii. 284. Are fixed and moveable, *ib.* Of the moveable pulley, *ib.* 285 to 289. Of Smeaton's pullies, *ib.* 311. Of their immense force, *ib.* 313.

*Pulses of the air*, propagated by sound, i. 245. Are alternately condensed and rarefied, *ib.* 247. All pulses move at an equal rate, 1142 feet in a second, *ib.* 249.

*Pump, common*, invented by Ctesebes, i. 138. Raises water thirty four feet, *ib.* 139.

—*forcing*, acts by condensed air, *ib.* 141.

*Pumps*, of. Of the chain pump, iii. 493. Its construction and use, *ib.* Of the common pump, *ib.* 494. Its construction and action, *ib.* 495. The piston must be less than thirty-three feet from the water, *ib.* 496. Of the forcing pump, its construction and use, *ib.* 498. Of de la Hire's pump, *ib.* 500. Of Taylor's pump, *ib.* 501. Of the Hessian pump, *ib.* 503. Of Vera's pump, *ib.* 504.—See *Air, Water.*

*Pupil of the eye*, an account of, ii. 322. Its motions; is naturally dilated, *ib.* 323. Is contracted by light, *ib.* 324.—See *Eye, Light.*

*Pyrometer*, an instrument for measuring the degree of heat, i. 296.

## Q

*Quadrant, astronomical*, its use and description, iii. 533 to 535.

To find the altitude of any celestial body, *ib.* 538.

*Quadrant of altitude*, iii. 559.

## R

*Rain* is supposed to proceed from the decomposition of the air resulting from the aqueous vapours being converted into an aeriform fluid, ii. 80. Heavy showers caused by clouds of different electricities being driven together, iv. 374. How much we are ignorant of it; on what it depends, *ib.* 510. Rain is not the precipitation of water simply evaporated in the air, *ib.* 511. Is indicated by a hollow noise, *ib.* 531. Rains in the West Indies, *ib.* 537. Most rain falls in woody



- and mountainous countries, *ib.* 544. Rain and snow generally give vitreous electricity, *ib.* 552. Generally follows sudden changes of the weather, *ib.* 558.—See *Vapour*.
- Rainbow*, the ignorance of the ancients concerning it; explained by Sir Isaac Newton, ii. 391, 392. The order of colours; the varieties of them, *ib.* 393. Illustrated; the second bow explained, *ib.* 395. On what the size of the bow depends, *ib.* —See *Light*, *Colours*, *Refraction*.
- Rain gage*, its construction and use, iv. 500. Explanation of, by the Editor, *ib.* 574.
- Read*, Mr. his experiments on electricity, iv. 355, 358.
- Reaumur*, M. his discoveries on eggs, i. 209.
- Reflexion of light*, ii. 217. All reflexion reciprocal, *ib.* 219. Laws of reflexion, *ib.* 221. No colours are displayed by reflected light, *ib.* 422.—See *Light*.
- Refraction of light*, laws of, ii. 154, 155. Refraction at a convex surface, *ib.* 169. At a concave surface, *ib.* 173.—See *Light*.
- Religion*, it requires a sobriety of mind, i. 359. Religion and philosophy agree together, iv. 431. The arts and sciences flourish most where religion is cultivated, *ib.* 564.—See *God*, *Providence*, *Man*.
- Resinous electricity*.—See *Electricity*.
- Respiration* receives vital air, and mixes it with the blood in the lungs, i. 528. Respiration is similar to combustion; respiration explained, i. 218, 227, 228. Concerned in smelling, laughing, speaking, weeping, *ib.* 233, 234.
- Rods*, *conducting*, iv. 379. Are the means of restoring the equilibrium, *ib.* Observations against pointed conductors, *ib.* 380. They only draw off the electric matter when immersed in its atmosphere, *ib.* 381. Cannot attract the lightning out of its direction, *ib.* Objections against them, *ib.* 382.—See *Electricity*.

## S

- Salts* produce great degrees of cold, ii. 52. How they form saline liquids, *ib.* 66.
- Saturn*, his size, distance, revolution, iv. 30. His ring and moons, *ib.* 32, 239. His year, and motion round the sun, *ib.* 160. His belts, *ib.* 239.
- Screw*, male and female, iii. 294. Of the endless screw, *ib.* 296. Of the micrometer screw, *ib.* 299.
- Sea*. Saltness of the sea, inquiries into the cause of, ii. 28. It was originally salt, *ib.* 29. Dr. Halley's weak opinion, *ib.* The water is most salt where the sun is vertical; an easy method to ascertain the saltness, *ib.* 30. The advantages derived from the sea to temperate the air, iv. 548.
- Seasons* of the year accounted for, iv. 63. Summer is longer than winter, *ib.* 69.



- Senses* lead to all physical knowledge, i. 276. The imperfections attending their information, *ib.* 277. This to be judged of from experiment, *ib.* 278.
- Sight*. Of imperfect sight, ii. 326. Of old, or long-sighted eyes, *ib.* 327. Of short-sighted eyes, *ib.* 339. How assisted, *ib.* 341.—See *Eye*.
- Smeaton*, Mr. an account of his pyrometer, i. 303 to 307.
- Smoke*.—See *Chimnies*.
- Smith*, Dr. his observation on the division of labour illustrated, iii. 359.
- Snow* keeps the ground warm in winter, i. 291, 293. The form of its flakes, ii. 44.
- Solution*, an effect of fire, i. 449. Description of its operation, *ib.* 450. Illustrated in the solution of salts, *ib.* 452.
- Sound*, benefits resulting from it, i. 239. Cause of, *ib.* 240, 259. Of musical sounds, *ib.* 262. Of sympathetic sounds, *ib.* 265. Sounds of metals, how improved, *ib.* 241. Classes of sonorous bodies, *ib.* Sound is best conducted in a dense medium, *ib.* 242. May be conveyed through wood or water, *ib.* It does not proceed from a flux of air, but from a vibratory motion of the particles of air in their proper place, *ib.* 245. Sound vibrates according to the motion of a cycloidal pendulum, *ib.* 249. Differences among sounds, *ib.* 250. The intensity is inversely as the squares of the distance, *ib.* The velocity of sound continues always the same, *ib.* Sound diminishes for want of perfect elasticity in the air, *ib.* 251. Is more perfect in some winds than in others, *ib.* 252. Its effects on solid bodies, iv. 406.—See *Air*.
- Sound judgment*, the means to form it, i. 71.
- Space*, the idea of it from extension, iii. 8. Space, absolute and relative, *ib.* 93. The analogy between time and space, *ib.* 94.
- Speaking trumpet* explained, i. 252.
- Spectacles*, their use, ii. 331. Directions in the choice of them, *ib.* 332. Directions to discover if they be wanted, *ib.* 336.
- Speech*, the blessing of it; the various parts which form it, i. 232.
- Spheres*, right, parallel, or oblique, iii. 563.
- Spirit of man*, the opinions which the ancients entertained of it, iii. 63. The gospel does not treat of its natural immortality, *ib.* 65. Dr. Hartley represented the soul as uniformly passive, *ib.* 66. The excellencies of the soul, *ib.* 84.
- Springs of water*, different opinions concerning them, ii. 17, 18. Are not supplied by rains and dews, *ib.* Some run the same in a wet or dry season, *ib.* 21. Springs are principally supplied from the subterraneous stores of water, *ib.* 26.
- Stars*, the numbers of, discovered by Herschel, ii. 482. Their apparent diurnal motion, iii. 524. Of the fixed stars, their twinkling, *ib.* 567. Are arranged in constellations, *ib.* 568. Are divided into different classes, from their size, *ib.* 569. The catalogues of them, *ib.* by Hipparchus, by Bayer, by Flamsteed, by de la Caille, by Wollaston, *ib.* 571. De



pictured on a new 18-inch celestial globe by W. Jones, *ib.* 572. The immense number of the stars, *ib.* 573. The numbers discovered by Dr. Herschel, *ib.* 574. How to obtain a knowledge of the constellations, *ib.* The vast distance of the fixed stars from us, of the first magnitude, iv. 40; of the second, *ib.* 41. Their parallax, *ib.* 128. Their apparent motions, from the aberration of light, *ib.* 138. Their motion, *ib.* 140. Different stars appear at different times of the year, *ib.* 162. Their distance great beyond computation, *ib.* 217. Have a general motion, *ib.* 218. The variety in these; some appearing, others vanishing, *ib.* New stars; catalogues formed, *ib.* 219. Remarkable new stars, *ib.* 220. Stars, their proper motion, *ib.* 221. Stars of different lustre supposed to be at different distances from us, *ib.* 226. Nebulæ of stars, *ib.* 227. A perforated nebula, *ib.* 230. All the universes of stars or suns connected together, *ib.* 231. Are probably suns; their use, *ib.* 245. There are more stars in the northern than in the southern hemisphere, *ib.* 563.

*Steam of boiling water* occupies 1800 times more space than water, i. 373. Its nature and properties, ii. 83.

*Steel-yard*, an account of the, iii. 278.

*Suction*, improperly applied to account for some phenomena of air, i. 58.

*Sun*. The emanation of matter from the sun one of the prime movers of the machine of the world, i. 433. Its influence under different forms, *ib.* 434. The solar fluid is absorbed in vegetables, and is the cause of colour, flavour, &c. *ib.* 513. The solar substance in one place is *fire*, in another *light*, in a third, *electricity*, ii. 452. The sun animates and quickens the globe of the earth, as the seminal bed of his rays, *ib.* 467. The source of natural life, *ib.* 468. His influence on the earth, *ib.* particularly in the vegetable kingdom, *ib.* 470. His rising and setting, iii. 530. His annual motion, *ib.* 543. He rises and sets in different parts, *ib.* He moves about a degree every day, *ib.* 545. The center of the system; the heart of heaven, iv. 14. His influence, size, distance, motion, *ib.* 15. His supposed atmosphere, *ib.* 16. Is the center of the system, *ib.* 56. His apparent motion, *ib.* 57. The motion of the sun appears differently to inhabitants of different planets, *ib.* 60. He appears to move in the ecliptic, *ib.* 61. His apparent diameter greater in winter than in summer, *ib.* 70. Eclipses of the sun, how caused, *ib.* 113; are visible to only a few inhabitants of the earth, *ib.* 115. Total eclipse remarkable, *ib.* 116. Are total, annular, or partial, *ib.* 117. On what the quantity and duration of the eclipse depends, *ib.* 118. His parallax, *ib.* 137. His tropical and siderial year, *ib.* 142. A measurer of time, *ib.* 143. The inequality of his apparent motion, *ib.* 153. Appears to pass through the signs of the zodiac in a year, *ib.* 161. Dr. Herschel conjectures that our sun belongs to the milky way, *ib.* 223. The spots on its



surface, their variety, *ib.* 232. Peculiarities of their nucleus and umbra, *ib.* 233. Sometimes they appear to burst, *ib.* Their directions different, *ib.* Conjectures concerning them, *ib.* 234. His center of gravity, *ib.* 232. Is the source of the electric fluid, *ib.* 394. Is the cause of natural life, *ib.* 404. Probably supplies the magnetic fluid, *ib.* 470. Is a principal source of heat, *ib.* 541. His rays act as fire, and increase the expansive force of fire, *ib.* 542. Causes an undulating motion in the atmosphere, *ib.* 555. Shines more on the northern than on the southern hemisphere, *ib.* 562.—See *Light, Heat, Colours, Electricity, Magnetism.*

*Sun-dial*, universal or equatorial, description of, 209.

*Swimming*, on, iii. 419.

*Sympathetic inks*, experiments with, ii. 131.

*Syphon* explained, i. 143. Forms Tantalus's cup, *ib.* 144. Accounts for intermitting springs, *ib.* 145. Fuller account of; principles on which they act, iii. 508. Distiller's syphon, *ib.* 510. Of s'Gravesande's syphon, *ib.*

## T

*Telescopes*, observations on their use, ii. 481. Lord Bacon's remark on them, *ib.* 482. Are supposed to have been discovered by Roger Bacon, *ib.* 483; and by Jansen, *ib.* 486. Were improved by Galileo, *ib.* Of refracting telescopes, *ib.* 487. Their properties, *ib.* 490 to 496. Their apparent field, *ib.* 494. Of the astronomical telescope, its properties, *ib.* 497 to 501. Imperfections arising from the dispersion of the rays of light in them, *ib.* 506. Of the compound object glass, *ib.* 508. From the refrangibility of the light, *ib.* 512. How corrected, *ib.* 513. Of telescopes with several eye-glasses, *ib.* 517. Of achromatic telescopes, *ib.* 522. Were invented by Mr. Dollond, *ib.* 524. The invention has been ascribed to Mr. Hall, *ib.* 530. Are composed of different kinds of glasses, *ib.* 527. This discovery was claimed for Euler, *ib.* 529. Of the reflecting telescope, *ib.* 530. By whom discovered, *ib.* 531. Of the Gregorian telescope; its properties, *ib.* 534. Of the Newtonian telescope, *ib.* 539. The most improved constructions of, described by the Editor, 563. Transit telescope, 576.

*Temperature* of the earth, observations on it, iv. 546. On what it depends, *ib.* 548.

*Tests*, chemical, list of, ii. 122.

*Thermometers*, the principle on which they are constructed, i. 319, 320. Of Fahrenheit, Reaumur, and Celsius, the relation between them, *ib.* 321. Mercurial thermometer, an accurate measure of heat, *ib.* 322. Experiments on it, *ib.* 383. May be reduced by ether, ii. 51. Its construction and use, iv. 491, 492. The requisites for a good one, *ib.* 494, 495. The



manner of filling it, *ib.* 496. How to graduate it, *ib.* 497. To seal it hermetically, *ib.* 497. The thermometer is a scale of expansion, indicating the transfusion of the igneous fluid, *ib.* 499. Six's thermometer, *iv.* 573.—See *Fire, Heat.*

*Thunder*, remarks on, *iv.* 527.

*Time*, of, *iii.* 93. The analogy between time and space, *ib.* 94. The measure of it, *ib.* 211. Observations on time, *ib.* 218. Mr. Locke's opinion of it, *ib.* 220. Dr. Clarke's mistake concerning successive and unsuccessive duration, *ib.* 221. Quotation from Tucker, *ib.* 222. Time, true and apparent, and mean, *iv.* 148. Equation of time, *ib.* 150. Whence the difference arises, *ib.* 151. Reflexion on the lapse of time, *ib.* 155.

*Tin*, its peculiar quality in rendering other metals more sonorous, *i.* 241.

*Torricellius*, his invention of the barometer, *i.* 74.

*Transparency*, the least part of all bodies are transparent, *ii.* 411. Transparency depends on homogeneity, *ib.* 412. Transparent bodies reflect rays of one colour, and transmit rays of another, *ib.* 413. Transparency acquired, *ib.* 432. The advantages from the transparency of glass, *ib.*—See *Light, Opacity.*

*Tropics*, *iii.* 561.

*Truth*, love of, *i.* 72. In what manner it should be sought for, *ib.* Its gradual advances, *ib.* 80. Nature of, *ib.* 106. The cause of, injured by a deference to the authority of names, *i.* 285. Its analogy or correspondence with water, *ii.* 7. Its nature, *ib.* 275.

*Tschirnhausen*, M. effects produced by his burning glass, *ii.* 188.

*Tubes*, eudiometer, and measure, *i.* 495.

## V

*Vacuum*, no perfect vacuum of air can be produced by the air-pump, *i.* 158. A vacuum in nature disproved, *iii.* 248 to 250.

*Vapours*, not permanently elastic fluids, *i.* 499. Are destroyed by pressure and cold, *ib.* 500. The accidents occasioned by their sudden expansion, *i.* 364. Occupy 14,000 times more space as vapours than as water, *ii.* 74.

*Vapours*, vesicular and concrete, an account of, *ii.* 86. In the form of spherical balls, *ib.* 87. Only the 3600th part of an inch in size, *ib.* 87. The difference between vapours and elastic fluids, *iv.* 502. Watery vapours are one half less than a like volume of air, *ib.* 503. Vapours consist of fire and water united, *ib.* 503. How they are decomposed, part with their water to hygroscopic substances, *ib.* 506. The condensation of them a source of heat, *ib.* 543.—See *Fire, Air, Water.*

*Vegetables*, when acted upon by the solar light, afford abundance of vital air, *i.* 513; but in the shade, the air they yield is impure,



- ib.* 515. They imbibe mephitic and emit vital air, *ib.* 518. Admirable reflexions on their uses, *ib.* They consume more water than falls in rain, ii. 21. Their influence on the climate and weather, iv. 549.—See *Light, Air, Water.*
- Velocity*, relative and absolute, iii. 101. Of the velocity of falling bodies, *ib.* 137.
- Venus*, her size, distance, diurnal and annual revolutions, different appearances, atmosphere, iv. 19 to 22. Her conjunctions with the sun, *ib.* 78. When she appears stationary, *ib.* 82. Her phases, *ib.* 84.
- Vince*, Mr. his observations on friction, iii. 329 to 335. His observations on wheel carriages on a plain ground, *ib.* 352.
- Vision* is caused by the refraction of the rays of light, ii. 297. Why are not objects seen in an inverted position? *ib.* 302 to 305. Vision is not produced on the optic nerve, *ib.* 306. Of the extent and limits of vision, *ib.* 307. Is limited by various means, *ib.* 308. Vision is confused by the undulating motion of the air, *ib.* 309. The angle of the least vision, *ib.* 310. Of distinct and clear vision, *ib.* 312. On what it depends, *ib.* At what distance it is perceptible, *ib.* 316. The appearance of distance affected by light and colours, *ib.* 348. Mistakes concerning distances, *ib.* 352. Fallacies of vision explained, *ib.* 358. Of vision by images, *ib.* 359.—See *Light, Eye.*
- Vitreous electricity*.—See *Electricity.*
- Voice of man*, wonders and variety of it, i. 267.

## W

- Walker*, Mr, of Oxford, his experiments for freezing mercury, ii. 54.
- Water* is converted into vapour whenever the pressure of the atmosphere is diminished to a certain degree, i. 164. Gradually parts with its latent fire whilst it is freezing, *ib.* 348. May be cooled several degrees below the freezing point, *ib.* Receives a less quantity of heat than what quicksilver does, *ib.* 356. Water boils with a small degree of heat when the pressure is removed, and *vice versa*, *ib.* 371. Water is not dissolved by air, *ib.* 375. One-thousand six-hundred gallons of water raised from an acre of ground in a hot summer's day, *ib.* 394. Water constitutes the ponderable part of all aeriform fluids, *ib.* 507, ii. 58. Its nature and properties, *ib.* 2. Its various uses, *ib.* 3. Is not a compound of vital and inflammable airs, *ib.* 4, 5. Of water in a fluid state, *ib.* 6. Is compressible in a small degree, *ib.* Enters into the composition of all bodies, *ib.* 7. Its analogy to truth, *ib.* The quantity of it suspended in the atmosphere, *ib.* 8. It increases the weight of certain bodies exposed to it, *ib.* 9. Has a similar effect on the human frame, *ib.* 10. Water in mixture or combination with bodies, *ib.* 11. Is a general cement, *ib.* 12.



Is never obtained pure, *ib.* 13 to 15. Is of different degrees of softness, *ib.* 14. Is purified by distillation, *ib.* 15. The water from rain is not a sufficient supply for springs, *ib.* 18. The subterraneous stores of water, *ib.* 22. These supply springs and vegetables, *ib.* 25. Peacock's filtration of it by ascent, *ib.* 24. Sea water deposits its salt by freezing, *ib.* 31. According to the quantity of heat is the quantity of salt which water can dissolve, *ib.* 33. Water becomes ice by losing its fire, *ib.* 34. Boiled water does not so easily freeze as unboiled, *ib.* 35. Water may be cooled below the point of congelation without freezing, *ib.* 36, 37. It increases in bulk just as it freezes, *ib.* 38. Ice is changed into water by means of fire, *ib.* 58. Is the ponderable part of all aeriform fluids, *ib.* 59. Its simple particles are of a certain form, *ib.* 65. By means of acids the particles of water are brought nearer together, without losing the fire of liquifaction, *ib.* 66. Is probably the principal constituent in oils and salts, *ib.* 68. Is the universal menstruum, *ib.* 69. Water combines with all other substances, *ib.* 70. Water expanded in vapour is 800 times rarer than air, *ib.* 71; and 14,000 times rarer than itself, *ib.* 74. Is a principal ingredient in vegetable and animal substances, *ib.* 90. The varieties of the weather depend on the changes of water, *ib.* 477. Can receive a greater degree of heat before it boils, than when it boils, *ib.* 493. Is not held in solution by air, *ib.* 504. In what manner it is received by different hygroscopic substances, *ib.* 506.—See *Fire, Air, Vapour, Evaporation.*

*Waters, mineral*, their nature and properties, *ib.* 89. Their different qualities, *ib.* 92. Are artificially made, *ib.* 93.

*Weather*, knowledge of, very interesting, *ib.* 470. But at present is uncertain, *ib.* 473 to 556. The phenomena which are to be observed, *ib.* Depend on the circulation of matter, *ib.* 476. Inquiries concerning it; instruments to be used, *ib.* 477. A barometer, *ib.* How to attain a more perfect knowledge of the weather, *ib.* 556, 557. Signs of the weather from the barometer, *ib.* 558, 559. From the thermometer and hygrometer, *ib.* 560. From the appearance and different currents of clouds, *ib.*

*Wedge*, its use, *ib.* 291 to 294. A simple instrument to illustrate its theory, *ib.* 294.

*Whalebone*, slips of, best substance for an hygrometer, *ib.* 369.

*Wheels*, of their work, *ib.* 315. How to compute their forces, *ib.* 317.

*Wheel and axis*, its properties, *ib.* 280. Acts as a perpetual lever, *ib.* 282. Crane-wheel, capstan, *ib.* Watch spring, *ib.* 284. Of the fly-wheels, *ib.* 322.

*Wheel carriages*, on, *ib.* 347. Their utility, *ib.* 350. On the center of gravity in wheel carriages, *ib.* 351. Observations on them on plain ground, *ib.* 352. On hard ground, with



- obstacles, *ib.* 353. On sand, *ib.* 356. The advantages of springs, *ib.* 357. The reason of this, *ib.*
- Whirling table*, Ferguson's description of, iii. 362. Description of an improved one, *ib.* 381.
- Wieglib*, Mr. a German chemist, an abstract of his Dissertation on Phlogiston, i. 575. Supported by the experiments of Mr. Green, *ib.* 585. His analysis of mineral waters, *ib.* 102.
- Wilson*, Mr. his experiments on phosphoric bodies in a dark chamber, ii. 441.
- Wind-gage*, by Dr. Lind, iv. 574.
- Winds*, cause of, i. 114. Bacon's suggestion for an history of them, iv. 528. His queries concerning them, *ib.* Different causes which affect them, *ib.* Are influenced by the return of air to a state of vapour, *ib.* 530. On the origin of winds, *ib.* 531. Their irregularities, *ib.* Are affected by the diurnal rotation of the earth, *ib.* 533. Various tempests produced by winds, *ib.* 536. Are affected by the soil over which they blow, *ib.* 538. Remarkable unhealthy winds, *ib.* 539. Their indication of a change of weather, *ib.* 561.— See *Air*.
- Wood* is pervious to air, i. 210. Effects of this, *ib.* 211.
- Woods*, their utility in a country respecting rain, iv. 544.
- World*, the great powers of it, heat and gravitation mutually counterbalance each other, i. 437. The influence of these, *ib.* 438. The northern hemisphere of the world superior to the southern, iv. 562.

## Z

- Zenith*, iii. 528.
- Zodiac*, iii. 560.

### DIRECTIONS TO THE BINDER.

The Fifth Volume contains the Index and Plates. The Index is to be placed first, and the Plates to succeed in the following order.

1. Air, &c. .... Seven Plates, ..... i. to vii.
2. Optics ..... Ten Plates, ..... i. to x.
3. Mechanics ..... Six Plates, ..... i. to vi.
4. Hydrostatics &c. .... Three Plates, ..... i. to iii.
5. Astronomy ..... Fifteen Plates, ..... i. to xv.
6. Electricity, &c. .... Two Plates, ..... i. to ii.

In all forty-three Plates, besides the Frontispiece.



---

## REFERENCES TO THE PLATES.

---

### VOL. I.

---

#### AIR.—PLATE I.

- |                       |                        |                  |
|-----------------------|------------------------|------------------|
| Fig. 1, p. 51.        | Fig. 9, p. 67.         | Fig. 16*, p. 55. |
| Fig. 2, p. 45.        | Fig. 10, p. 85.        | Fig. 17, p. 58.  |
| Fig. 3, p. 44.        | Fig. 11, p. 54.        | Fig. 18, p. 87.  |
| Fig. 4, p. 46.        | Fig. 12, p. <i>ib.</i> | Fig. 19, p. 173. |
| Fig. 5, p. <i>ib.</i> | Fig. 13, p. 171.       | Fig. 20, p. 63.  |
| Fig. 6, p. <i>ib.</i> | Fig. 14, p. 60.        | Fig. 21, p. 141. |
| Fig. 7, p. <i>ib.</i> | Fig. 15, p. 173.       | Fig. 22, p. 138. |
| Fig. 8, p. <i>ib.</i> | Fig. 16, p. 177.       |                  |

#### AIR.—PLATE II.

- |                       |                        |                        |
|-----------------------|------------------------|------------------------|
| Fig. 1, p. 129.       | Fig. 7, p. 176.        | Fig. 13, p. 90.        |
| Fig. 2, p. 89.        | Fig. 8, p. 89.         | Fig. 14, p. 176.       |
| Fig. 3, p. 176.       | Fig. 9, p. 174.        | Fig. 15, p. 241.       |
| Fig. 4, p. 66.        | Fig. 10, p. <i>ib.</i> | Fig. 16, p. <i>ib.</i> |
| Fig. 5, p. <i>ib.</i> | Fig. 11, p. 59.        | Fig. 17, p. 177.       |
| Fig. 6, p. 85.        | Fig. 12, p. 63.        |                        |

#### AIR.—PLATE III.

- |                 |                        |                        |
|-----------------|------------------------|------------------------|
| Fig. 1, p. 210. | Fig. 9, p. 171.        | Fig. 16, p. 135.       |
| Fig. 2, p. 86.  | Fig. 10, p. 215.       | Fig. 17, p. <i>ib.</i> |
| Fig. 3, p. 210. | Fig. 11, p. 78, 90.    | Fig. 18, p. 134.       |
| Fig. 4, p. 214. | Fig. 12, p. 134.       | Fig. 19, p. 135.       |
| Fig. 5, p. 173. | Fig. 13, p. 133.       | Fig. 20, p. 143.       |
| Fig. 6, p. 174. | Fig. 14, p. 135.       | Fig. 21, p. 175.       |
| Fig. 7, p. 175. | Fig. 15, p. <i>ib.</i> | Fig. 22, p. 176.       |
| Fig. 8, p. 57.  |                        |                        |

#### SOUND, FIRE, &c.—PLATE IV.

- |                       |                        |                        |
|-----------------------|------------------------|------------------------|
| Fig. 1, p. 95.        | Fig. 9, p. 260.        | Fig. 17, p. 361.       |
| Fig. 2, p. 144.       | Fig. 10, p. <i>ib.</i> | Fig. 18, p. <i>ib.</i> |
| Fig. 3, p. 111.       | Fig. 11, p. 254.       | Fig. 19, p. <i>ib.</i> |
| Fig. 4, p. 145.       | Fig. 12, p. 327.       | Fig. 20, p. <i>ib.</i> |
| Fig. 5, p. 258.       | Fig. 13, p. 327, 361.  | Fig. 21, p. <i>ib.</i> |
| Fig. 6, p. 259.       | Fig. 14, p. 143, 361.  | Fig. 22, p. <i>ib.</i> |
| Fig. 7, p. <i>ib.</i> | Fig. 15, p. 361.       | Fig. 23, p. 245.       |
| Fig. 8, p. <i>ib.</i> | Fig. 16, p. <i>ib.</i> | Fig. 23*, p. 383.      |

SOUND, FIRE, &c.—PLATE V.

Fig. 1, p. 303.	Fig. 6, p. 364.	Fig. 10, p. 88,
Fig. 2, p. 304.	Fig. 7, p. 388.	vol. 2.
Fig. 3, p. 306.	Fig. 8, p. 466.	Fig. 11, p. 133.
Fig. 4, p. 319.	Fig. 9, p. 390.	Fig. 12, p. <i>ib.</i>
Fig. 5, p. 366.		

ELASTIC FLUIDS, &c.—PLATE VI.

Fig. 1, p. 492.	Fig. 6, p. 495.	Fig. 11, p. 72,
Fig. 2, p. 493.	Fig. 7, p. 496.	vol. 2.
Fig. 3, p. 494.	Fig. 8, p. <i>ib.</i>	Fig. 12, p. 497.
Fig. 4, p. <i>ib.</i>	Fig. 9, p. 497.	Fig. 13, p. 495.
Fig. 5, p. 550.	Fig. 10, p. <i>ib.</i>	Fig. 14, p. 494.

ELASTIC FLUIDS, &c.—PLATE VII. VOL. I. and II.

Fig. 1, p. 495.	Fig. 6, p. 98,	Fig. 10, p. 97.
Fig. 2, p. <i>ib.</i>	vol. 2.	Fig. 11, p. <i>ib.</i>
Fig. 3, p. 520.	Fig. 7, p. 25,	Fig. 12, p. 99.
Fig. 4, p. 530.	vol. 2.	Fig. 13, p. 101.
vol. 2.	Fig. 8, p. 27,	Fig. 14, p. <i>ib.</i>
Fig. 5, p. 96,	vol. 2.	
vol. 2.	Fig. 9, p. 96.	

---

VOL. II.

---

OPTICS.—PLATE I.

Fig. 1, p. 148.	Fig. 10, p. 170.	Fig. 18, p. 167.
Fig. 2, p. 154.	Fig. 11, p. <i>ib.</i>	Fig. 19, p. 170.
Fig. 3, p. 157.	Fig. 12, p. <i>ib.</i>	Fig. 20, p. 171.
Fig. 4, p. 166.	Fig. 13, p. 172.	Fig. 21, p. 172.
Fig. 5, p. 173.	Fig. 14, p. 174.	Fig. 22, p. 175.
Fig. 6, p. 165.	Fig. 15, p. <i>ib.</i>	Fig. 23, p. 178.
Fig. 7, p. 166.	Fig. 16, p. 175.	Fig. 24, p. 179.
Fig. 8, p. 167.	Fig. 17, p. <i>ib.</i>	Fig. 25, p. 218.
Fig. 9, p. 170.		

OPTICS.—PLATE II.

Fig. 1, p. 174.	Fig. 7, p. 209.	Fig. 13, p. 179.
Fig. 2, p. 172.	Fig. 8, p. 200.	Fig. 14, p. 184.
Fig. 3, p. 174.	Fig. 9, p. 177.	Fig. 15, p. 185.
Fig. 4, p. 175.	Fig. 10, p. 200.	Fig. 15*, p. 187.
Fig. 5, p. 181, 215.	Fig. 11, p. 182.	Fig. 16, p. 194.
Fig. 6, p. 191.	Fig. 12, p. 202.	



OPTICS.—PLATE III.

Fig. 1, p. 198.  
Fig. 2, p. *ib.*  
Fig. 3, p. 306.  
Fig. 4, p. 181.  
Fig. 5, p. *ib.*

Fig. 6, p. 204.  
Fig. 7, p. *ib.*  
Fig. 8, p. 299.  
Fig. 9, p. 299.

Fig. 10, p. 205.  
Fig. 11, p. 215.  
Fig. 12, p. 205.  
Fig. 13, p. 151.

OPTICS.—PLATE IV.

Fig. 1, p. 210.  
Fig. 2, p. *ib.*  
Fig. 3, p. 211.  
Fig. 4, p. *ib.*  
Fig. 5, p. *ib.*

Fig. 6, p. 211.  
Fig. 7, p. *ib.*  
Fig. 8, p. *ib.*  
Fig. 9, p. 182.

Fig. 10, p. 215.  
299.  
Fig. 11, p. 215.  
Fig. 12, p. *ib.*

OPTICS.—PLATE V.

Fig. 1, p. 220.  
Fig. 2, p. *ib.*  
Fig. 3, p. *ib.*  
Fig. 4, p. 221.  
Fig. 5, p. *ib.*  
Fig. 6, p. *ib.*  
Fig. 7, p. 222.

Fig. 8, p. 222.  
Fig. 9, p. *ib.*  
Fig. 10, p. 223.  
Fig. 11, p. *ib.*  
Fig. 12, p. 224.  
Fig. 13, p. 226.

Fig. 14, p. 226.  
Fig. 15, p. 227.  
Fig. 16, p. 228.  
Fig. 17, p. *ib.*  
Fig. 18, p. 229.  
Fig. 19, p. *ib.*

OPTICS.—PLATE VI.

Fig. 1, p. 238.  
Fig. 2, p. 249.  
Fig. 3, p. 240.  
Fig. 4, p. 241.  
Fig. 5, p. 229.  
Fig. 6, p. 245.

Fig. 7, p. 247.  
Fig. 8, p. 371.  
Fig. 9, p. 370.  
Fig. 10, p. 373.  
Fig. 11, p. 379.  
Fig. 12, p. 380.

Fig. 13, p. 385.  
Fig. 13\*, p. 489.  
Fig. 14, p. 490.  
Fig. 15, p. 497.  
Fig. 16, p. 498.  
Fig. 17, p. 388.

OPTICS.—PLATE VII.

Fig. 1, p. 499.  
Fig. 2, p. 460.  
Fig. 3, p. 494.  
Fig. 4, p. 492.  
Fig. 5, p. *ib.*  
Fig. 6, p. 493.

Fig. 7, p. 504.  
Fig. 8, p. 507.  
Fig. 9, p. *ib.*  
Fig. 10, p. 511.  
Fig. 11, p. *ib.*  
Fig. 12, p. 393.

Fig. 13, p. 393.  
Fig. 14, p. 396.  
Fig. 15, p. 402.  
Fig. 16, p. 513.  
Fig. 17, p. 403.

OPTICS.—PLATE VIII.

Fig. 1, p. 517.  
Fig. 2, p. 534.  
Fig. 3, p. 540.  
Fig. 4, p. 545.

Fig. 5, p. 546.  
Fig. 6, p. 549.  
Fig. 7, p. 514.  
Fig. 8, p. 552.

Fig. 9, p. 555.  
Fig. 10, p. 550.  
Fig. 11, p. 539.

OPTICS.—PLATE IX.

Fig. 1, p. 233.	Fig. 8, p. 257.	Fig. 15, p. 260.
Fig. 2, p. <i>ib.</i>	Fig. 9, p. <i>ib.</i>	Fig. 16, p. 262.
Fig. 3, p. 251.	Fig. 10, p. <i>ib.</i>	Fig. 17, p. <i>ib.</i>
Fig. 4, p. 253.	Fig. 11, p. 258.	Fig. 18, p. 264.
Fig. 5, p. 254.	Fig. 12, p. <i>ib.</i>	Fig. 19, p. 265.
Fig. 6, p. 255.	Fig. 13, p. 259.	Fig. 20, p. 266.
Fig. 7, p. 256.	Fig. 14, p. <i>ib.</i>	Fig. 21, p. 267.

OPTICS.—PLATE X.

Fig. 1, p. 563.	Fig. 4, p. 569.	Fig. 7, p. 572.
Fig. 2, p. 565.	Fig. 5, p. 571.	Fig. 8, p. 576.
Fig. 3, p. 568.	Fig. 6, p. 572.	

---

VOL. III.

---

MECHANICS.—PLATE I.

Fig. 1, p. 102.	Fig. 10, p. 124.	Fig. 19, p. 170.
Fig. 2, p. <i>ib.</i>	Fig. 11, p. 125.	Fig. 20, p. 168.
Fig. 3, p. <i>ib.</i>	Fig. 12, p. 130.	Fig. 21, p. 172.
Fig. 4, p. 113, 116.	Fig. 13, p. 135, 138.	Fig. 22, p. 161,
Fig. 5, p. 117.	Fig. 14, p. 154, 156.	169.
Fig. 6, p. 118.	Fig. 15, p. 157.	Fig. 23, p. 140.
Fig. 7, p. 119.	Fig. 16, p. 301.	Fig. 23*, p. 173.
Fig. 8, p. 120.	Fig. 17, p. 159.	Fig. 24, p. <i>ib.</i>
Fig. 9, p. 121.	Fig. 18, p. 303.	

MECHANICS.—PLATE II.

Fig. 1, p. 114.	Fig. 8, p. 163.	Fig. 15, p. 213.
Fig. 2, p. 163.	Fig. 9, p. 174.	Fig. 16, p. 216.
Fig. 3, p. 164.	Fig. 10, p. 175.	Fig. 17, p. 217.
Fig. 4, p. <i>ib.</i>	Fig. 11, p. 194.	Fig. 18, p. <i>ib.</i>
Fig. 5, p. <i>ib.</i>	Fig. 12, p. 197.	Fig. 19, p. <i>ib.</i>
Fig. 6, p. <i>ib.</i>	Fig. 13, p. 199.	Fig. 20, p. 197.
Fig. 7, p. 166.	Fig. 14, p. 203.	

MECHANICS.—PLATE III.

Fig. 1, p. 259.	Fig. 3, p. 263.	Fig. 5, p. 123.
Fig. 2, p. 262.	Fig. 4, p. 284.	Fig. 6, p. 280.



MECHANICS.—PLATE IV.

Fig. 1, p. 166.	Fig. 4, p. 279.	Fig. 7, p. 275.
Fig. 2, p. 261.	Fig. 5, p. 292.	Fig. 8, p. 294.
Fig. 3, p. 284, 298.	Fig. 6, p. 289.	

MECHANICS.—PLATE V.

Fig. 1, p. 314.	Fig. 4, p. 288, 292.	Fig. 7, p. 268.
Fig. 2, p. 261.	Fig. 5, p. 207.	Fig. 8, p. 267.
Fig. 3, p. 280, 296.	Fig. 6, p. 312.	

MECHANICS.—PLATE VI.

Fig. 1, p. 362.	Fig. 6, p. 372.	Fig. 10, p. 377.
Fig. 2, p. 364.	Fig. 7, p. 374.	Fig. 11, p. 378.
Fig. 3, p. 369.	Fig. 8, p. 376.	Fig. 12, p. 380.
Fig. 4, p. 371.	Fig. 9, p. 378.	Fig. 13, p. 381.
Fig. 5, p. <i>ib.</i>		Fig. 14, p. <i>ib.</i>

HYDROSTATICS.—PLATE I.

Fig. 1, p. 392.	Fig. 8, p. 399.	Fig. 14, p. 414.
Fig. 2, p. 391.	Fig. 9, p. 401.	Fig. 15, p. 412.
Fig. 3, p. <i>ib.</i>	Fig. 10, p. <i>ib.</i>	Fig. 16, p. 404.
Fig. 4, p. 394.	Fig. 11, p. 402.	Fig. 17, p. 405.
Fig. 5, p. 402.	Fig. 12, p. <i>ib.</i>	Fig. 18, p. <i>ib.</i>
Fig. 6, p. 397.	Fig. 13, p. 417.	Fig. 19, p. 444.
Fig. 7, p. <i>ib.</i>		

HYDROSTATICS.—PLATE II.

Fig. 1, p. 404.	Fig. 5, p. 390.	Fig. 8, p. 503.
Fig. 2, p. 418.	Fig. 6, p. 477.	Fig. 9, p. 507.
Fig. 3, p. 428.	Fig. 7, p. 503.	Fig. 10, p. 512.
Fig. 4, p. <i>ib.</i>		

HYDROSTATICS.—PLATE III.

Fig. 1, p. 494.	Fig. 4, p. 502.	Fig. 7, p. 502.
Fig. 2, p. 498.	Fig. 5, p. <i>ib.</i>	Fig. 8, p. 503.
Fig. 3, p. 500.	Fig. 6, p. <i>ib.</i>	Fig. 9, p. 507.

VOL. III. AND IV.

ASTRONOMY.—PLATE I. VOL. IV.

Fig. 1, p. 5.

ASTRONOMY.—PLATE II. VOL. IV.

Fig. 1, p. 47.	Fig. 3, p. 53.	Fig. 4, p. 61.
Fig. 2, p. <i>ib.</i>		

ASTRONOMY.—PLATE III. VOL. III. and IV.

- |                            |                           |                            |
|----------------------------|---------------------------|----------------------------|
| Fig. 1, p. 554,<br>vol. 3. | Fig. 3, p. 9,<br>vol. 4.  | Fig. 5, p. 529,<br>vol. 3. |
| Fig. 2, p. 555,<br>vol. 3. | Fig. 4, p. 10,<br>vol. 4. |                            |

ASTRONOMY.—PLATE IV. VOL. IV.

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| Fig. 1, p. 58.  | Fig. 3, p. 146. | Fig. 5, p. 152, |
| Fig. 2, p. 145. | Fig. 4, p. 151. | vol. 4.         |

ASTRONOMY.—PLATE V. VOL. IV.

- |                |                |
|----------------|----------------|
| Fig. 1, p. 68. | Fig. 2, p. 66. |
|----------------|----------------|

ASTRONOMY.—PLATE VI. VOL. IV.

- |                |                |                |
|----------------|----------------|----------------|
| Fig. 1, p. 70. | Fig. 2, p. 78. | Fig. 3, p. 88. |
|----------------|----------------|----------------|

ASTRONOMY.—PLATE VII. VOL. IV.

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| Fig. 1, p. 89.  | Fig. 3, p. 129. | Fig. 4, p. 132. |
| Fig. 2, p. 134. |                 |                 |

ASTRONOMY.—PLATE VIII. VOL. IV.

- |                 |                 |                       |
|-----------------|-----------------|-----------------------|
| Fig. 1, p. 86.  | Fig. 4, p. 101. | Fig. 6, p. 107.       |
| Fig. 2, p. 87.  | Fig. 5, p. 107. | Fig. 7, p. <i>ib.</i> |
| Fig. 3, p. 100. |                 |                       |

ASTRONOMY.—PLATE IX. VOL. IV.

- |                 |                 |                |
|-----------------|-----------------|----------------|
| Fig. 1, p. 103. | Fig. 2, p. 103. | Fig. 3, p. 97. |
|-----------------|-----------------|----------------|

ASTRONOMY.—PLATE X. VOL. IV.

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| Fig. 1, p. 108. | Fig. 2, p. 110. | Fig. 3, p. 116. |
|-----------------|-----------------|-----------------|

ASTRONOMY.—PLATE XI. VOL. IV.

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| Fig. 1, p. 156. | Fig. 2, p. 164. | Fig. 3, p. 164. |
|-----------------|-----------------|-----------------|

ASTRONOMY.—PLATE XII. VOL. IV.

- |                 |                 |
|-----------------|-----------------|
| Fig. 1, p. 170. | Fig. 2, p. 179. |
|-----------------|-----------------|

ASTRONOMY.—PLATE XIII. VOL. III. and IV.

- |                            |                            |                            |
|----------------------------|----------------------------|----------------------------|
| Fig. 1, p. 550,<br>vol. 3. | Fig. 3, p. 192,<br>vol. 4. | Fig. 4, p. 190,<br>vol. 4. |
| Fig. 2, p. 187,<br>vol. 4. |                            |                            |



ASTRONOMY.—PLATE XIV. VOL. III. and IV.

Fig. 1, p. 533, vol. 3.	Fig. 2, p. 209, vol. 4.	Fig. 3, p. 533, vol. 3.
----------------------------	----------------------------	----------------------------

ASTRONOMY.—PLATE XV. VOL. IV.

Fig. 1, p. 138.	Fig. 8, p. 290.	Fig. 14, p. 293.
Fig. 2, p. 139.	Fig. 9, p. 291.	Fig. 15, p. <i>ib.</i>
Fig. 3, p. 263.	Fig. 10, p. <i>ib.</i>	Fig. 16, p. 294.
Fig. 4, p. 265.	Fig. 11, p. <i>ib.</i>	Fig. 17, p. <i>ib.</i>
Fig. 5, p. 273.	Fig. 12, p. 292.	Fig. 18, p. <i>ib.</i>
Fig. 6, p. 285.	Fig. 13, p. <i>ib.</i>	Fig. 19, p. 295.
Fig. 7, p. 289.		

ELECTRICITY.—PLATE I. VOL. IV.

Fig. 1, p. 308.	Fig. 8, p. 342.	Fig. 14, p. 360.
Fig. 2, p. 309.	Fig. 9, p. <i>ib.</i>	Fig. 15, p. 362,
Fig. 3, p. 310.	Fig. 10, p. 351.	367.
Fig. 4, p. 309.	Fig. 11, p. 352.	Fig. 16, p. 364.
Fig. 5, p. 311, 313.	Fig. 12, p. 353.	Fig. 17, p. 344.
Fig. 6, p. 322.	Fig. 13, p. 358.	Fig. 18, p. 363.
Fig. 7, p. 320.		

ELECTRICITY AND MAGNETISM.—PLATE II. VOL. IV.

Fig. 1, p. 326.	Fig. 7, p. 442.	Fig. 13, p. 448,
Fig. 2, p. 335.	Fig. 8, p. 443.	Fig. 14, p. 455.
Fig. 3, p. 382.	Fig. 9, p. 444.	Fig. 15, p. 449.
Fig. 4, p. 336.	Fig. 10, p. <i>ib.</i>	Fig. 16, p. 439.
Fig. 5, p. 338.	Fig. 11, p. 445.	Fig. 17, p. 466.
Fig. 6, p. 337.	Fig. 12, p. 446, 463.	

## ERRATA.

### VOL. I.

Page 2, line 7, *for has read have.* P. 25, l. 18, *for mere dream read a mere dream.* P. 47, l. 1, *for applied read is applied.* P. 203, l. 4, *for On read Of.* P. 220, last line, *for ventricals read ventricles.* P. 241, l. 4, *from the bottom, after receiver insert see plate 2, fig. 15 and 16.* P. 245, l. 13, *in the note, for admits read admit.* P. 254, l. 14, *for fig. 14 read fig. 11.* P. 275, l. 26, *for constitute read constitutes.* P. 319, l. 21, *for plate 4, fig. 5, read plate 5, fig. 4.* P. 383, l. 32, *for 23 read 23\*.* P. 494, l. 23, *for 12 read 14.* P. 496, l. 11, *for tube read tub; l. 18, before fig. b, read plate 6.*

### VOL. II.

Page 13, lines 5 and 6, *after of read the.* P. 23, l. 34, *for copiosissimus read copiosissimos; l. 36, for vapore read vapores.* P. 61, l. 1, *for leads read lead.* P. 75, l. 10, *for piston read friction.* P. 95, l. 23, *for consider as read consider his discourse as.* P. 98, l. 25, *after 567 insert vol. 1.* P. 100, last line, *for wire read chain.* P. 101, l. 4, *for dimentionis read dimensions.* P. 142, first line, *dele is.* P. 151, first line of note, *after ABC read plate 3, fig. 13.* P. 187, first line, *for fig. 15 read fig. 15\*.* P. 199, l. 5, *after outermost read tube.* P. 215, l. 16, *for F read T.* P. 254, l. 3, *from the bottom, for 5 read 4; last line, for O read K.* P. 256, l. 29, *for perceptive read perspective.* P. 257, l. 16, *after 6 read fig. 8.* P. 265, l. 13, *for effects read surprizing effects.* P. 266, l. 5, *for fig. 19 read fig. 20.* P. 493, l. 8, *for plate 6 read plate 7.* P. 499, l. 17, *for plate 6, fig. 16, read plate 7, fig. 1.* P. 513, l. 18, *for fig. 11 read fig. 16.* P. 563, l. 5, *for plate 9 read plate 10.* P. 564, l. 13, *for elevated read dovetail.* P. 569, l. 28, *for fig. 5, read fig. 4.* P. 572, l. 6, *for packed read pushed.* P. 576, l. 26, *for fig. 7, read fig. 8.*

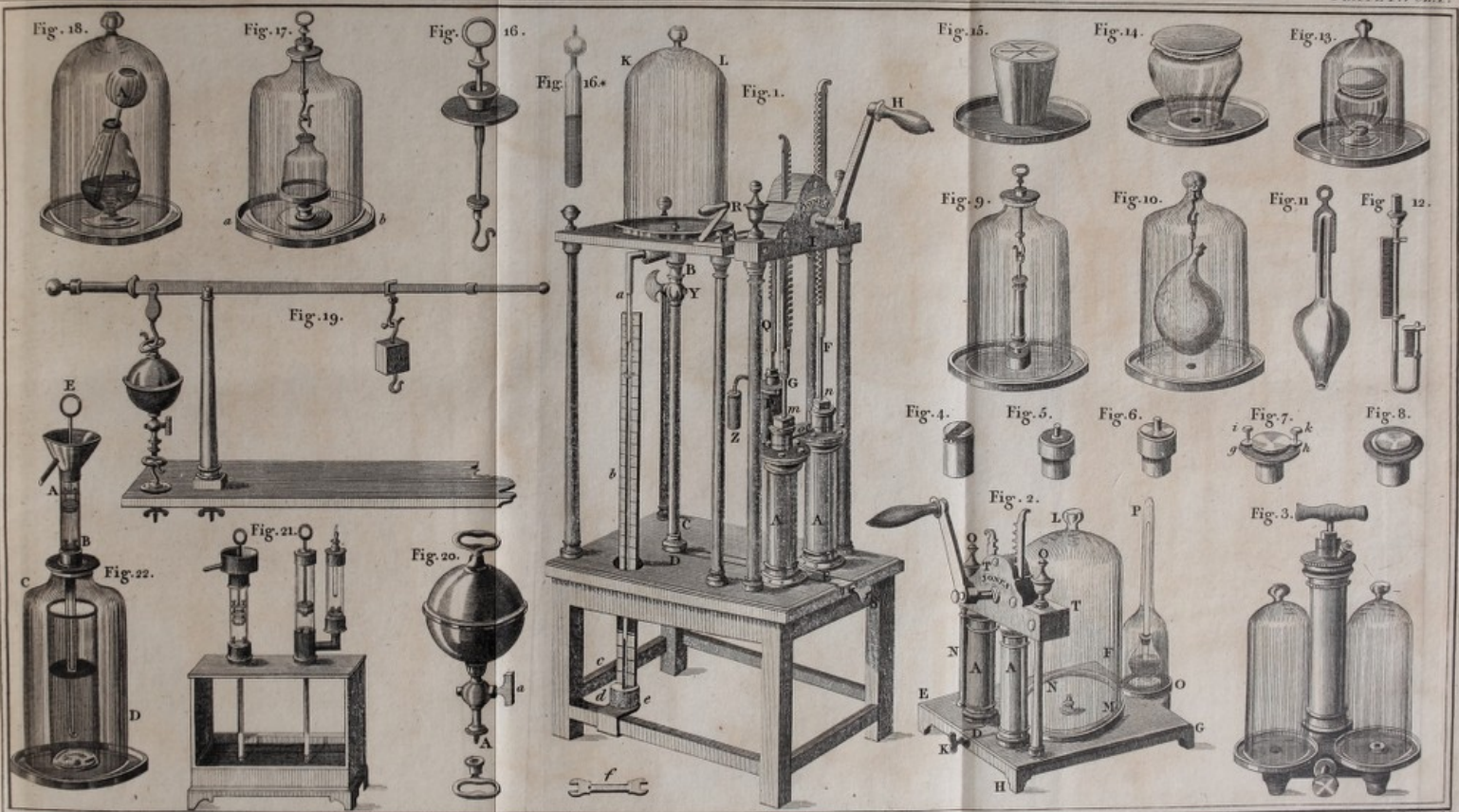
### VOL. III.

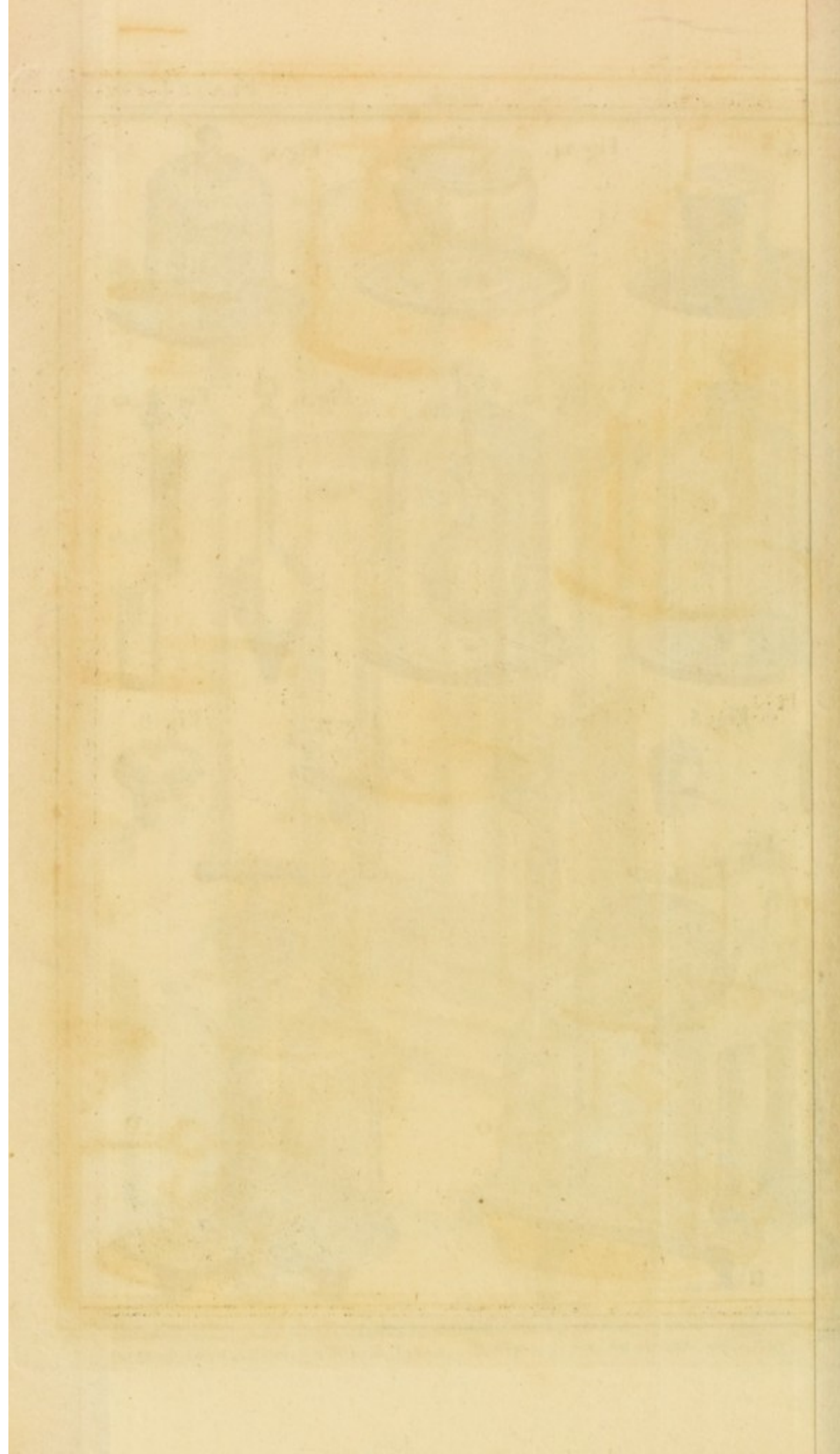
Page 91, line 21, *for prove read proves.* P. 337, l. 9, *for his head turning read his head to a wheel turning.* P. 444, l. 4, *from bottom, for plate 2 read plate 1.* P. 511, l. 14, *after suppose read plate 3, fig. 9.*

### VOL. IV.

Page 14, line 11, *for it read he.* P. 24, l. 12, *for where read were.* P. 34, l. 2 and 3, note, *for the planes of their orbits read the planes of the orbits of the two old satellites; l. 5, for the old read other.* P. 58, l. 13, *for G read C.* P. 61, l. 31, *for L read T.* P. 88, l. 31, *for AE read AS; l. 32, for EA read SA.* P. 126, l. 9, *for these read those; l. 15, for impious profane read impious and profane.* P. 134, l. 30, *for T read Tg.* P. 136, first line, *for. Y read r.* P. 143, first line, *for LXII. read XLII.* P. 180, l. 2, *for P Q read D Q.* P. 230, l. 21, *for 38 million of miles read 18,717, 442,526 miles.*

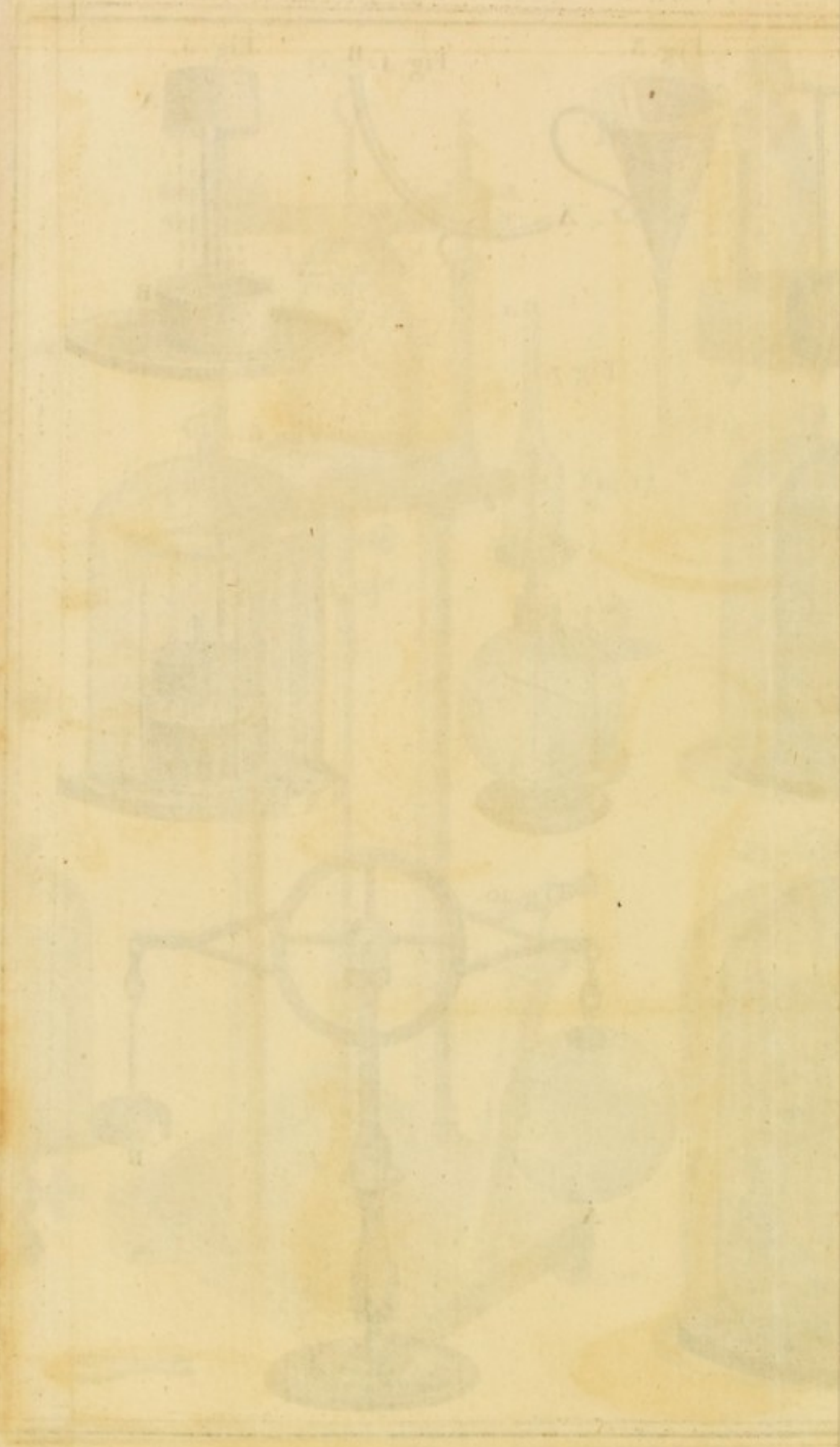






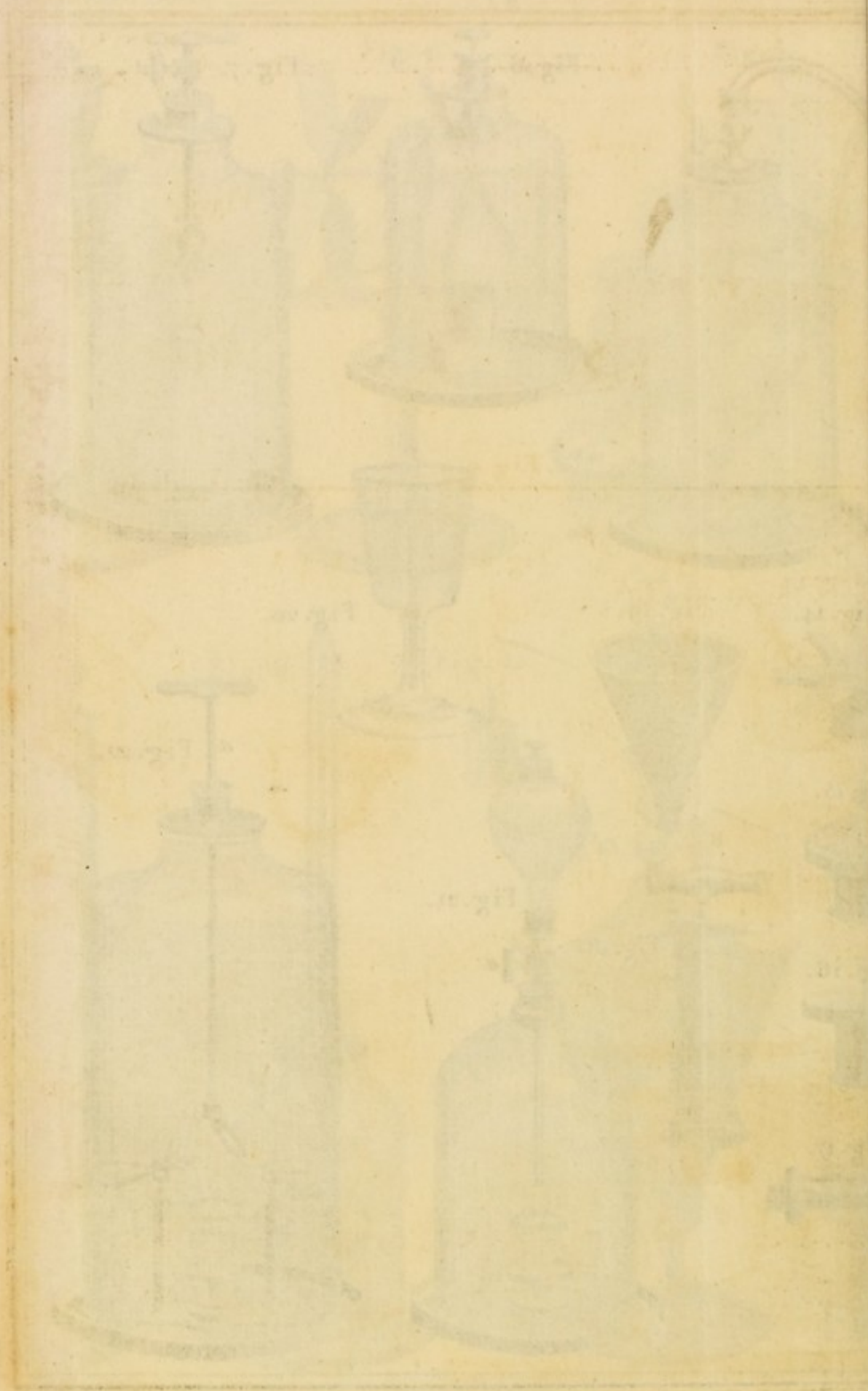




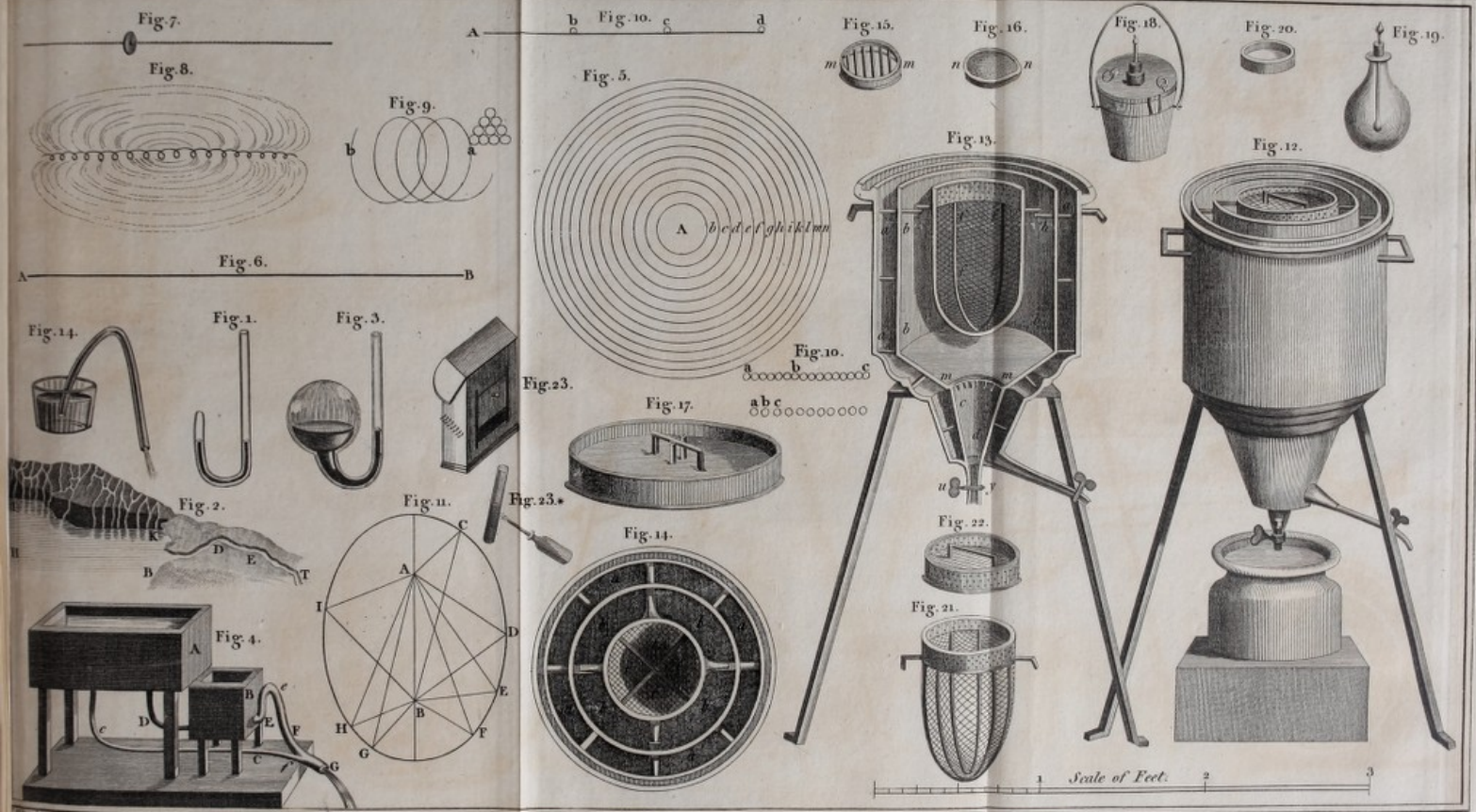


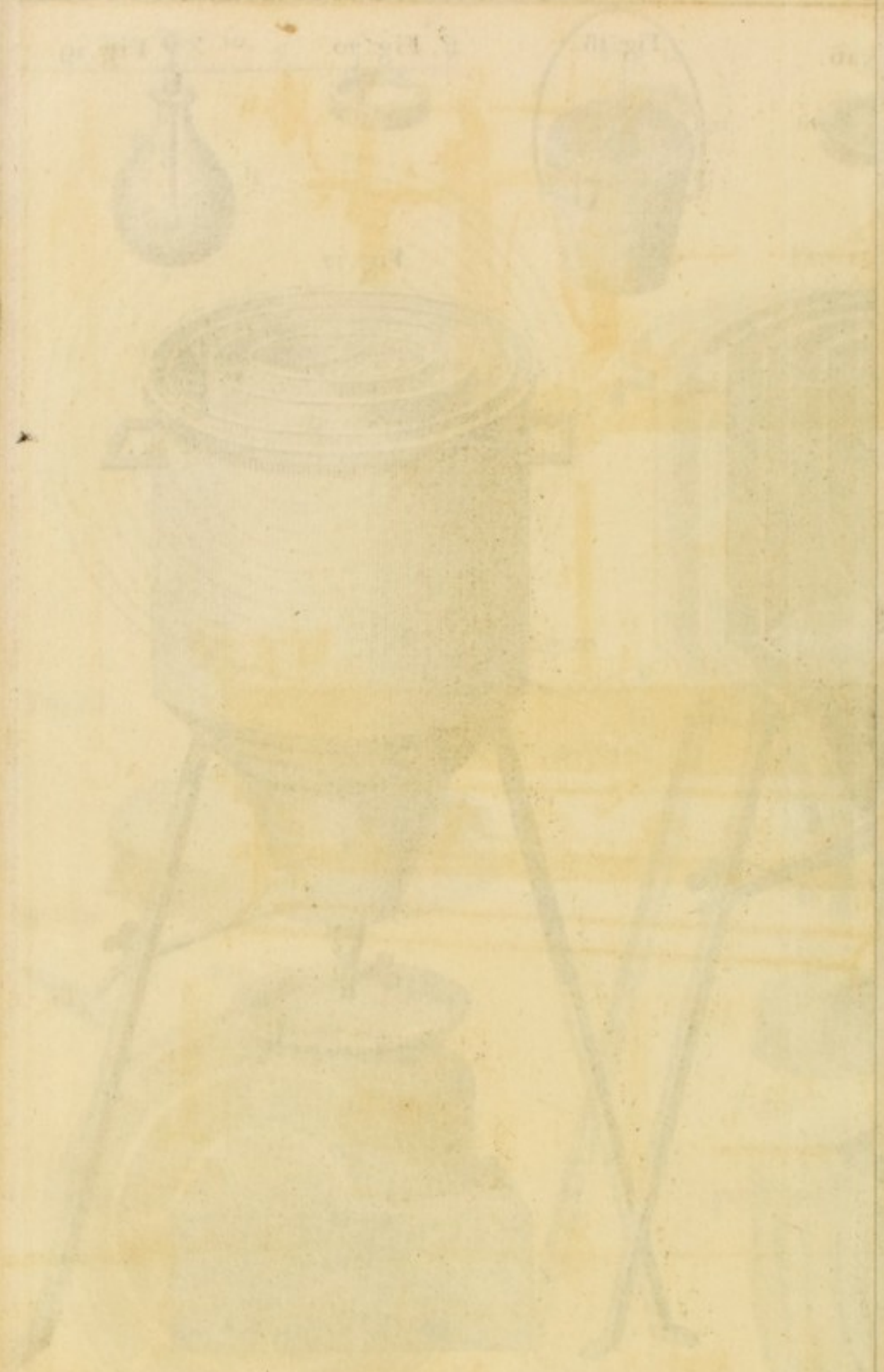




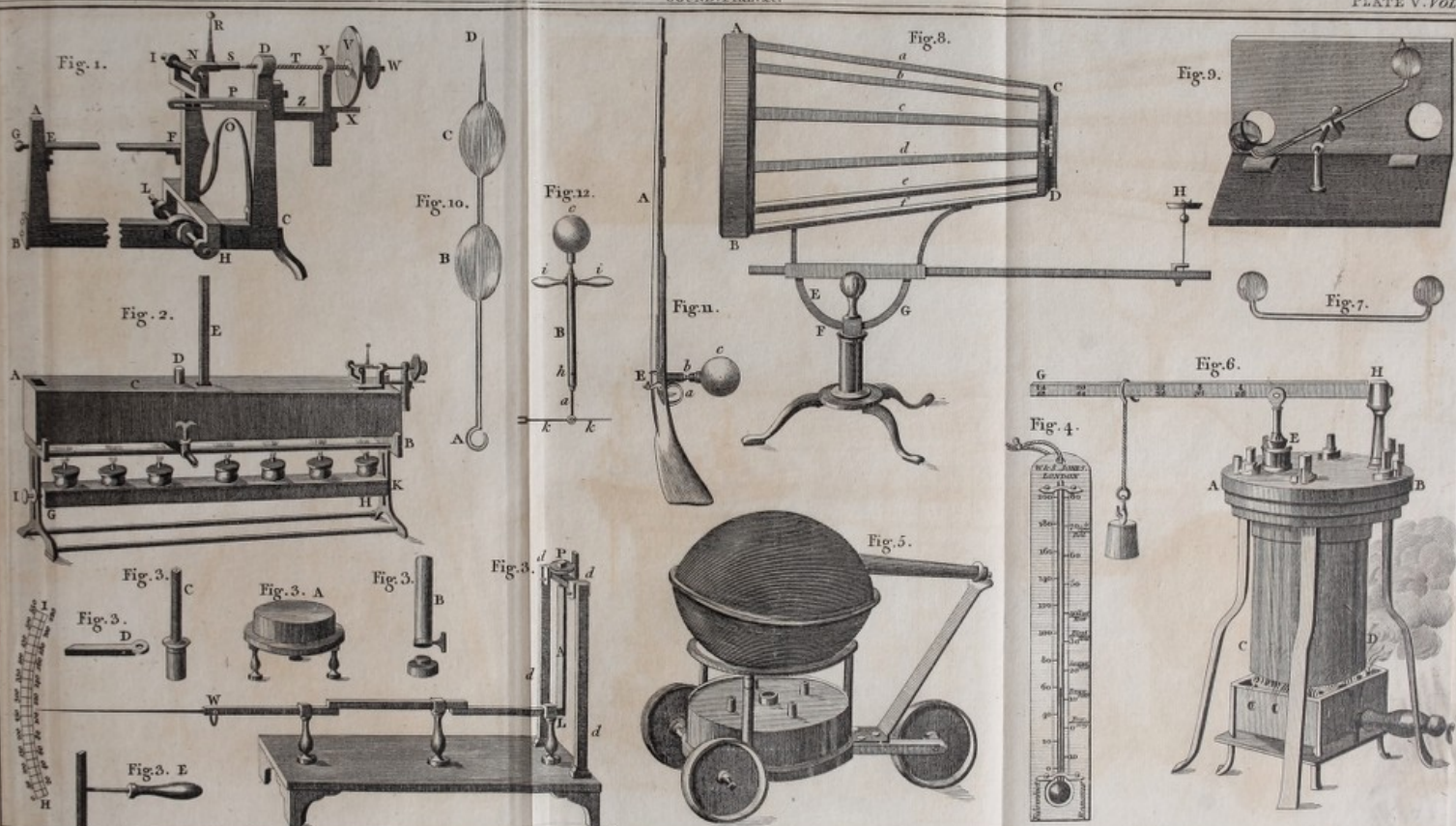


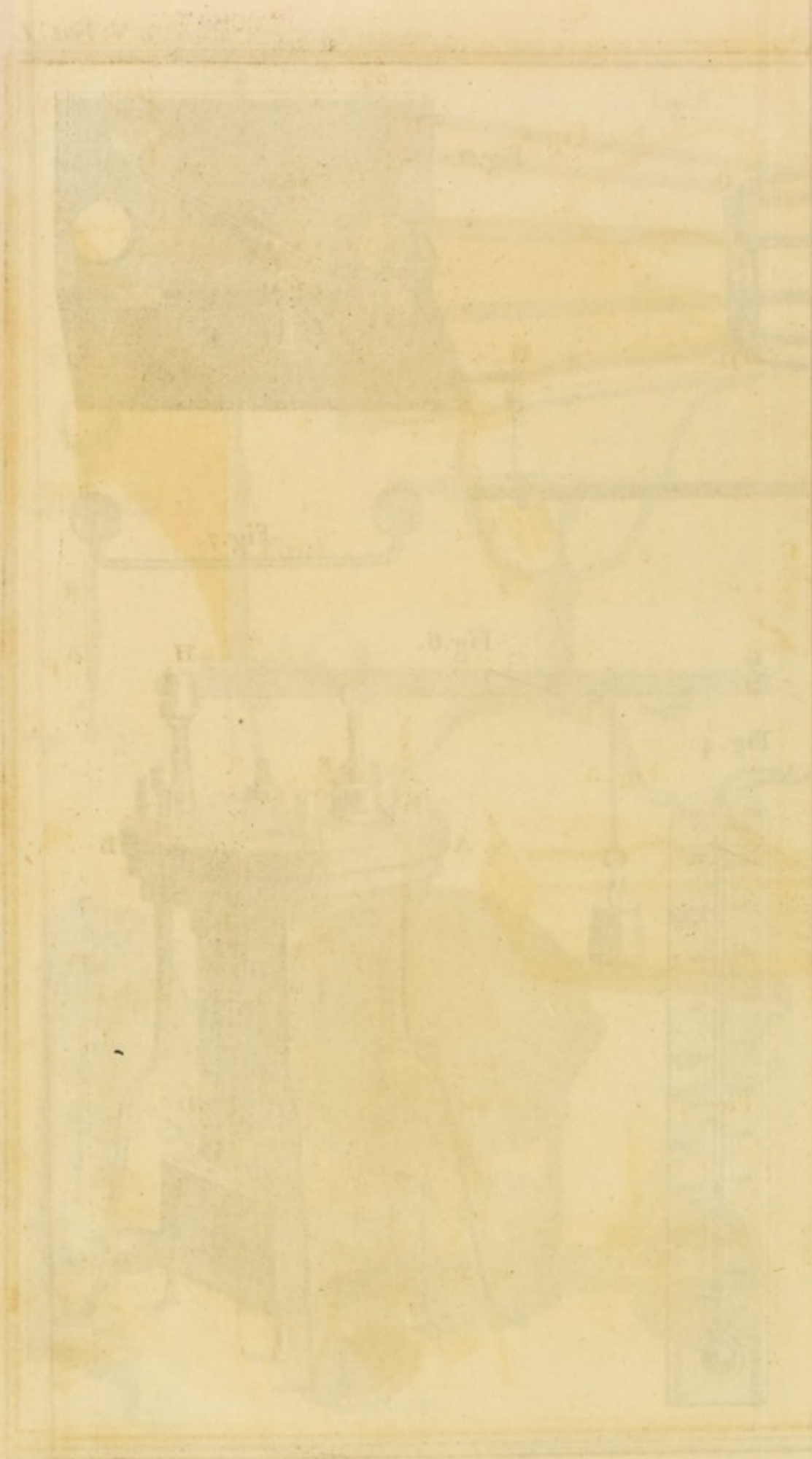




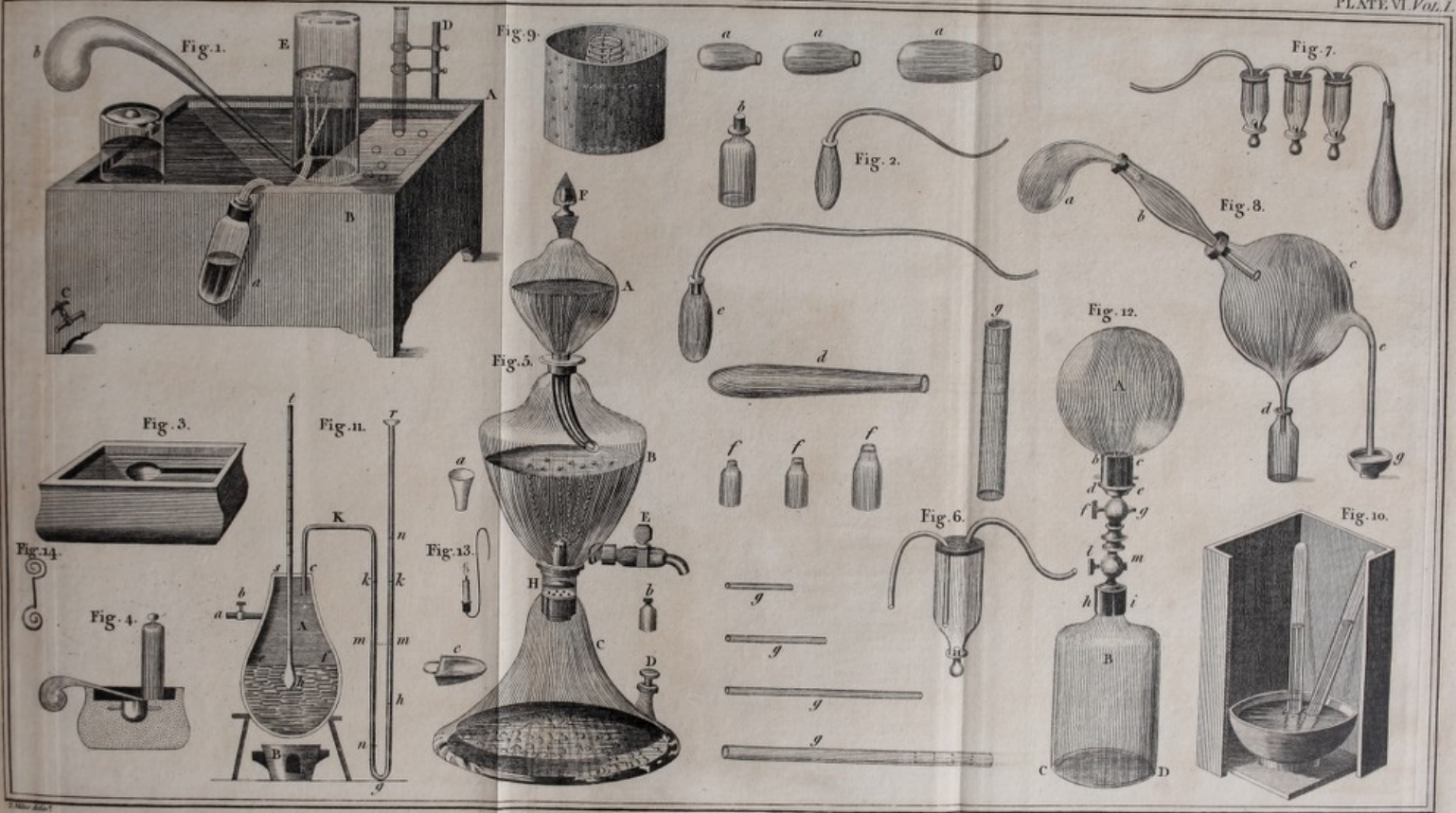


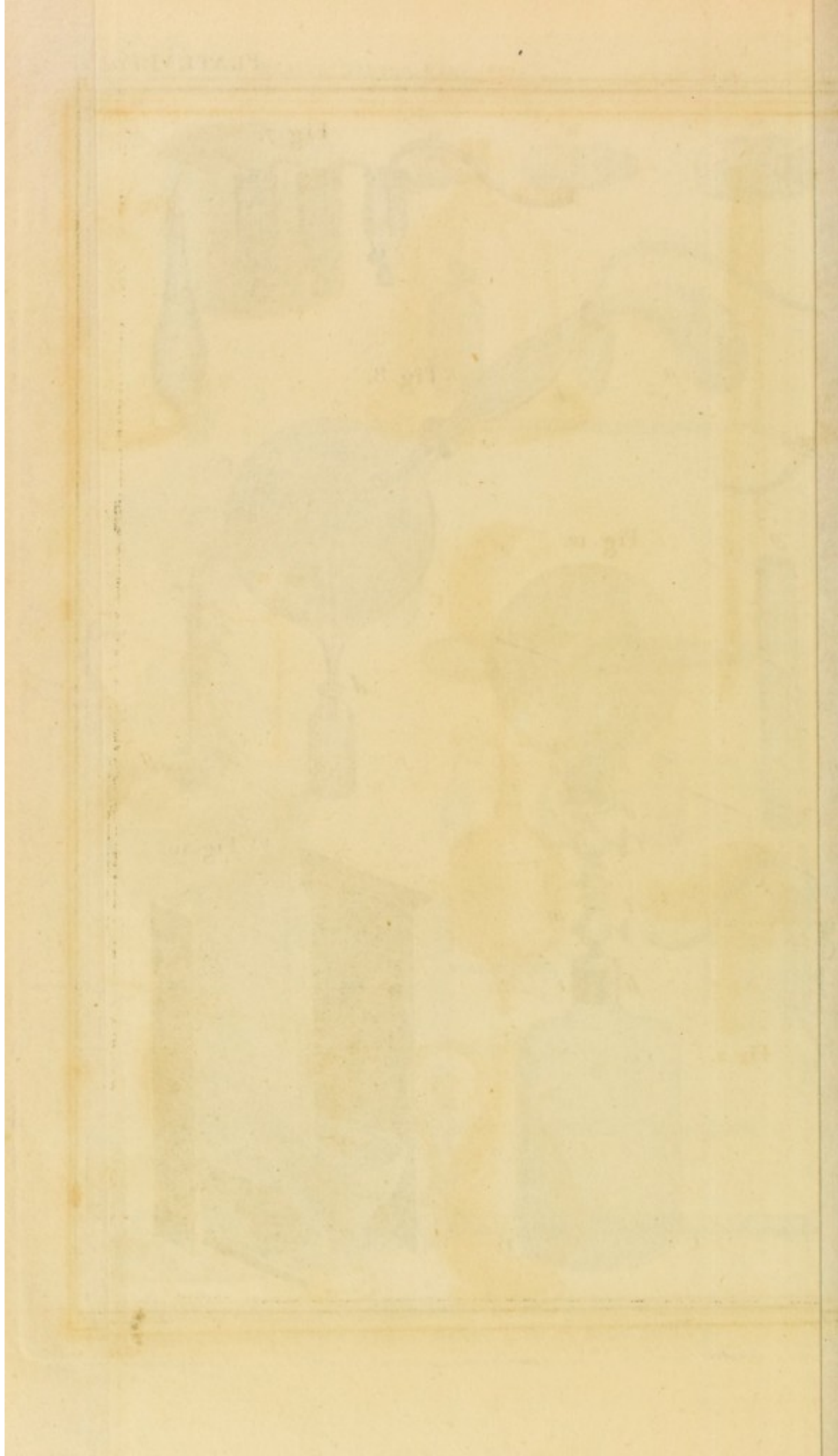




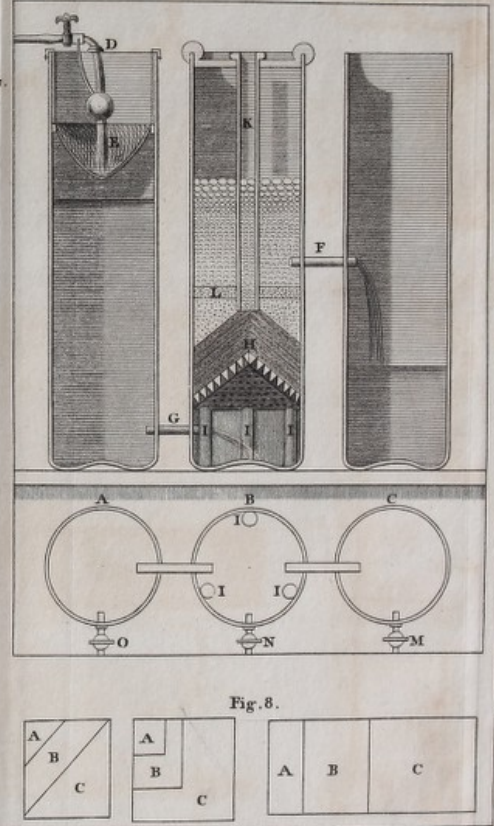






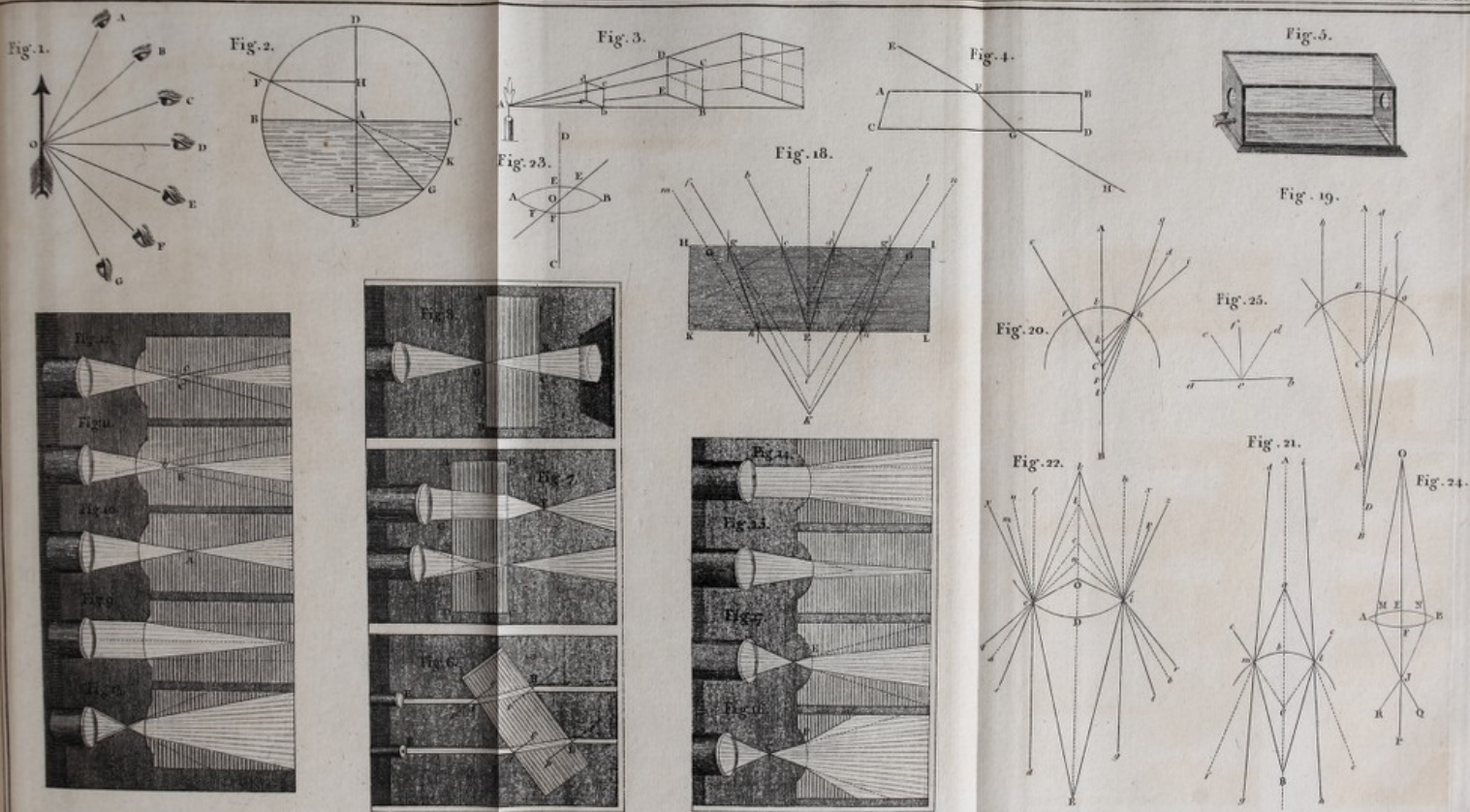


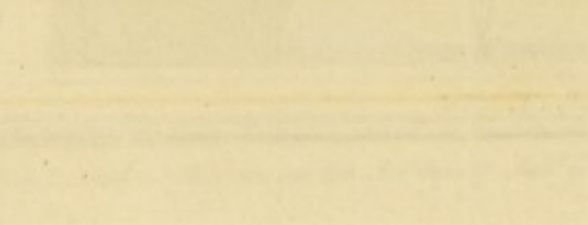
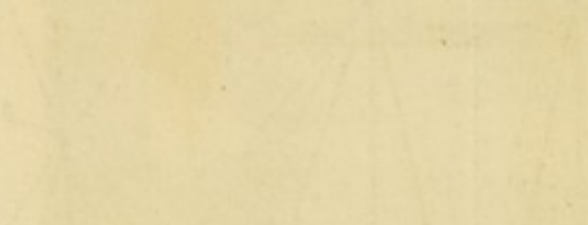
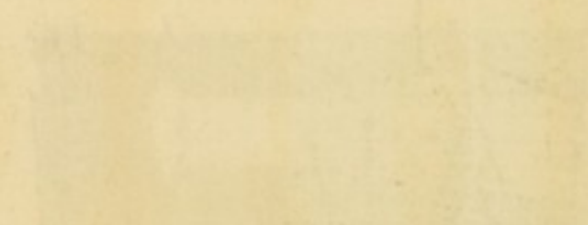
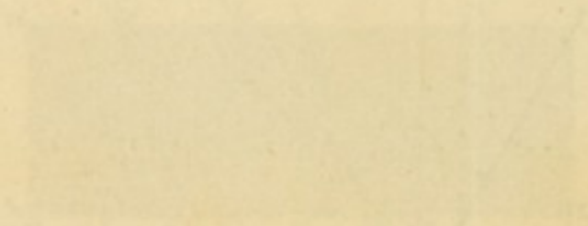
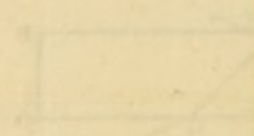
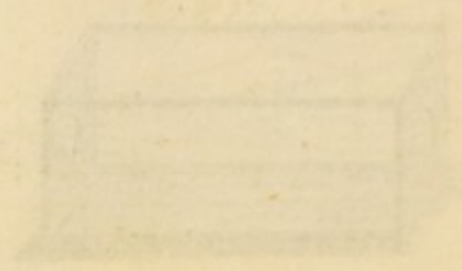




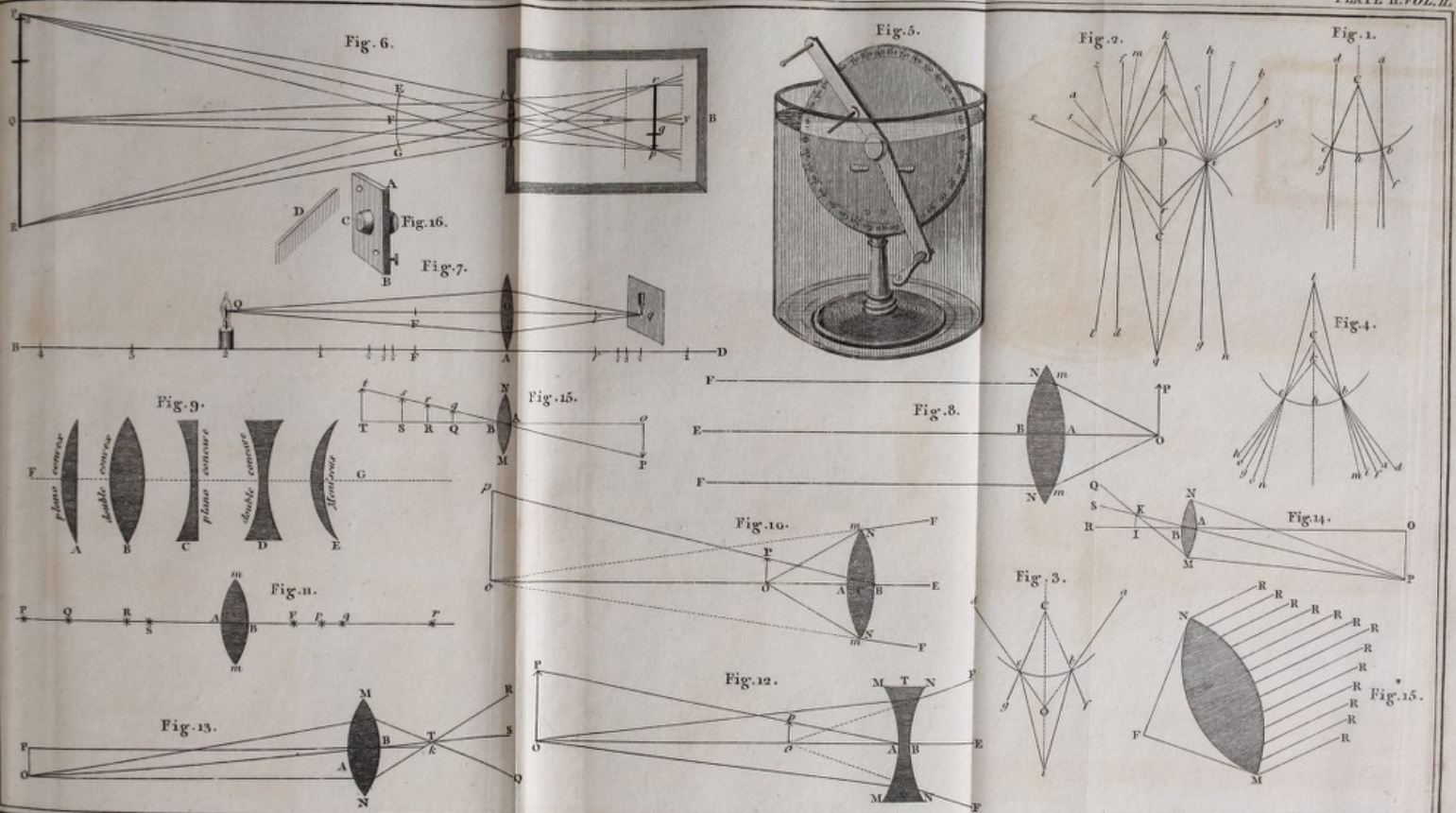












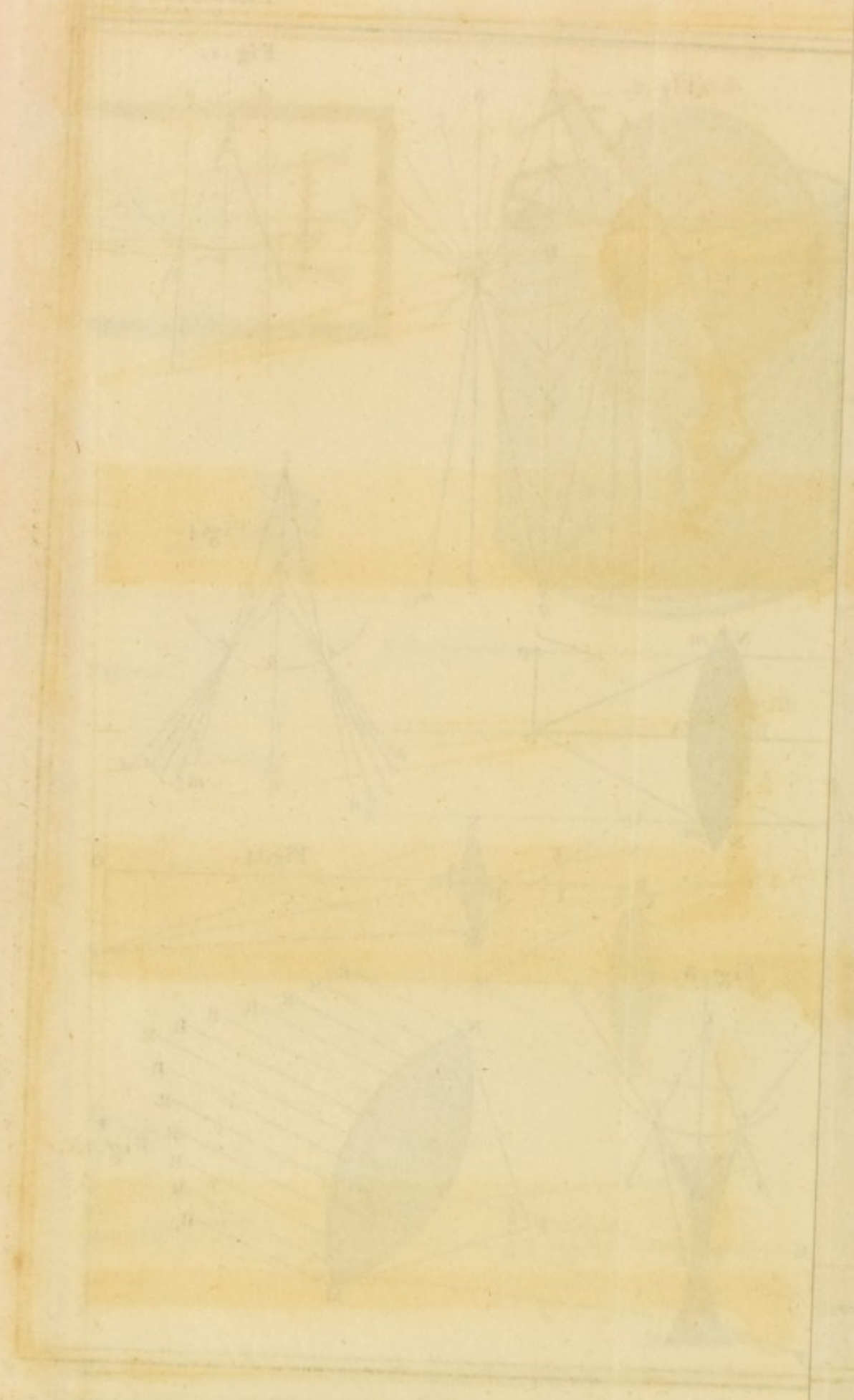




Fig. 10.

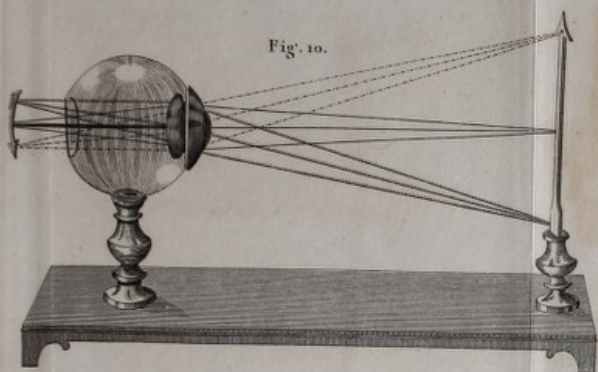


Fig. 11.

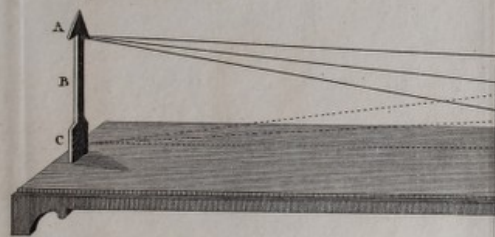


Fig. 12.

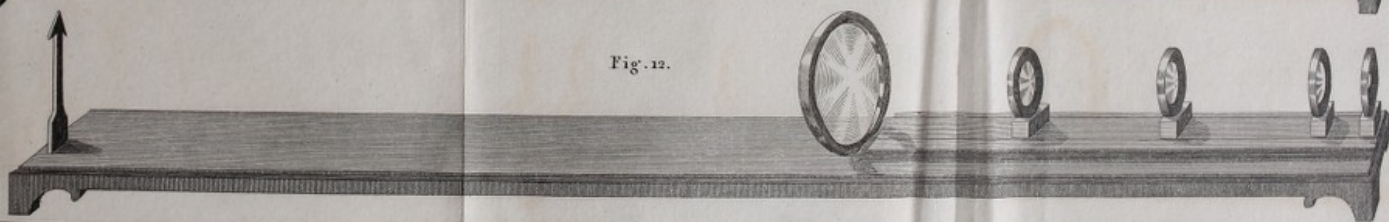


Fig. 9.

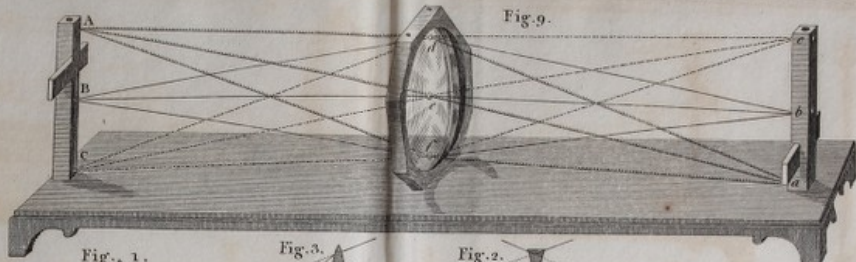


Fig. 1.

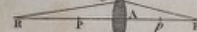


Fig. 1.

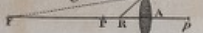


Fig. 3.

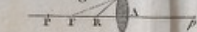


Fig. 3.



Fig. 4.



Fig. 2.

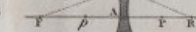


Fig. 5.

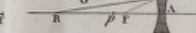


Fig. 6.



Fig. 7.

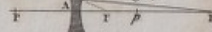
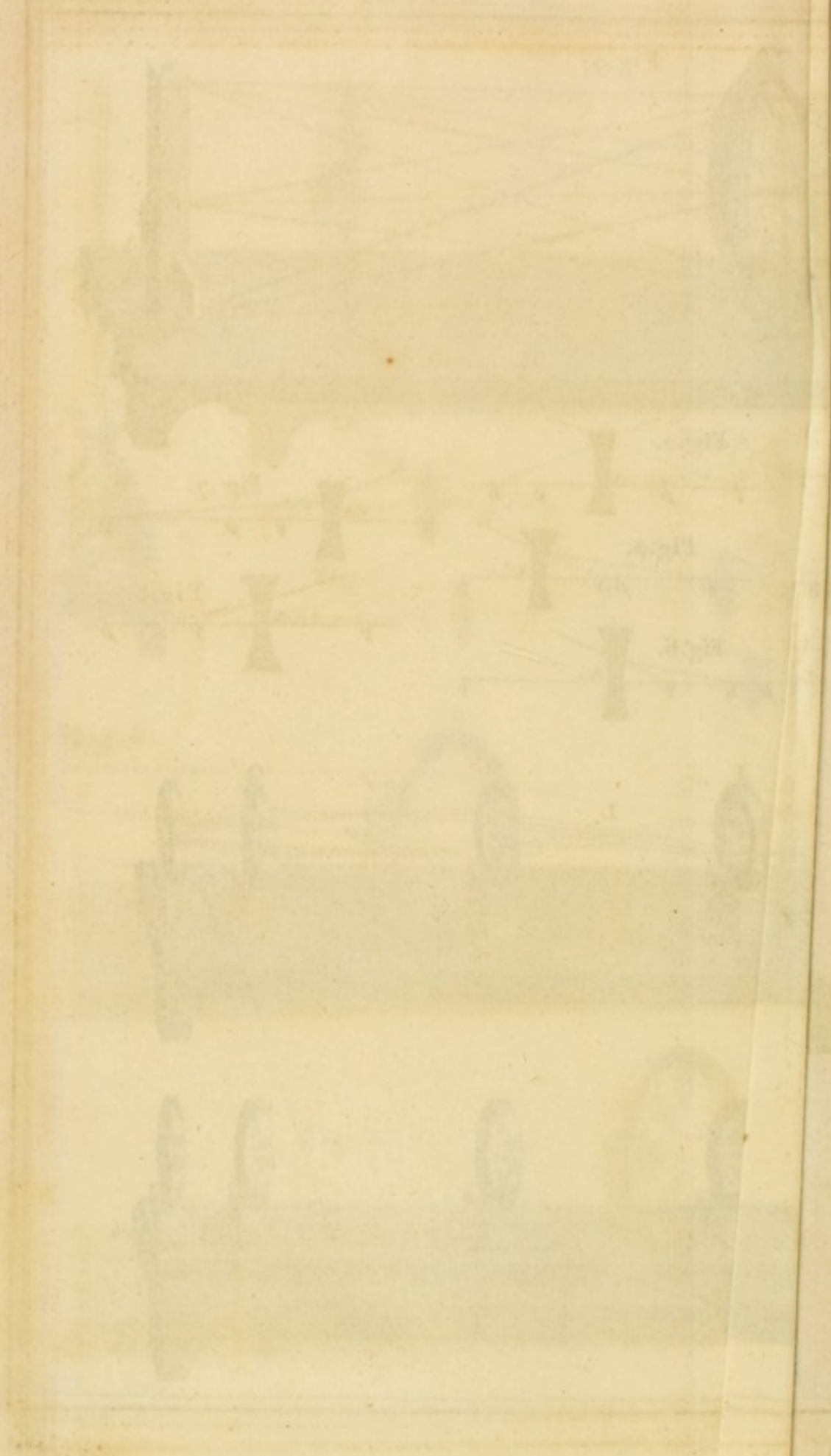
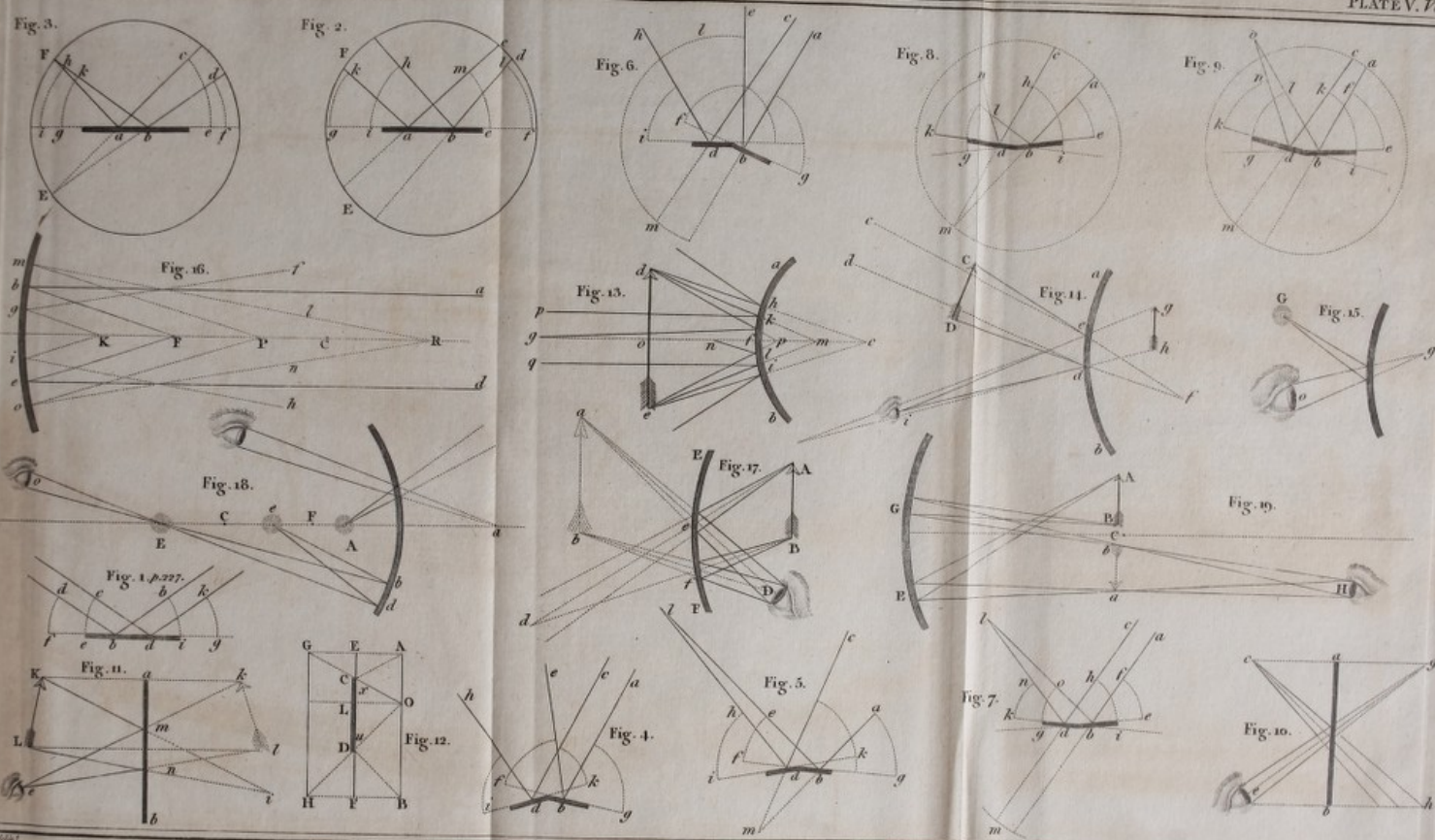


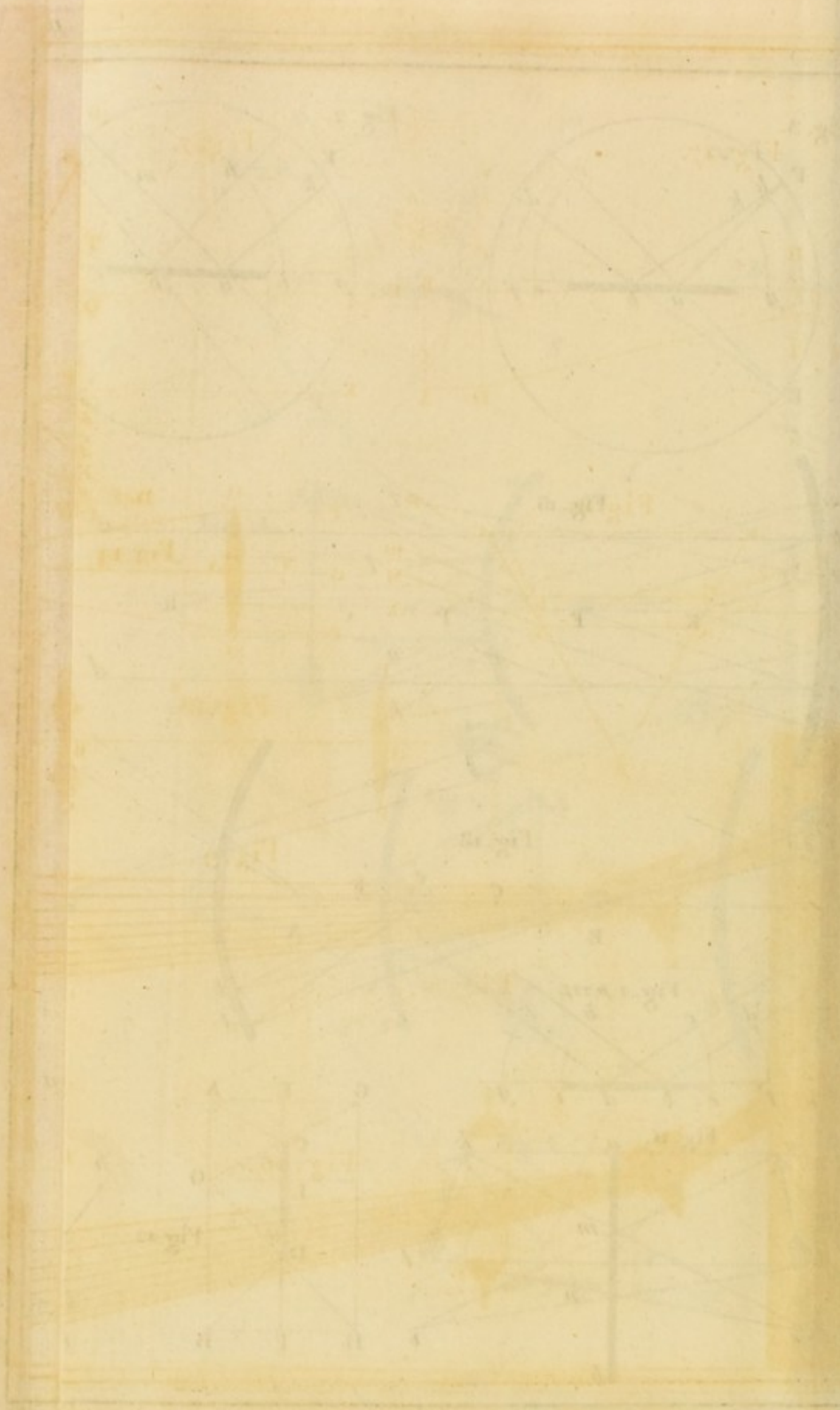
Fig. 8.



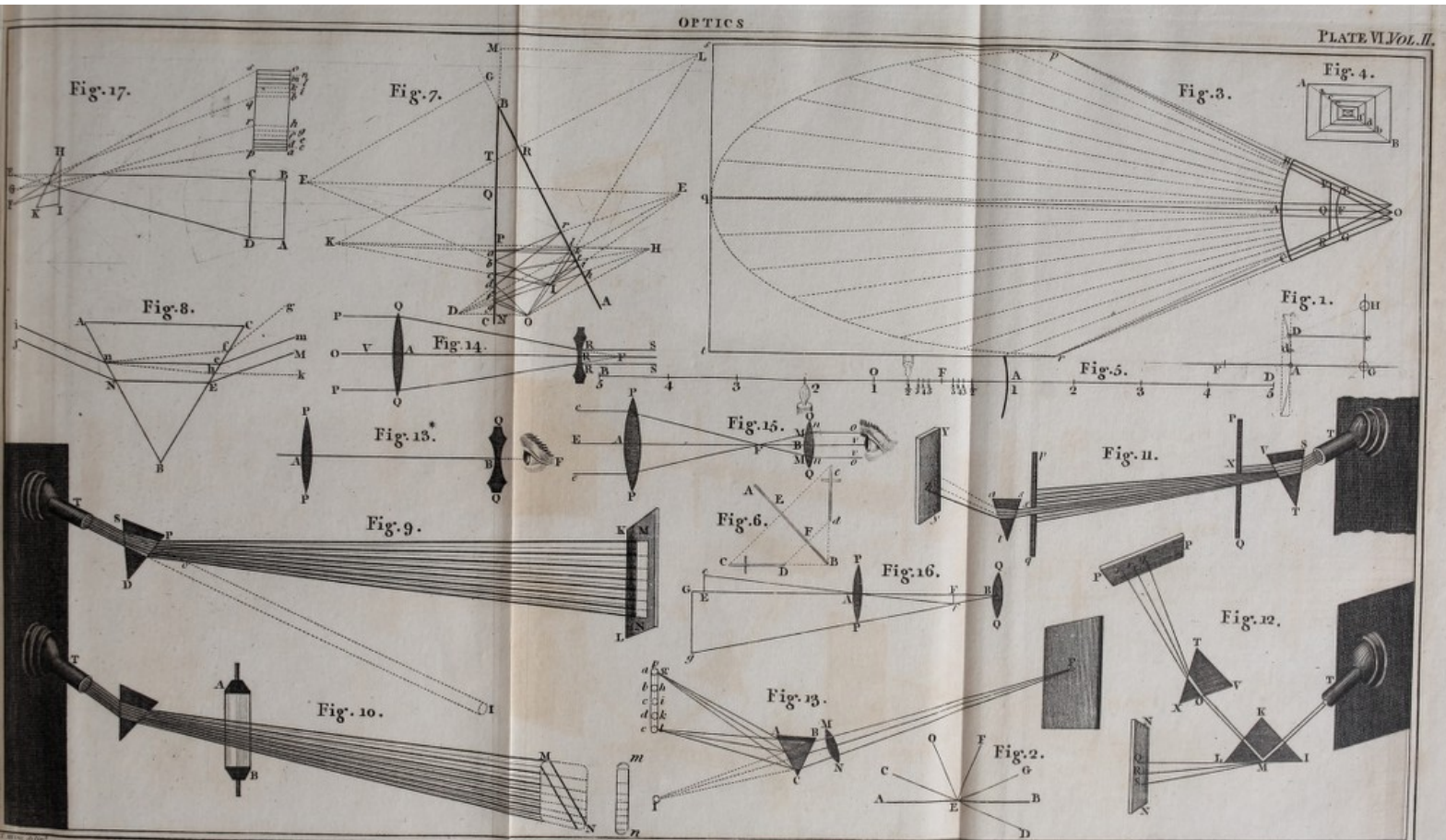


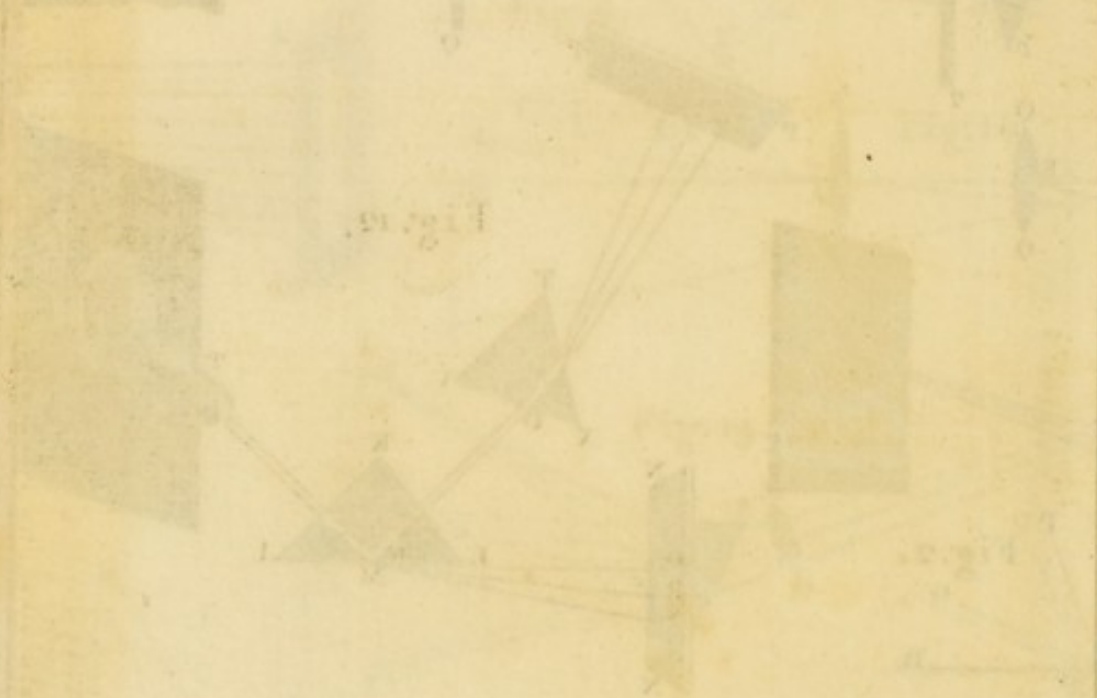
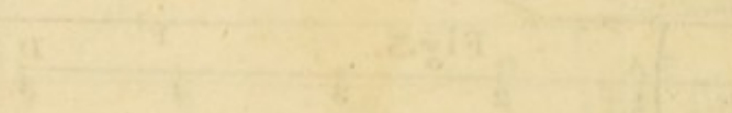
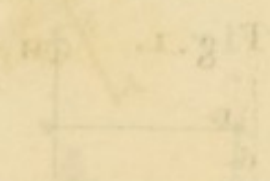
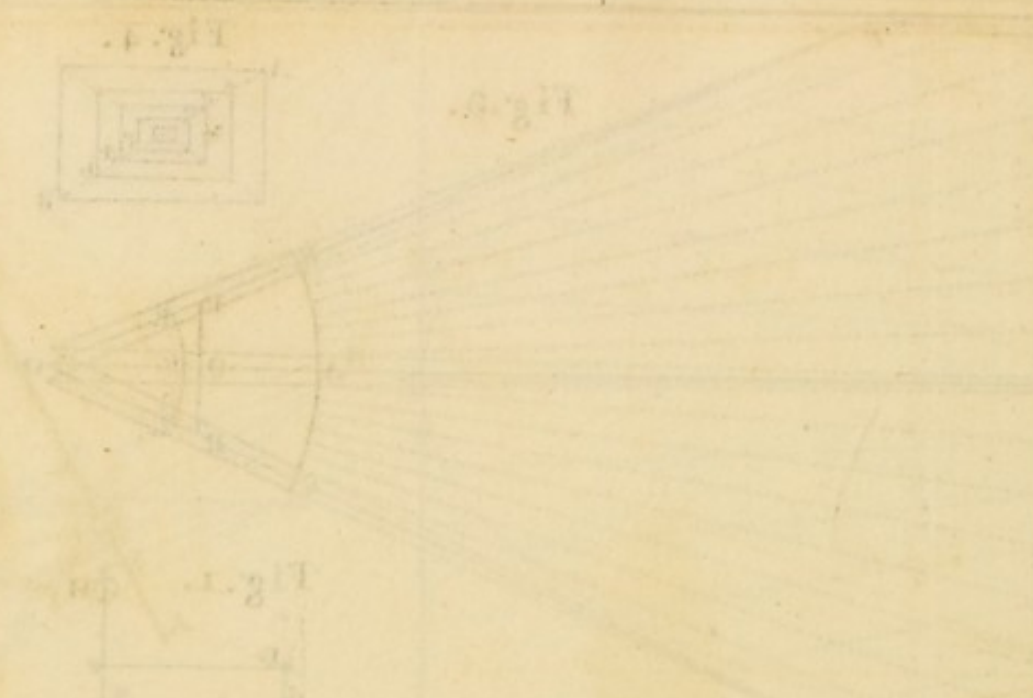




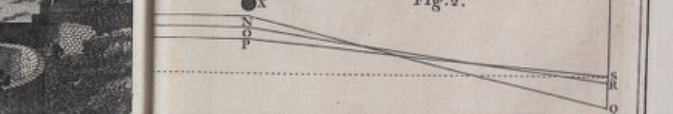
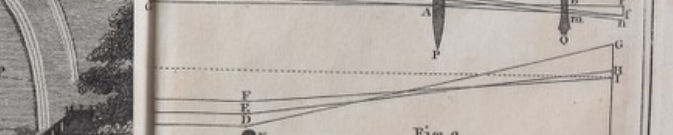
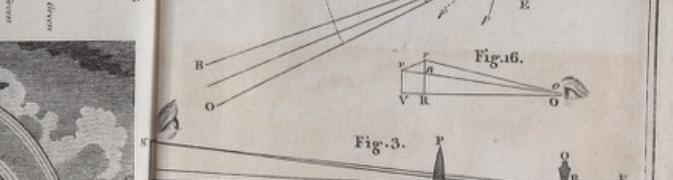
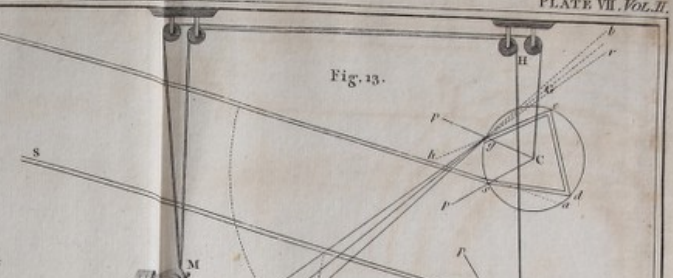
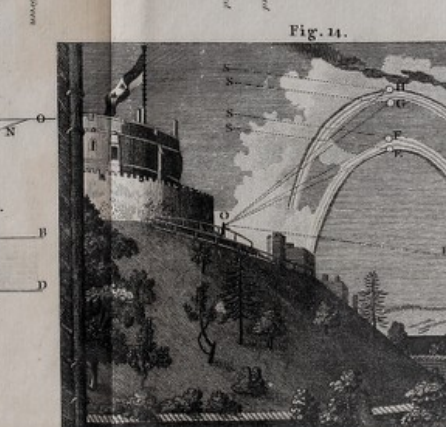
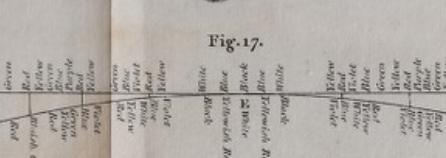
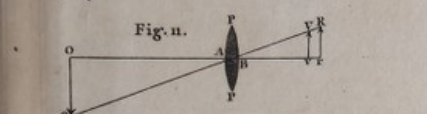
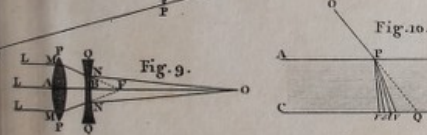
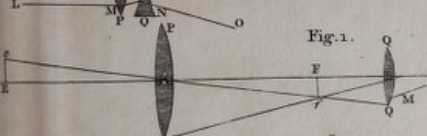
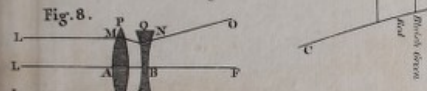
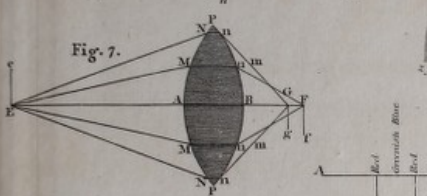
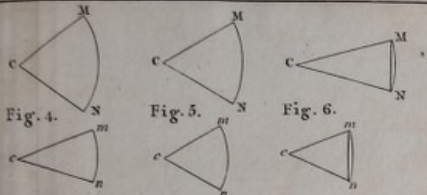


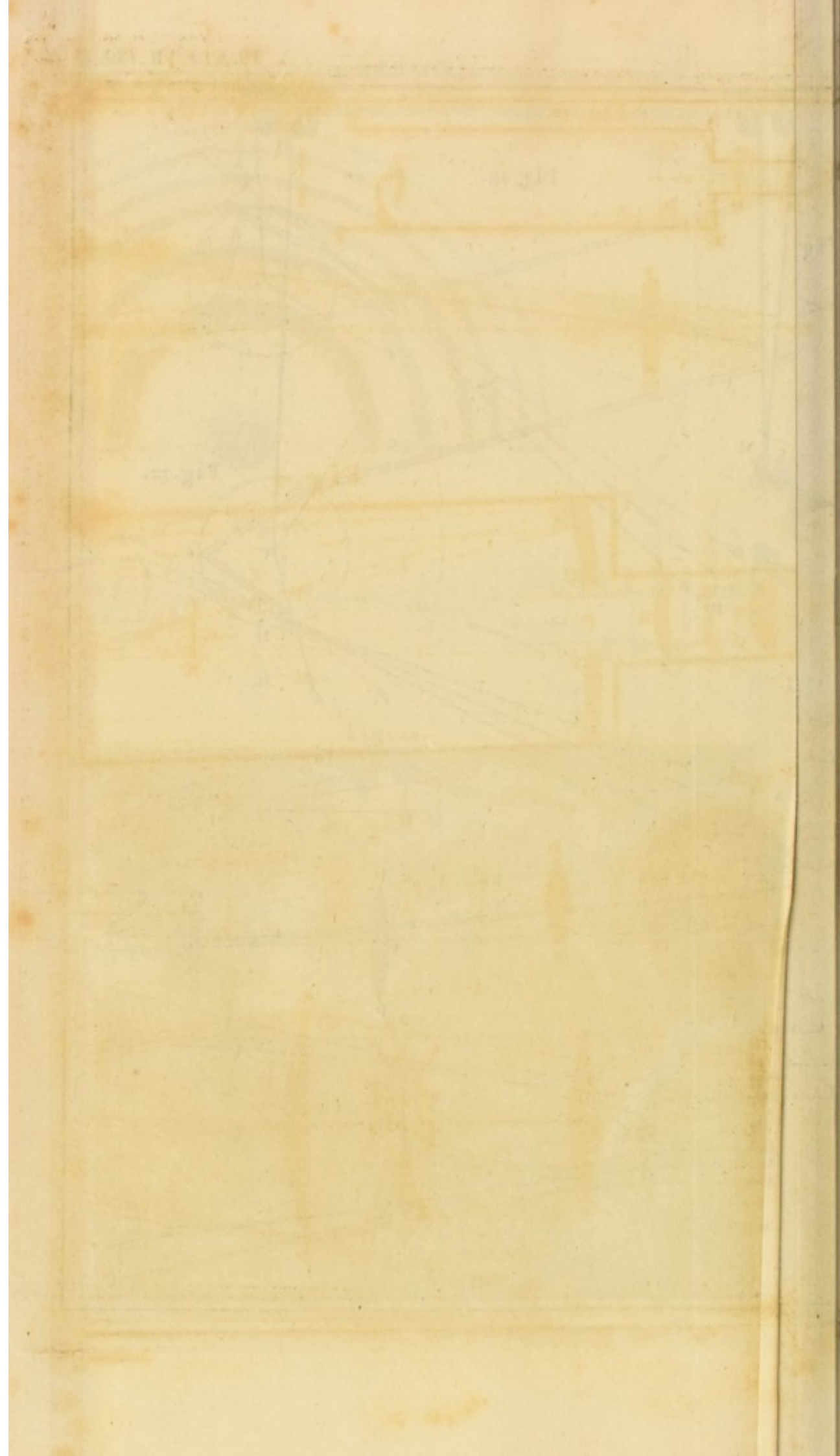




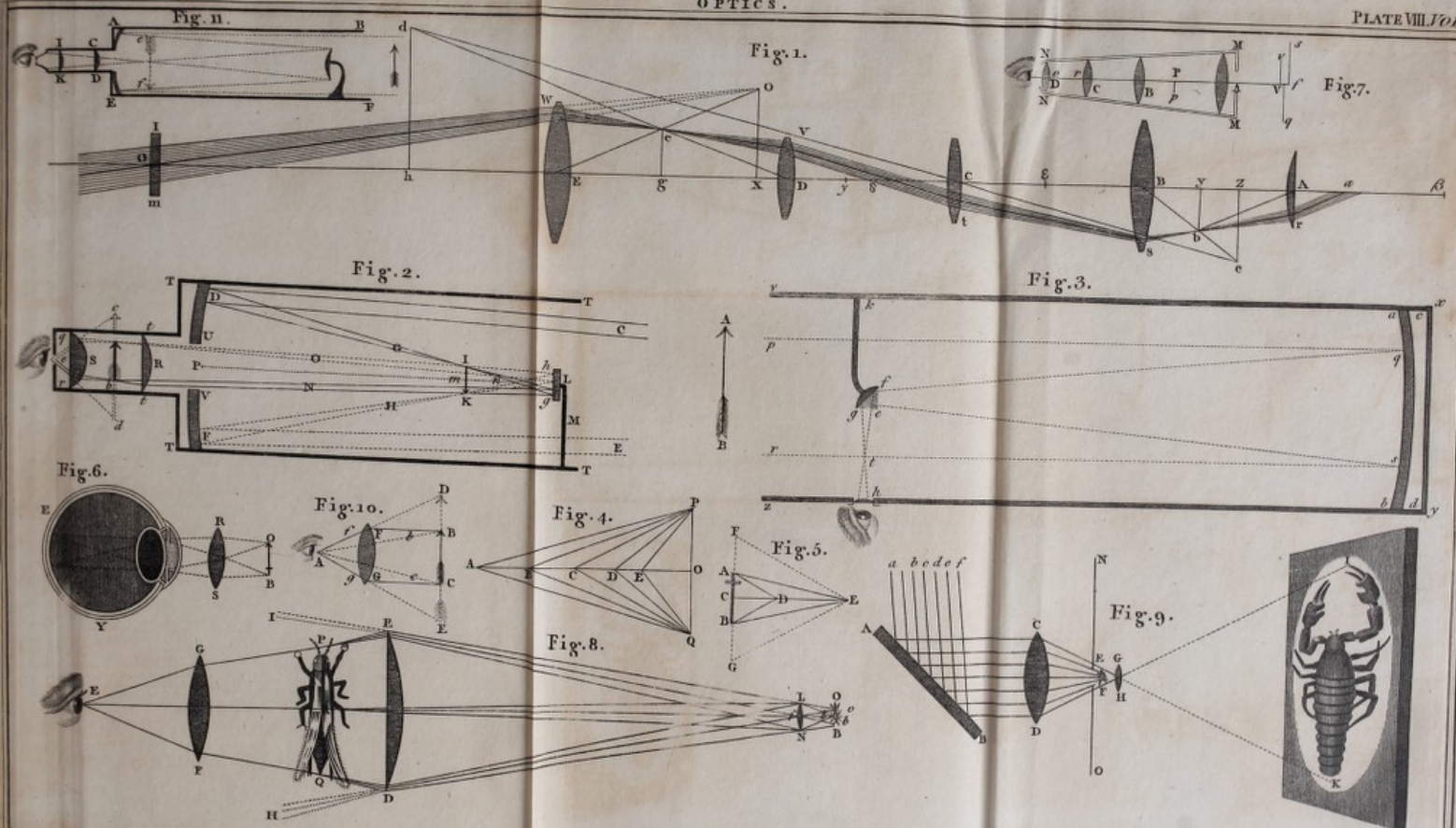






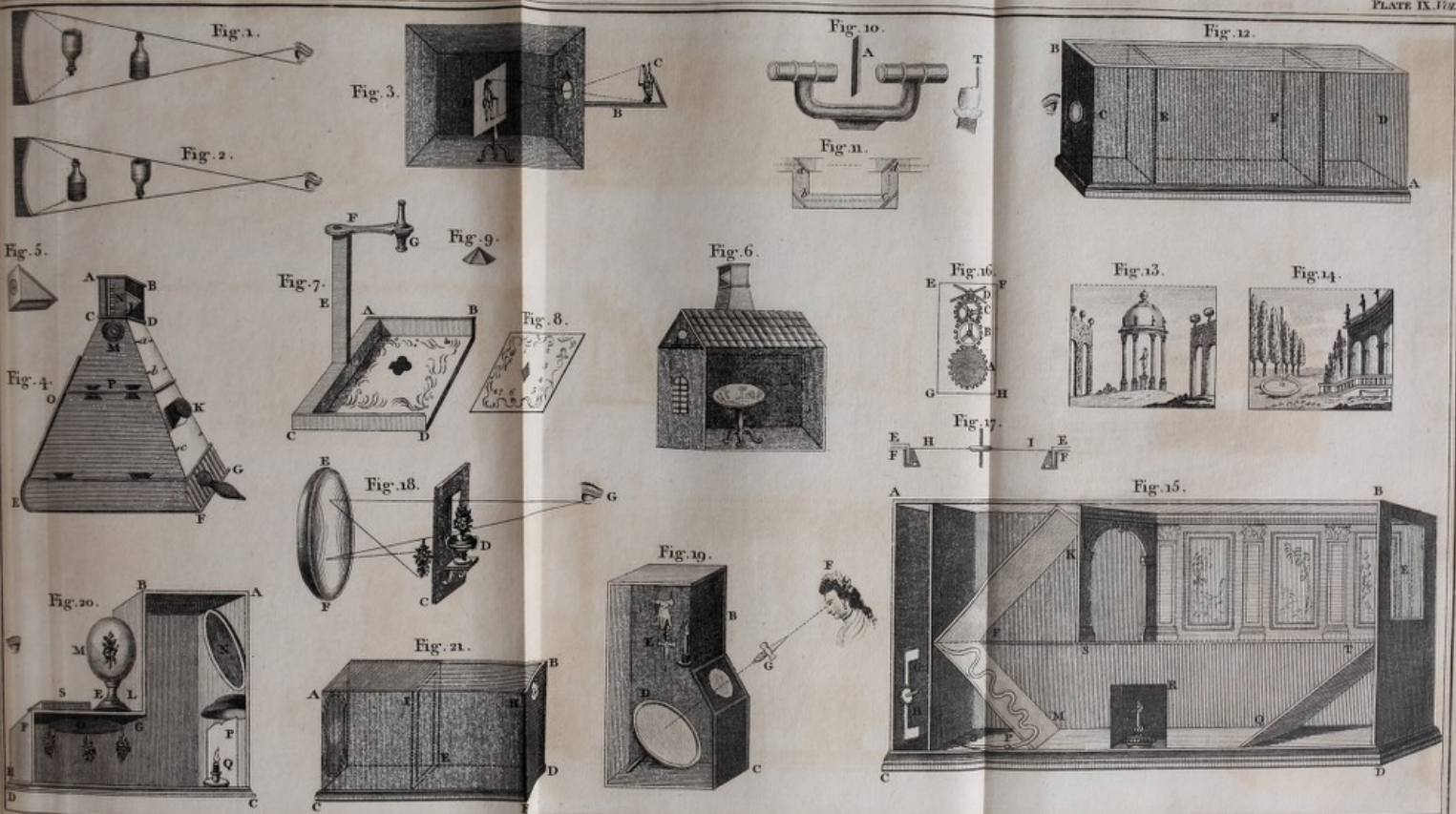


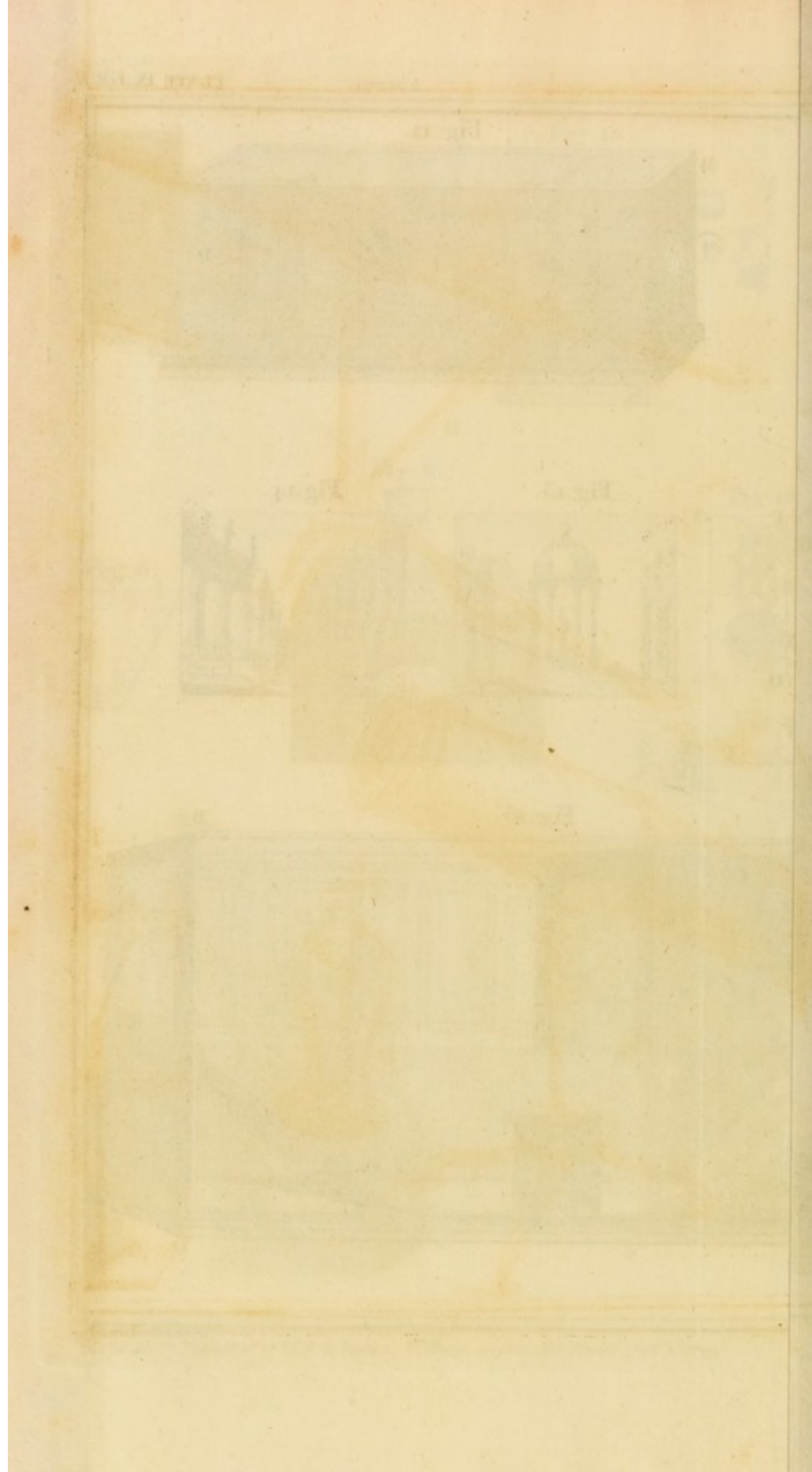




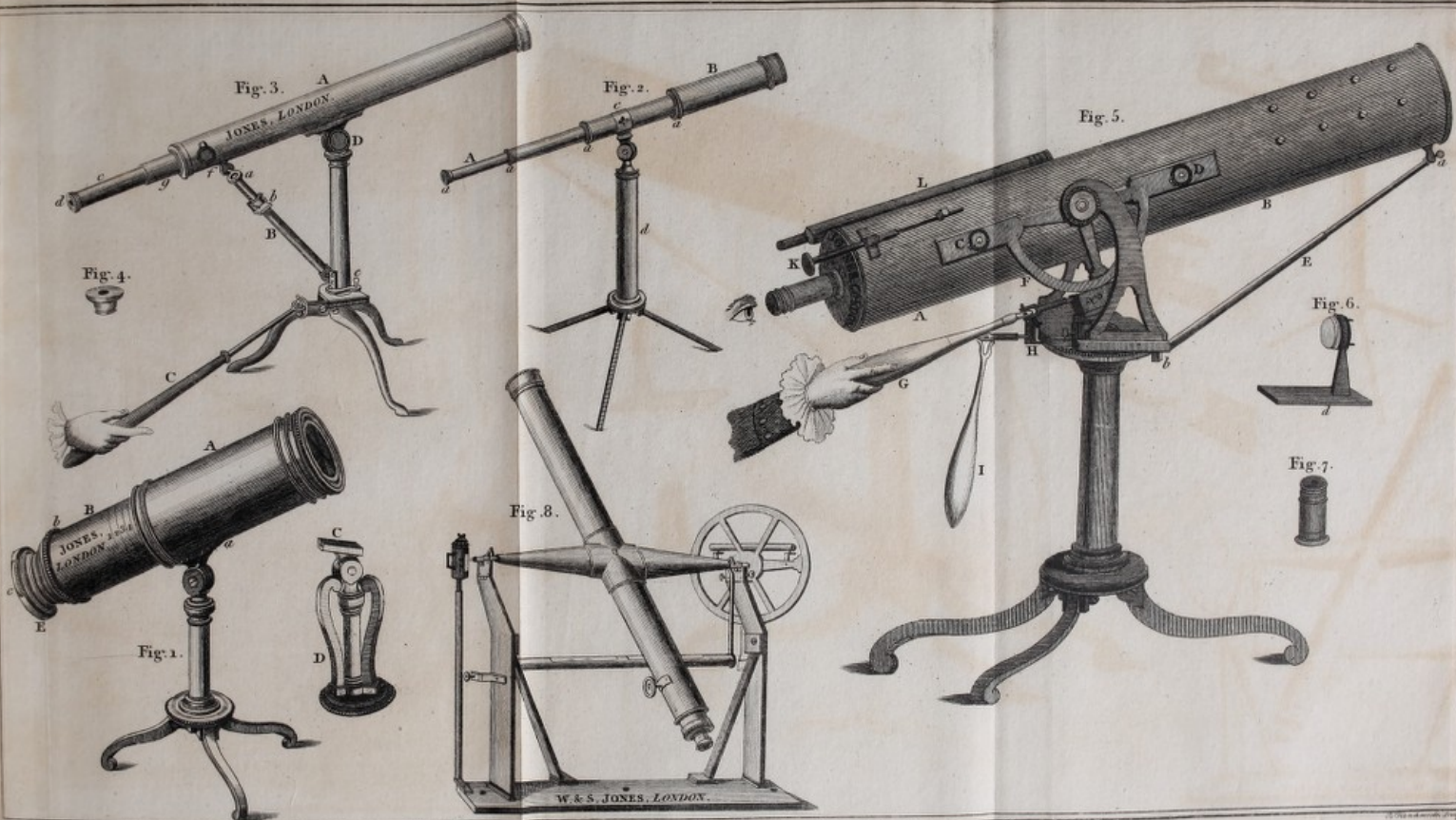






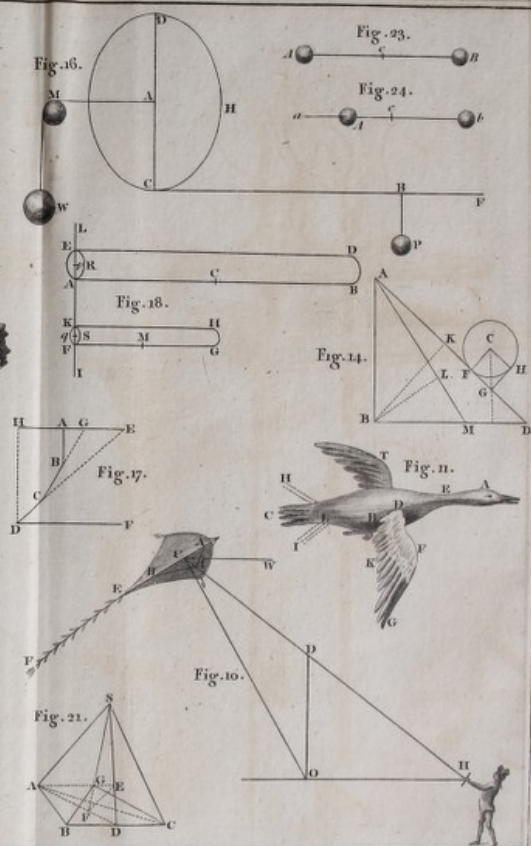
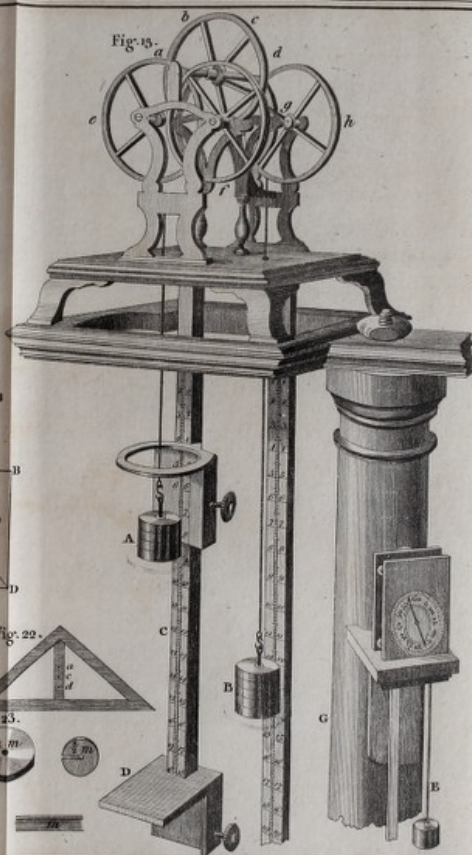
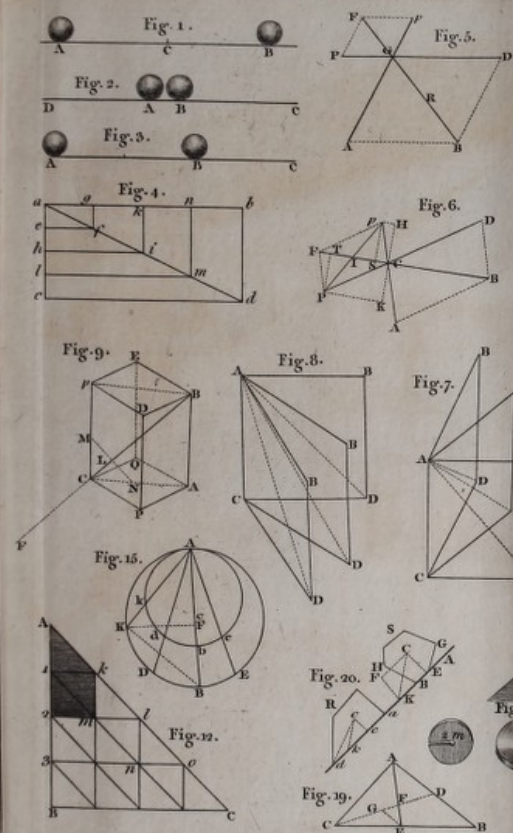


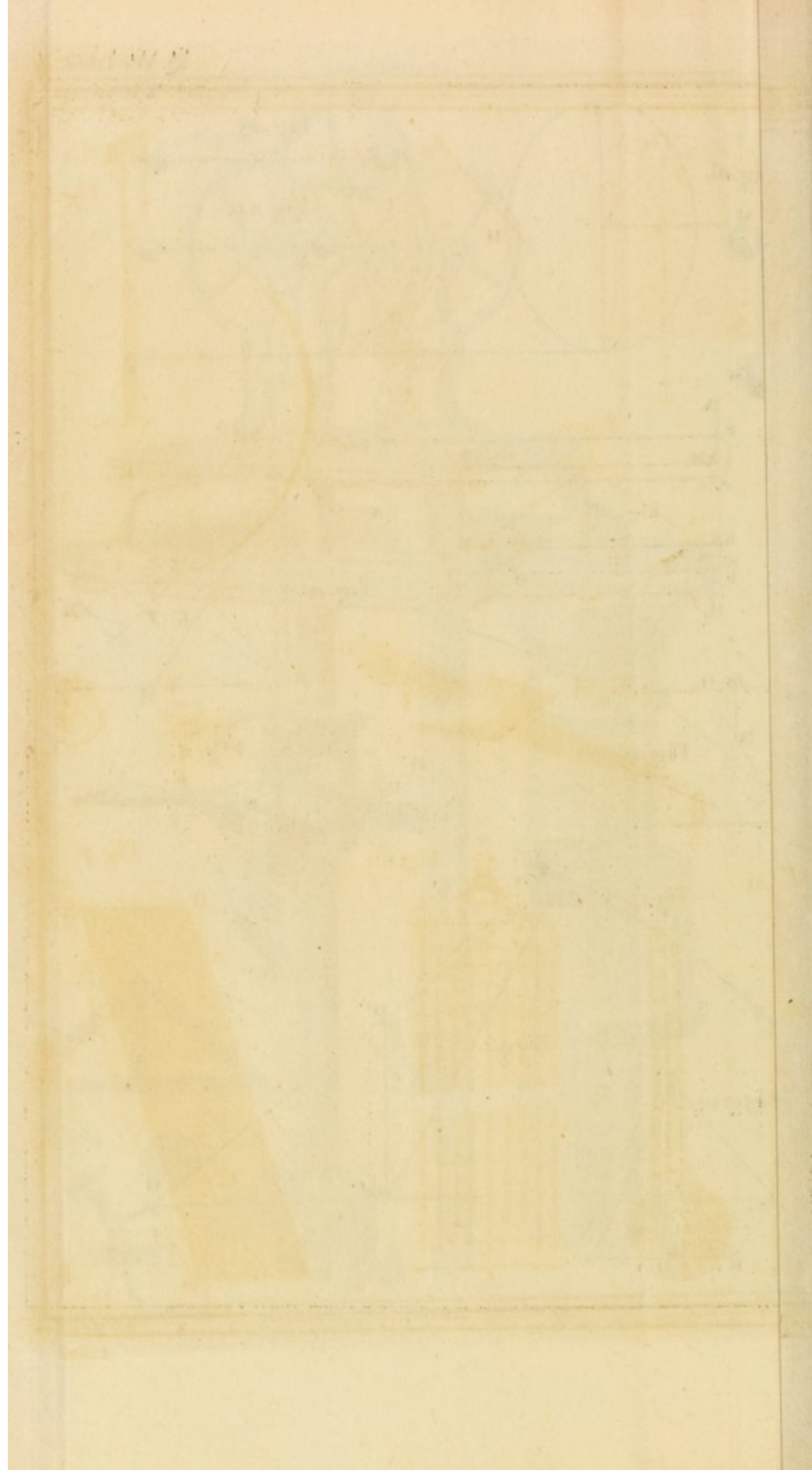




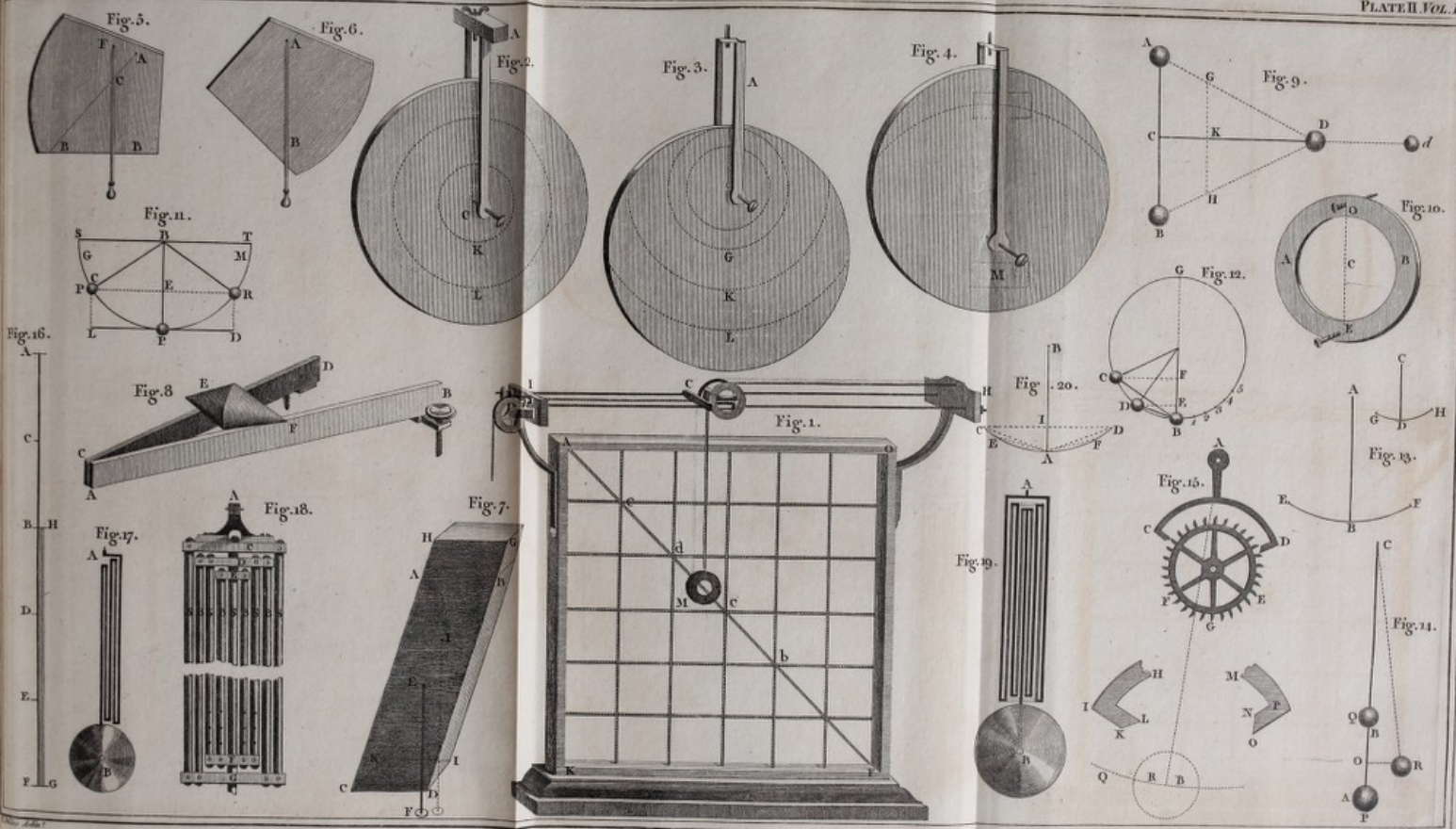


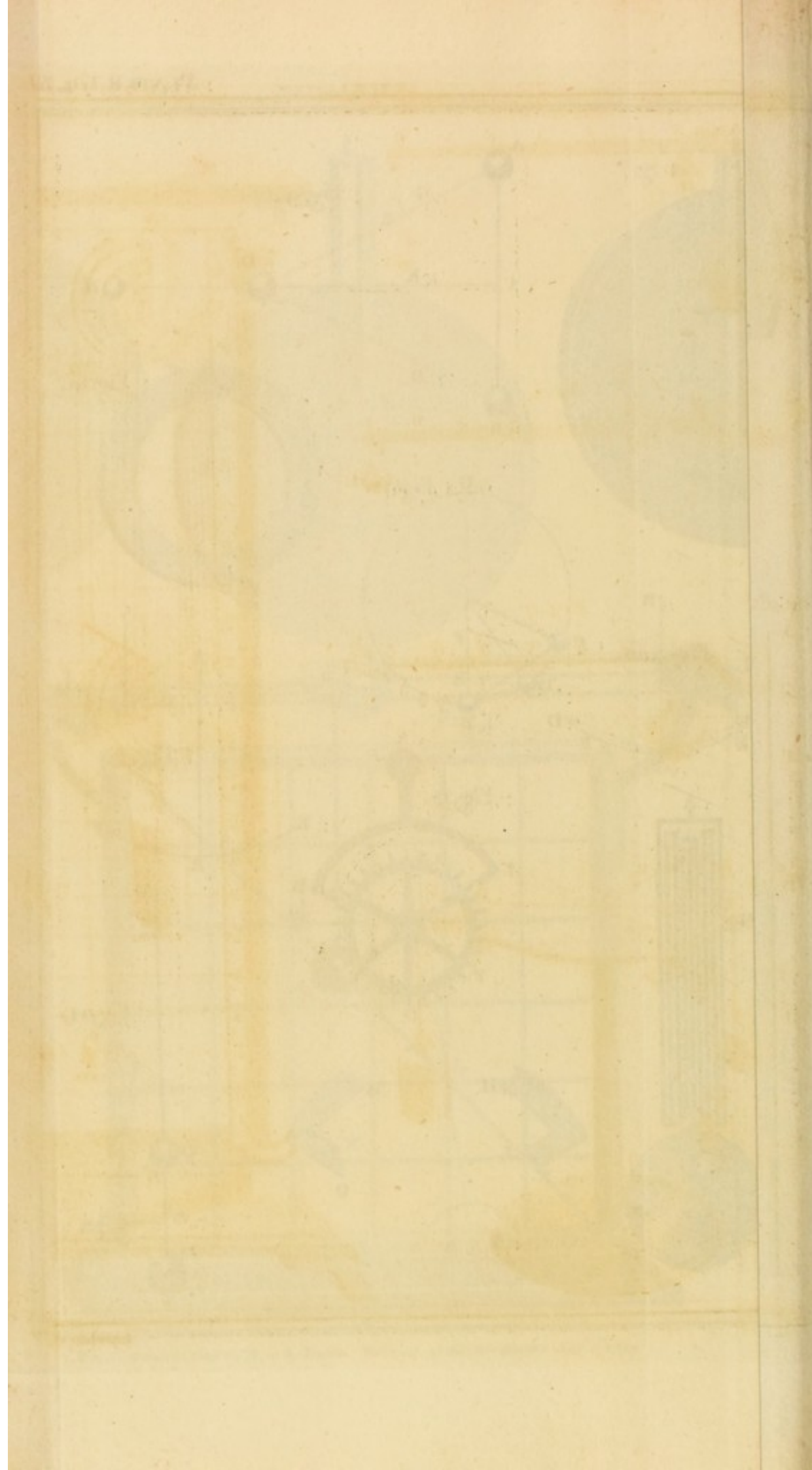




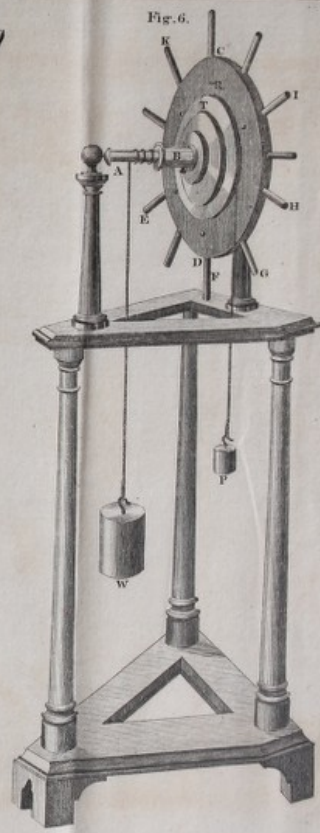
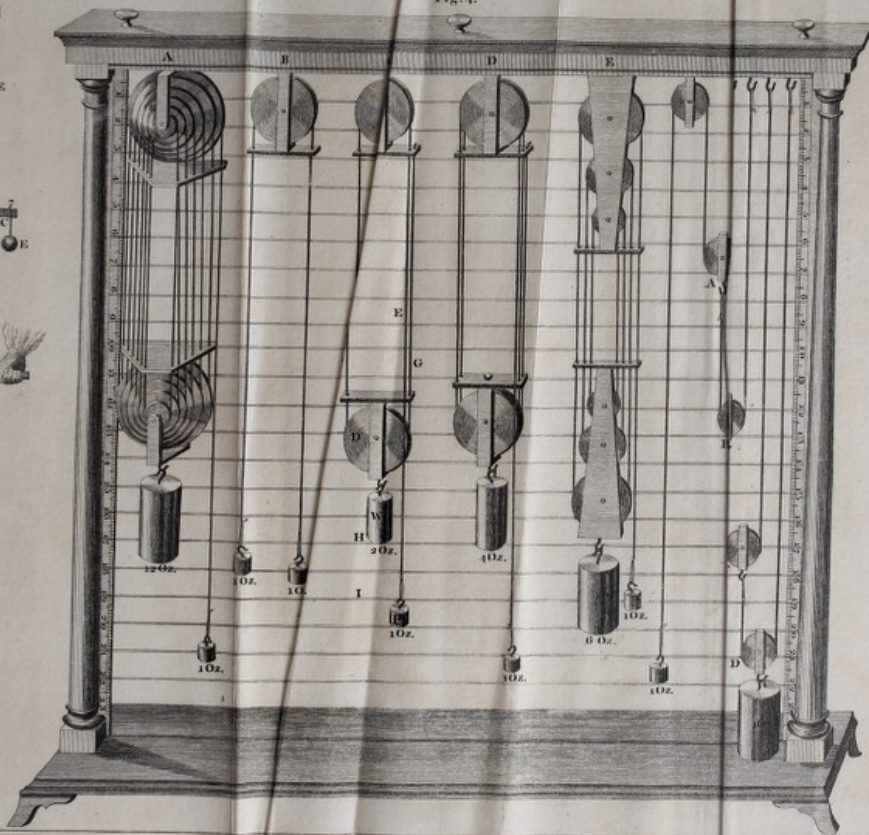
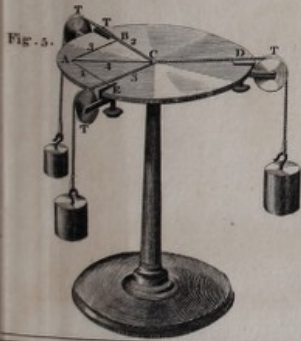
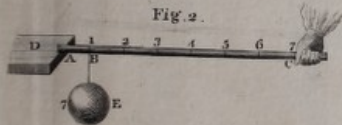
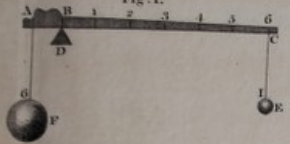






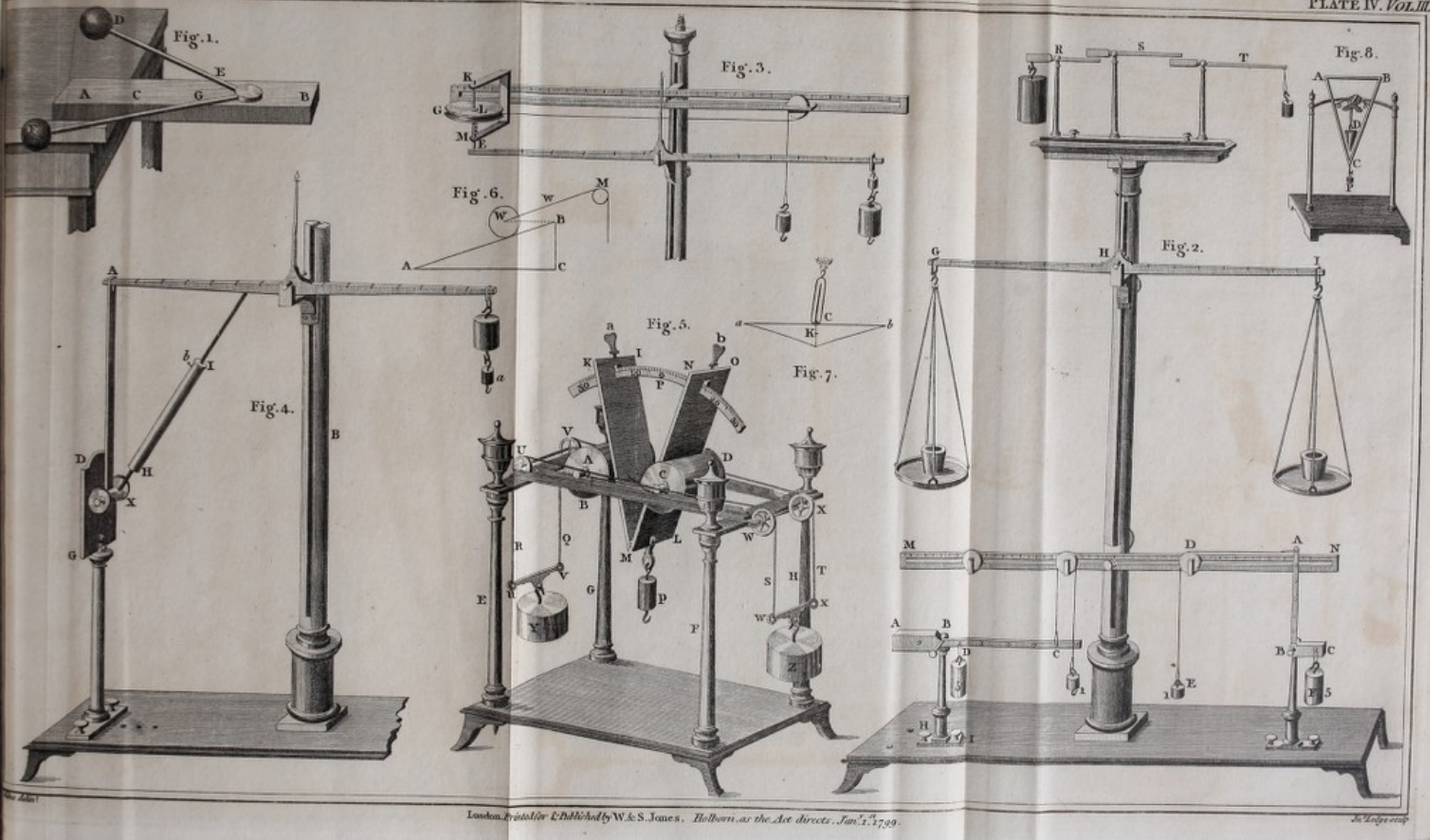










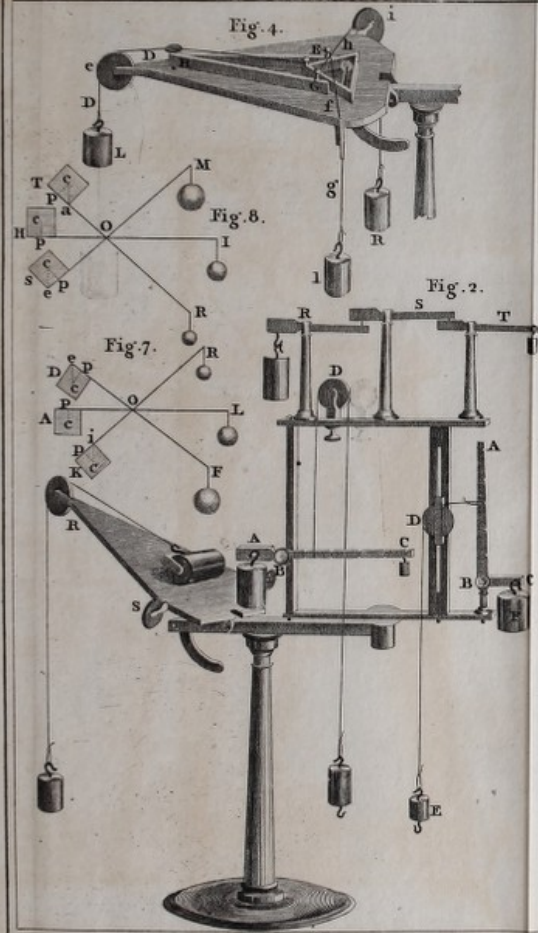


Mathematical Sciences

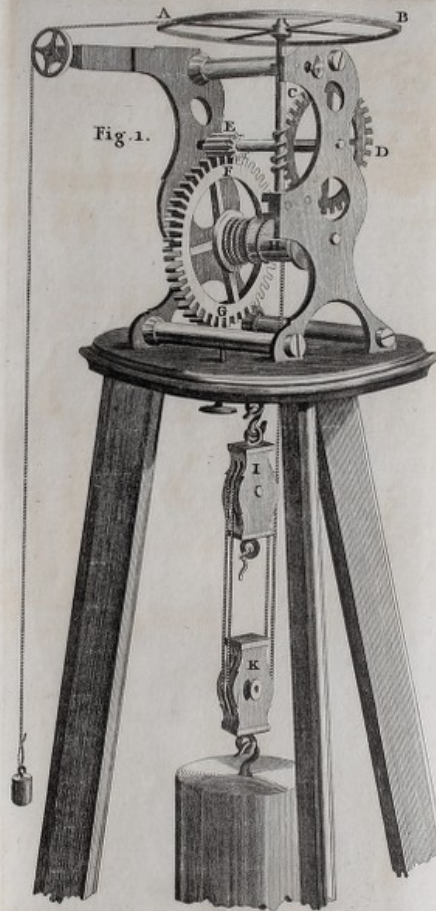
877H



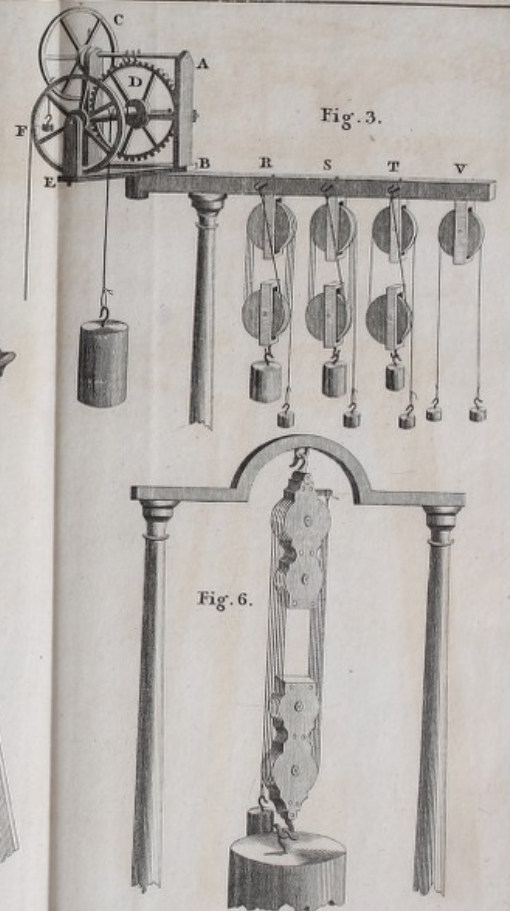




*L. M. Edin.*



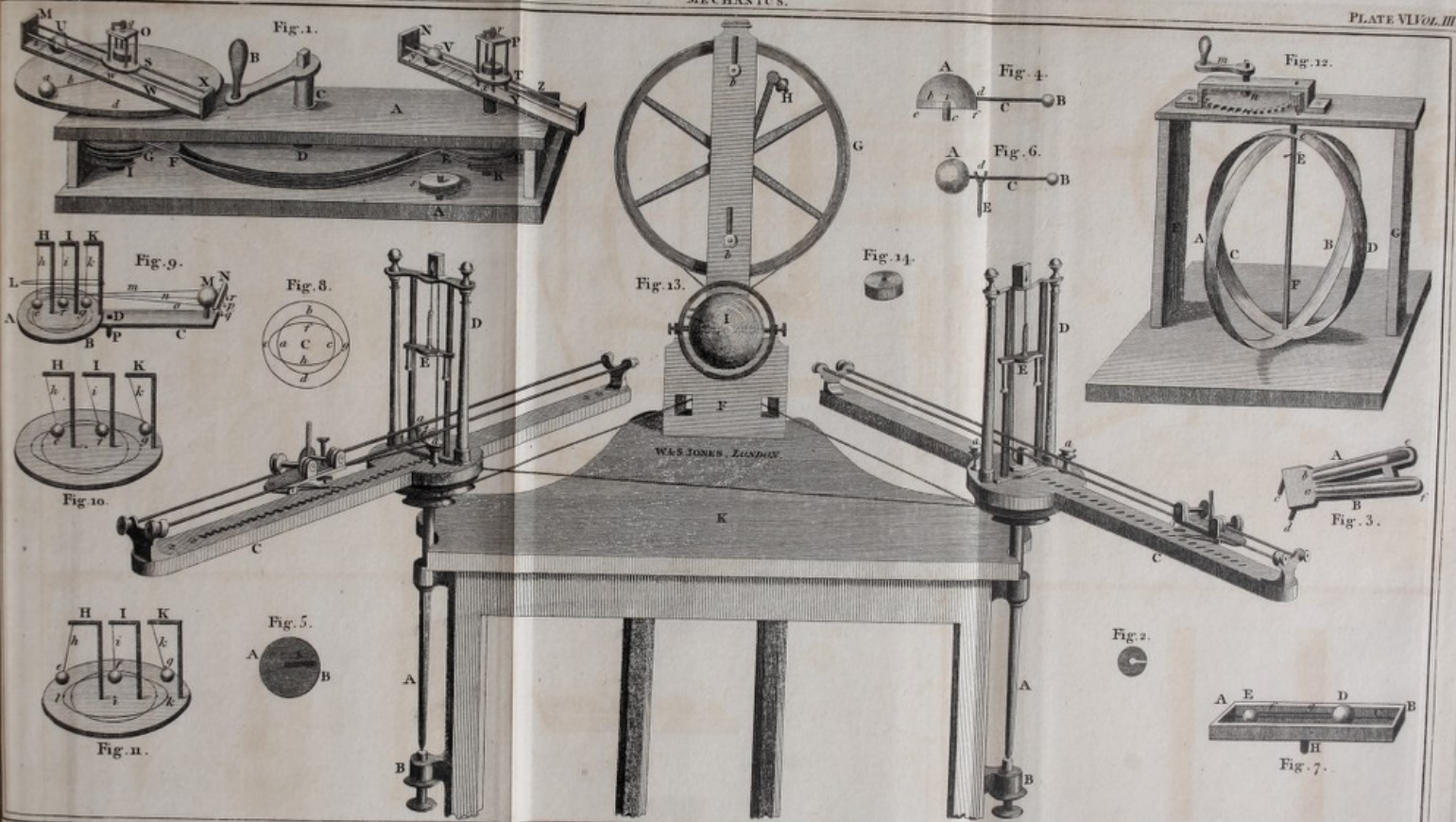
*London, Printed by W. & S. Jones, Holborn, as the Act directs, Jan. 1. 1799.*

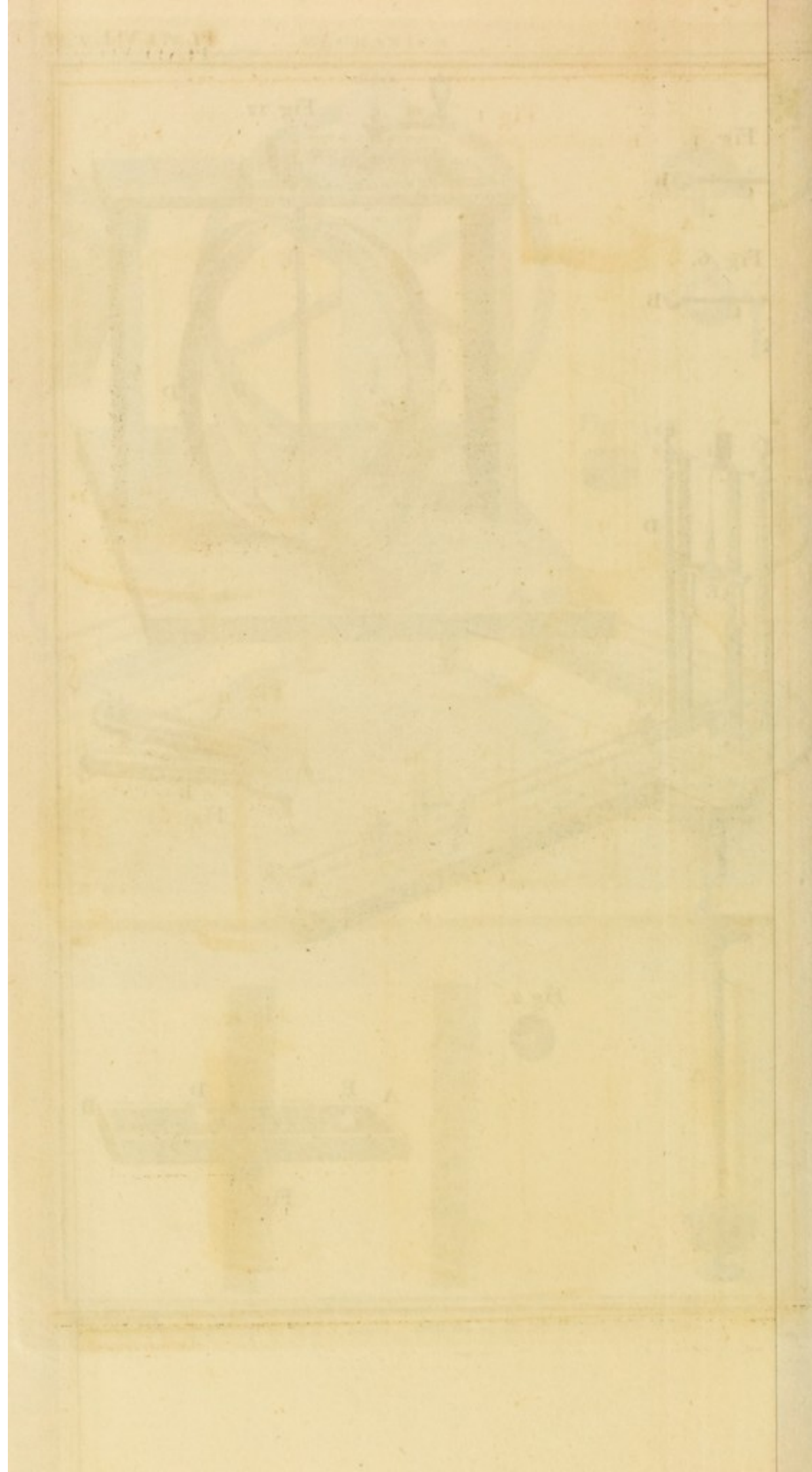


*Edin. 1799.*

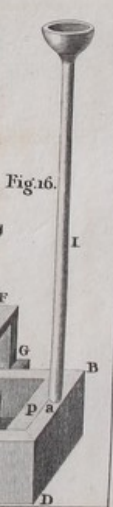
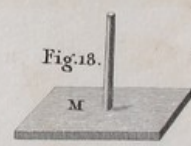
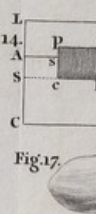
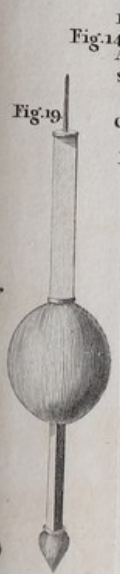
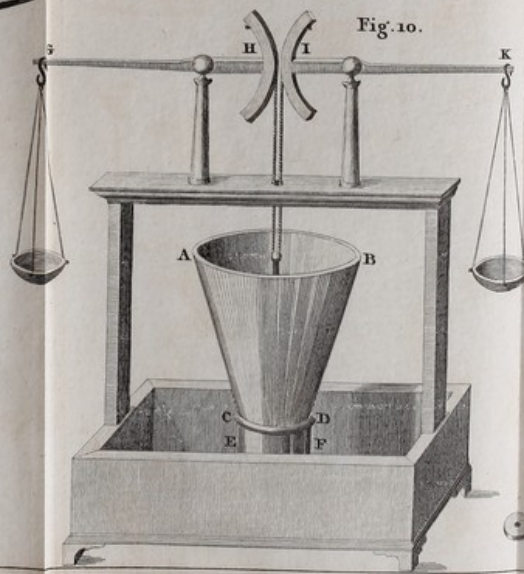
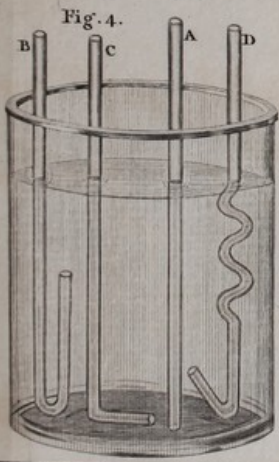
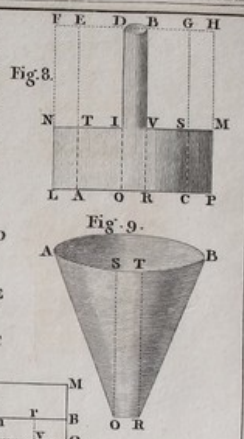
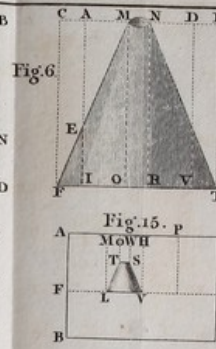
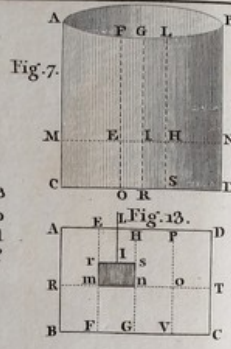
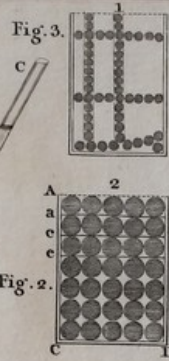
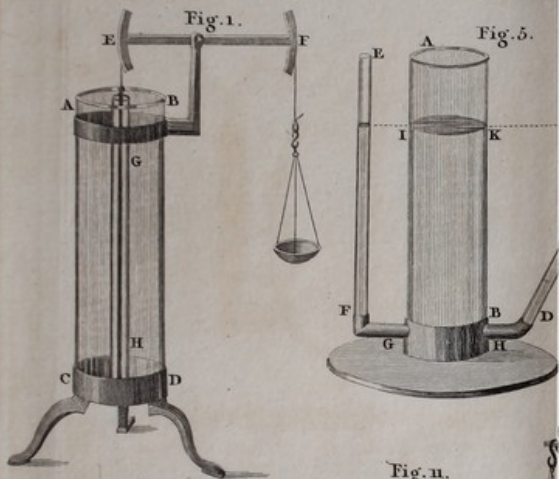


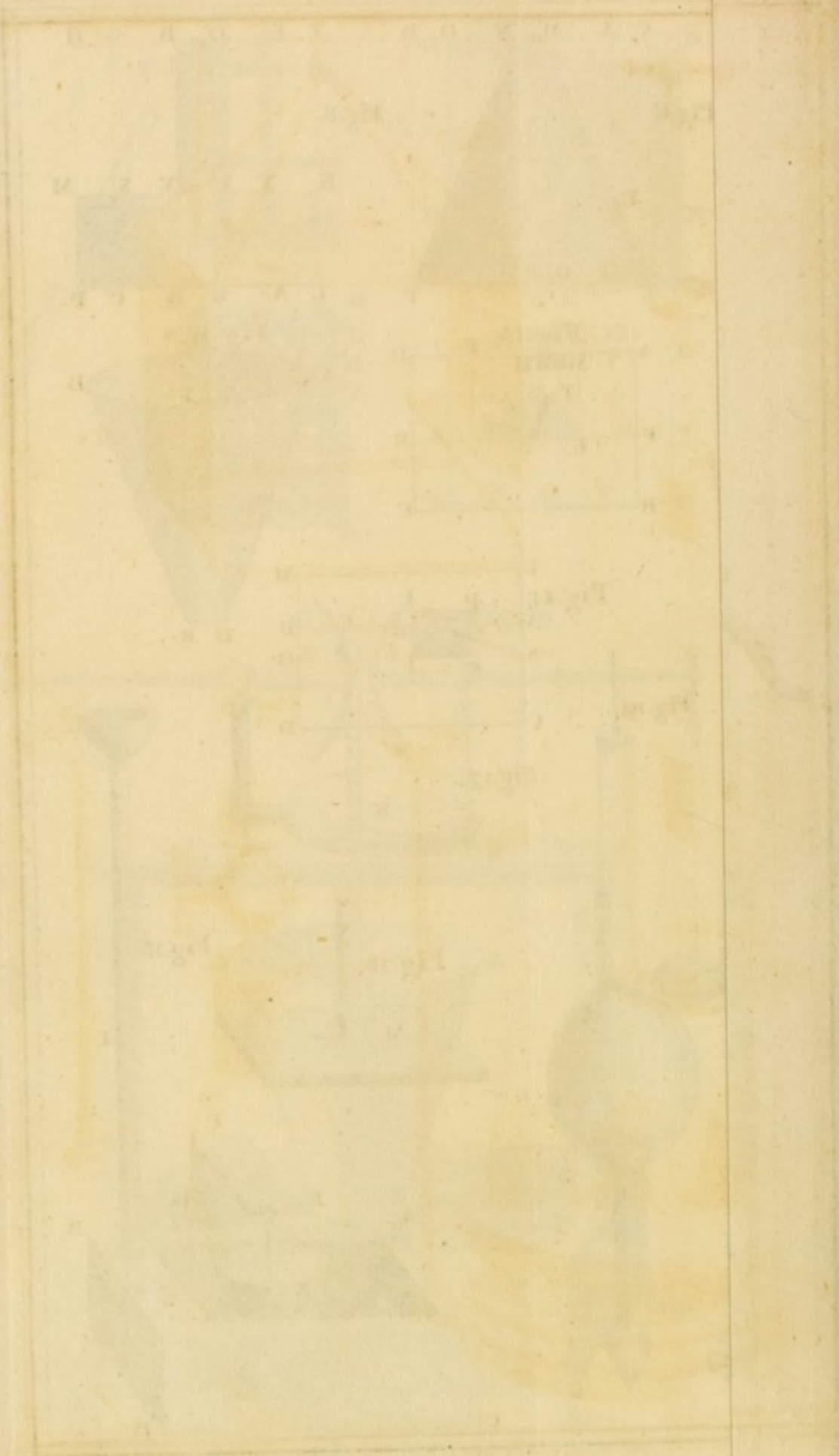








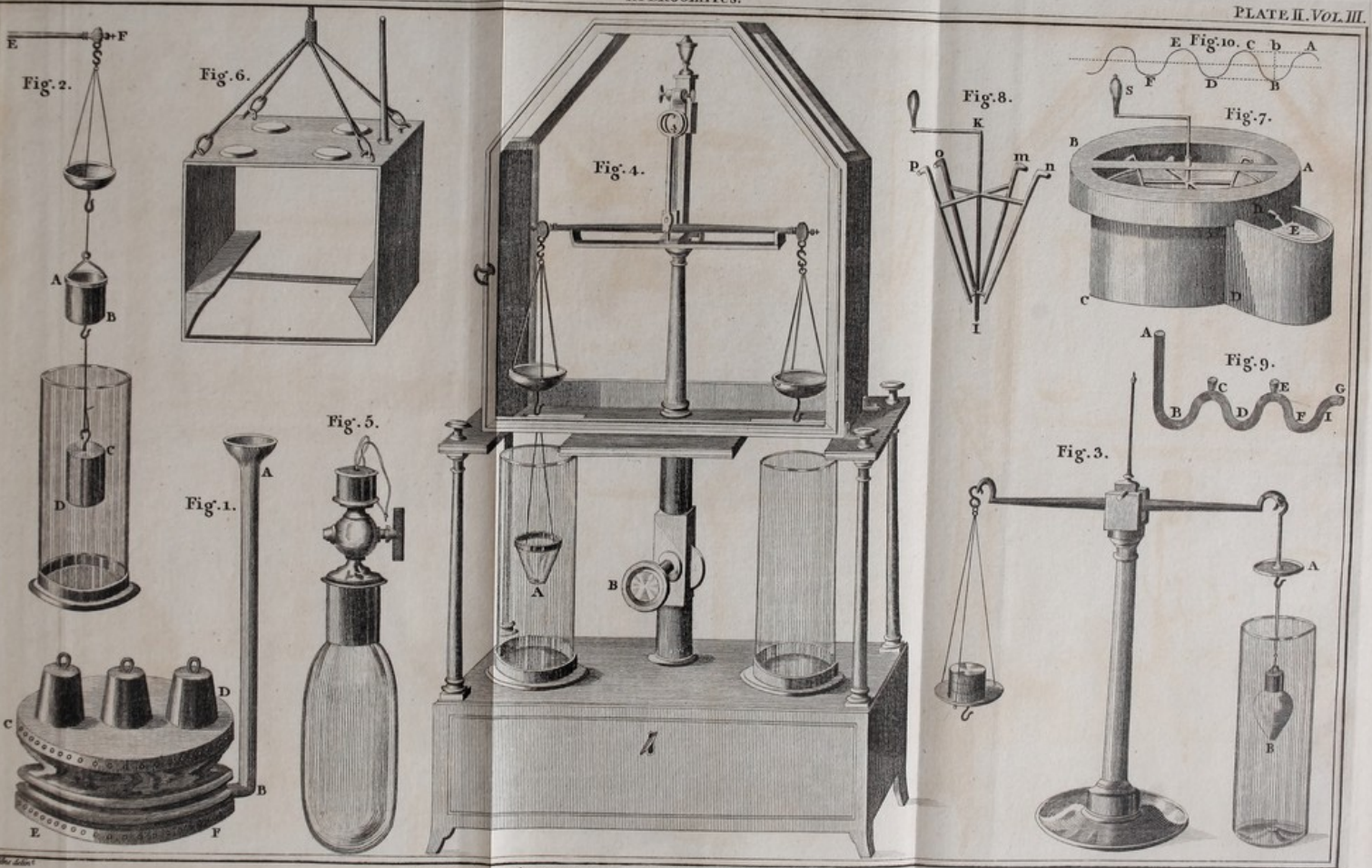




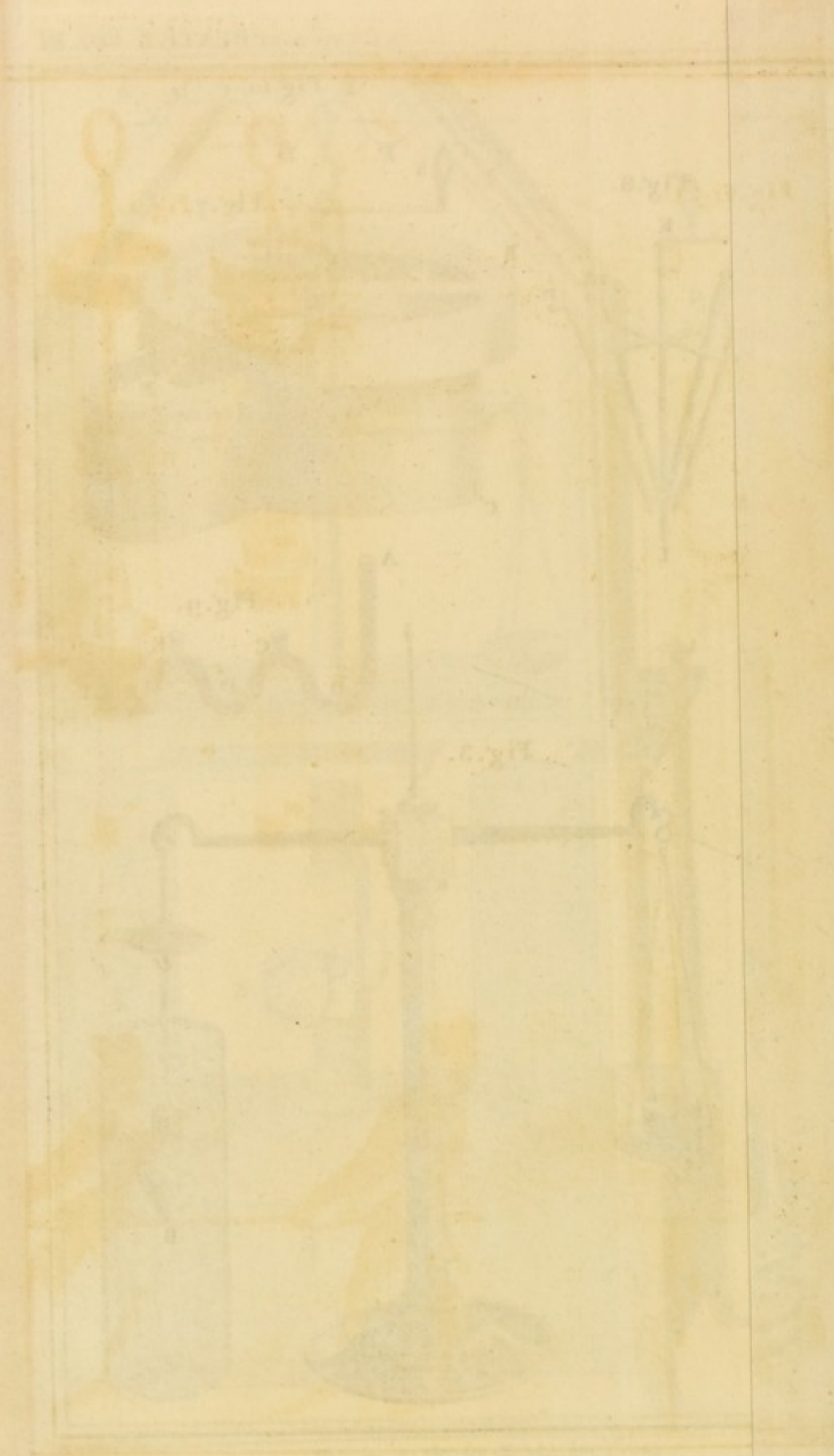


HYDROSTATICS.

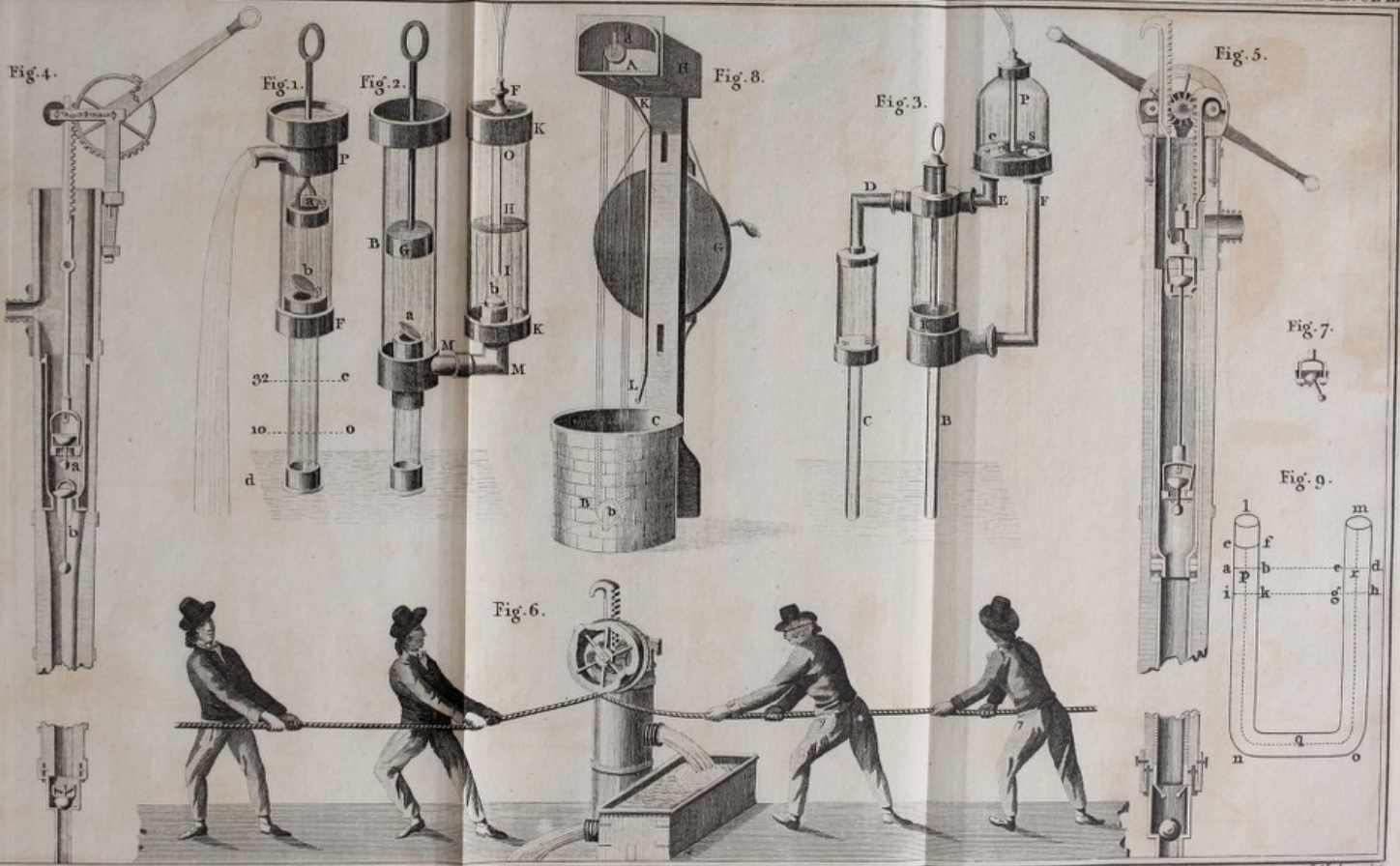
PLATE II. VOL. III.



London: Printed by W. & S. Jones, Holborn, as the Act directs, Jan. 1. 1799.

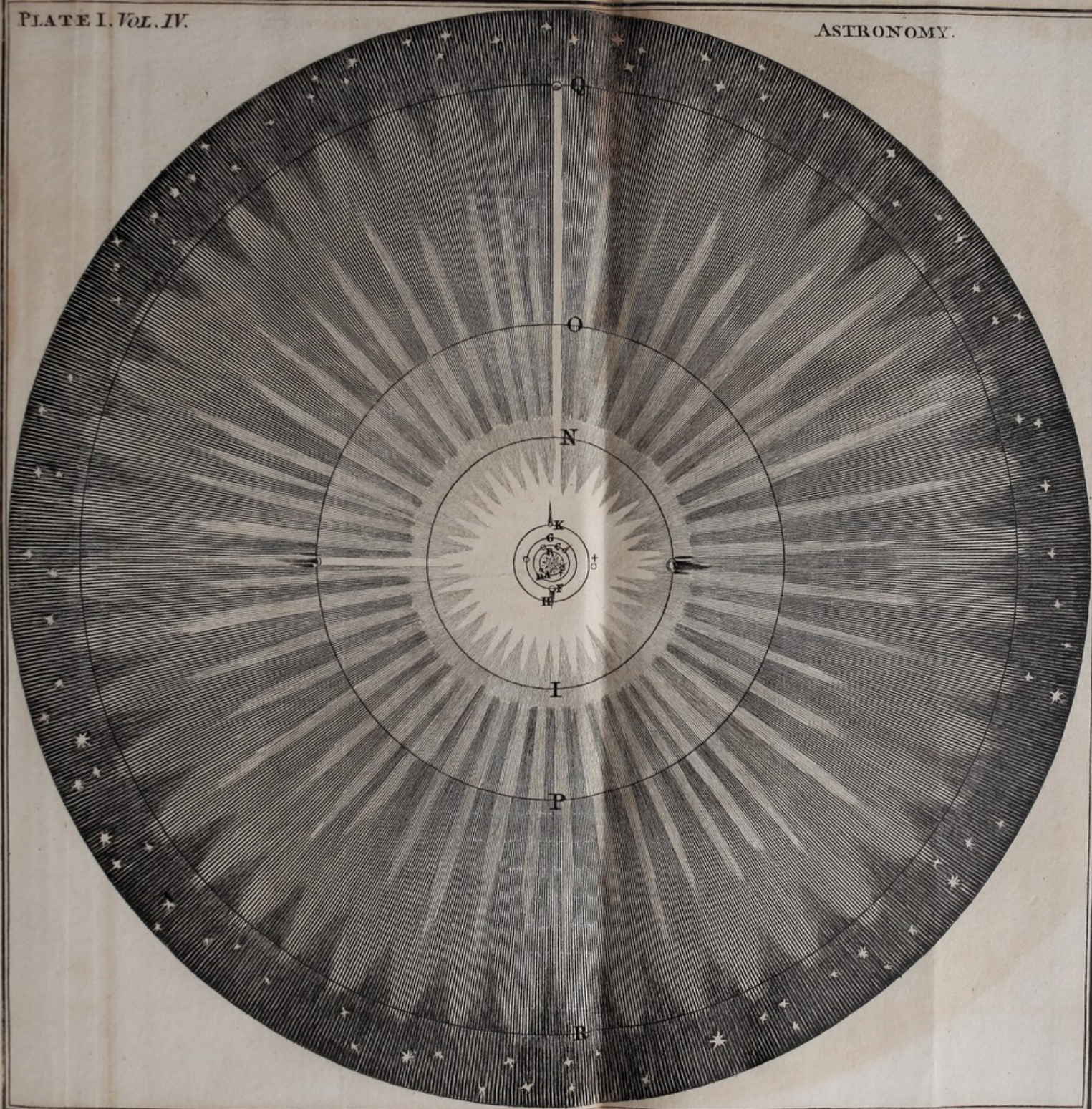




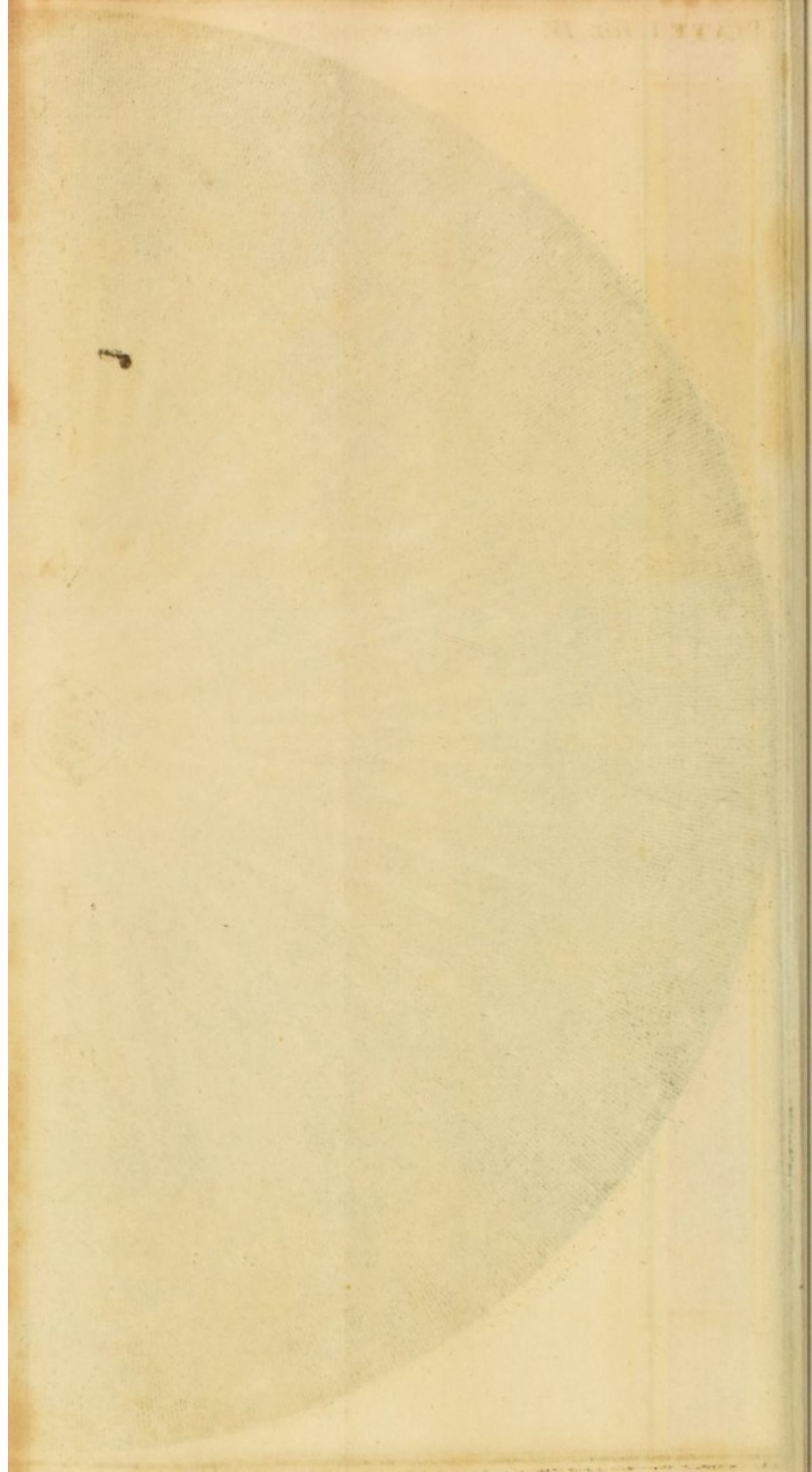




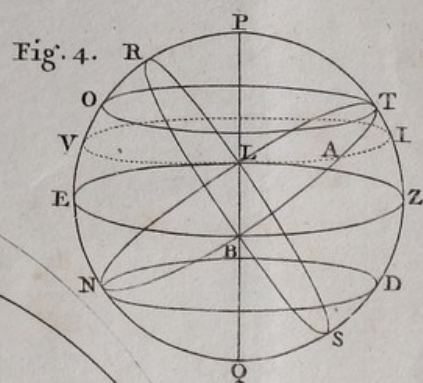
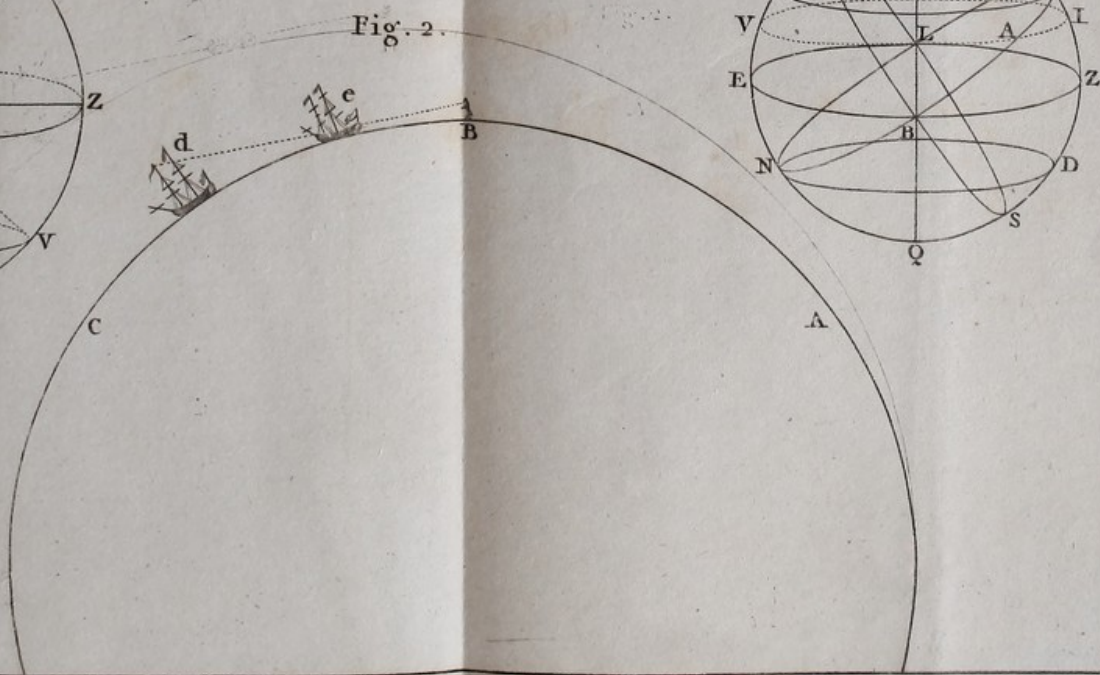
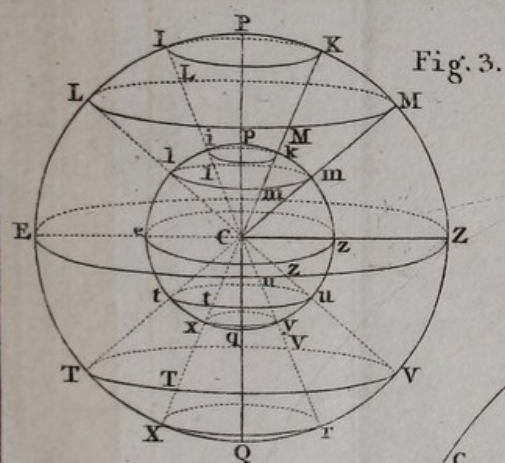












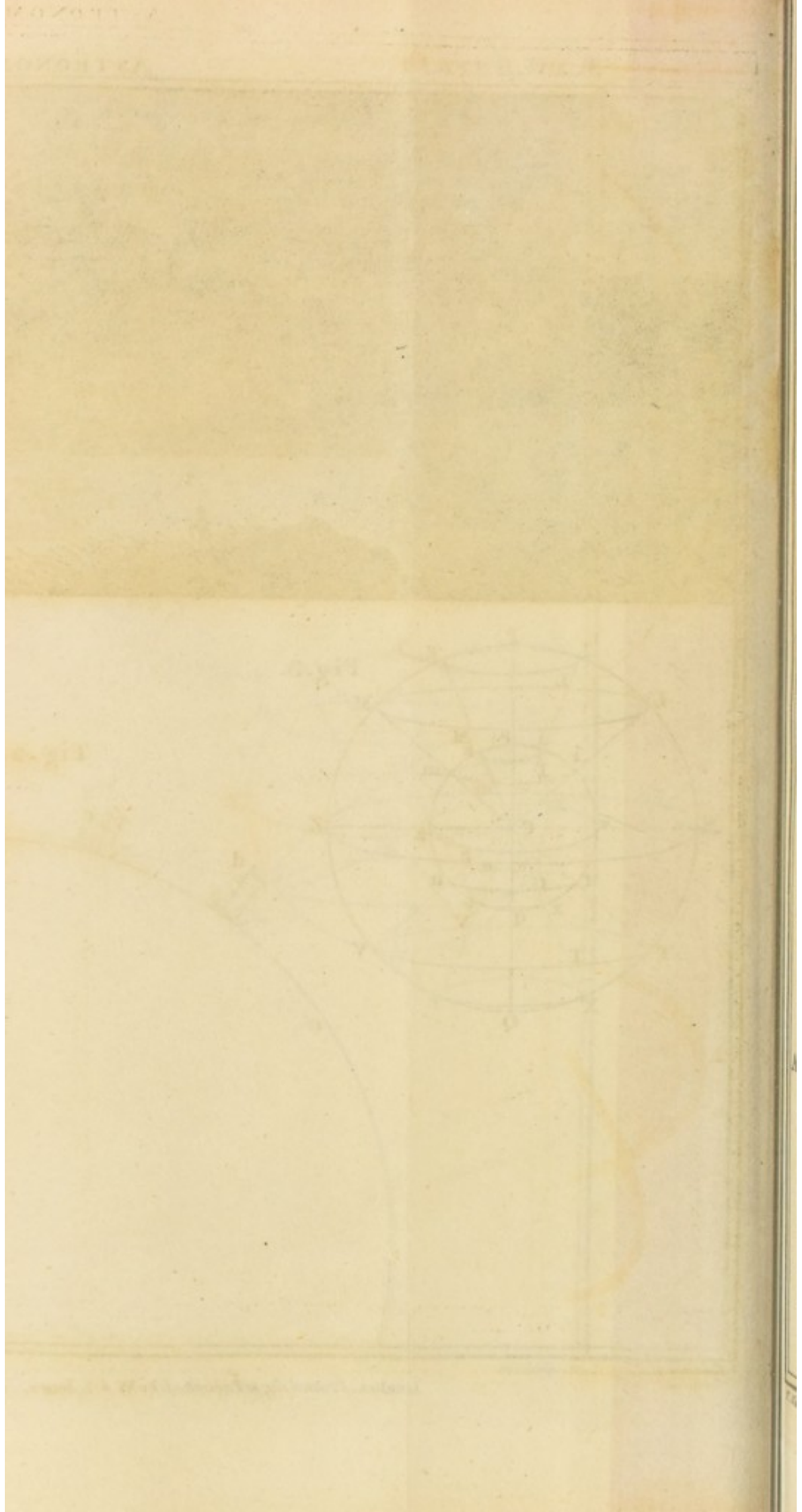




Fig. 1.

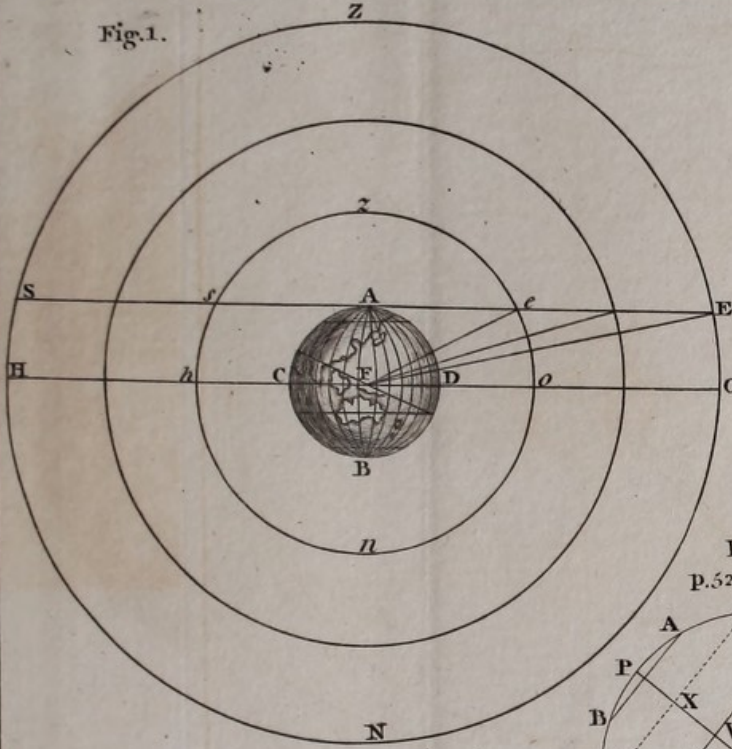


Fig. 2.

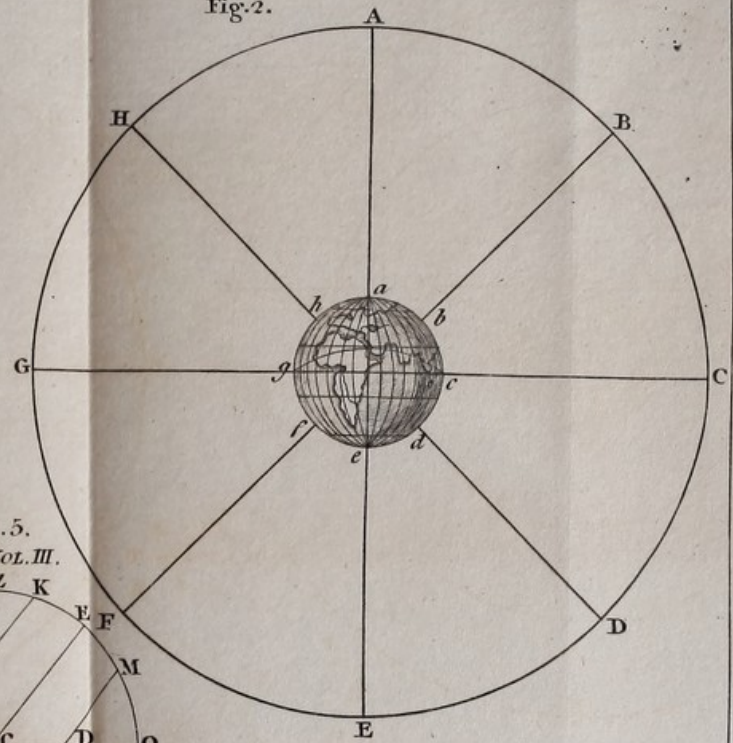


Fig. 5.  
P. 521. VOL. III.

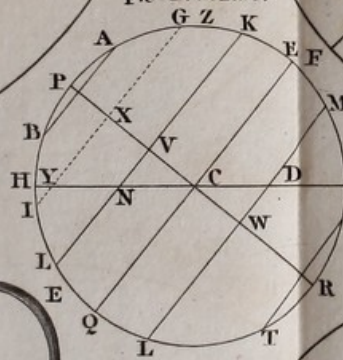


Fig. 3.

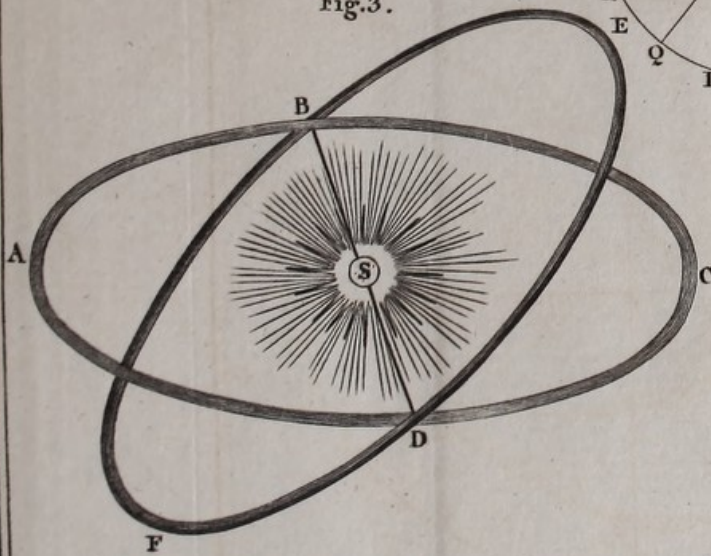
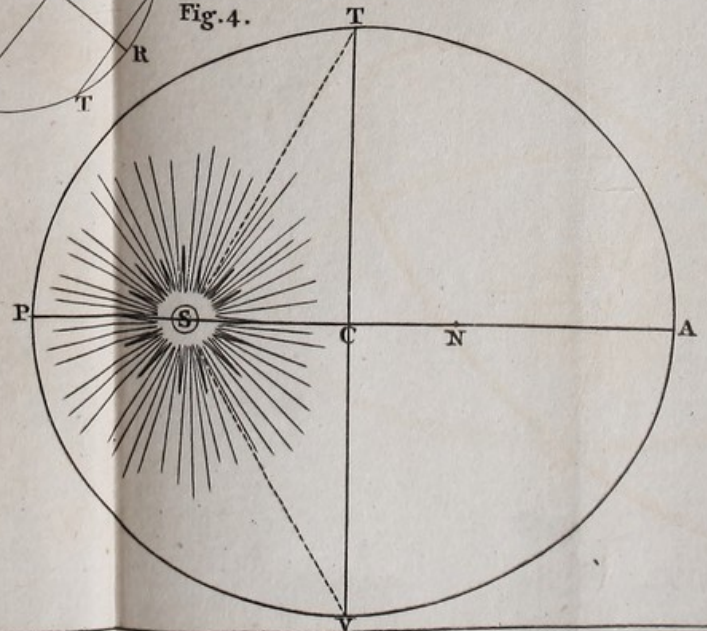


Fig. 4.



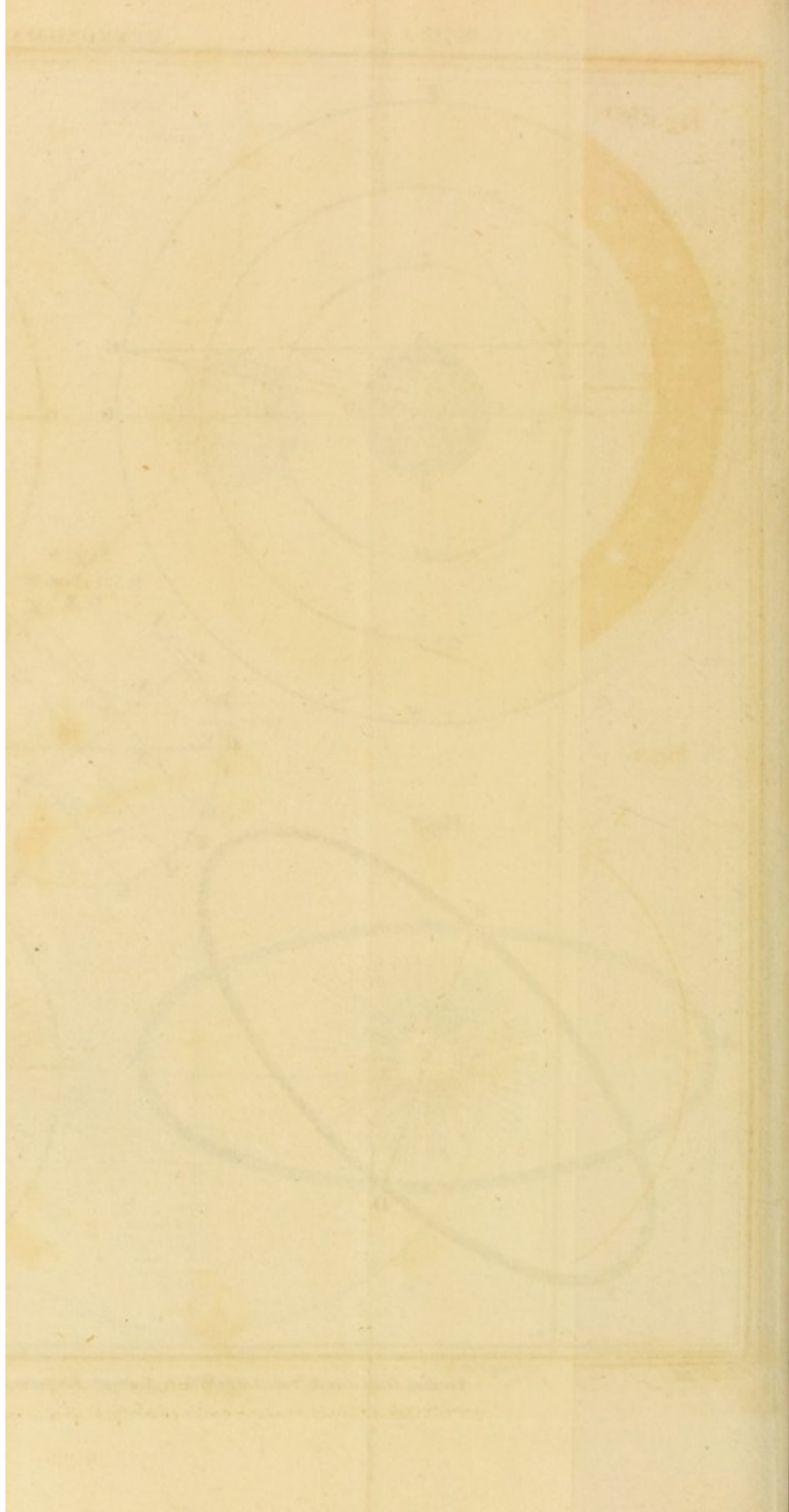




Fig. 1.

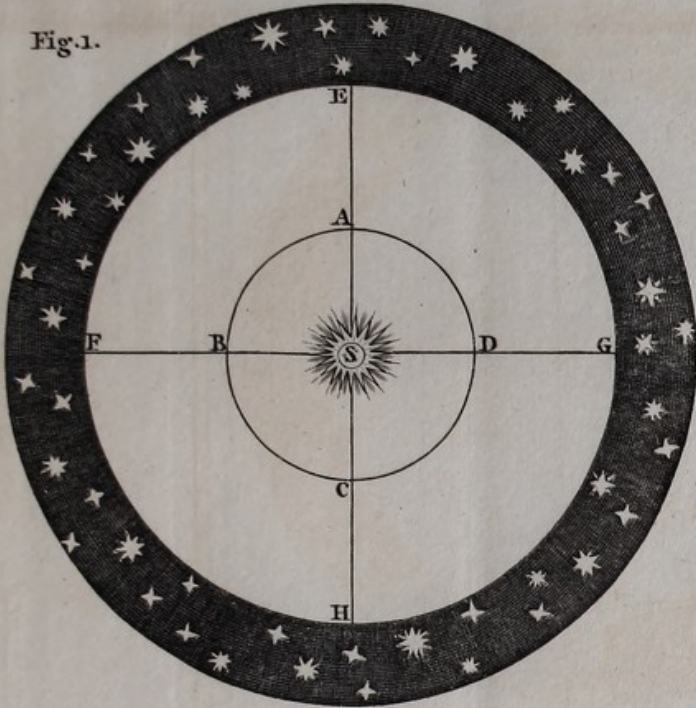


Fig. 2.

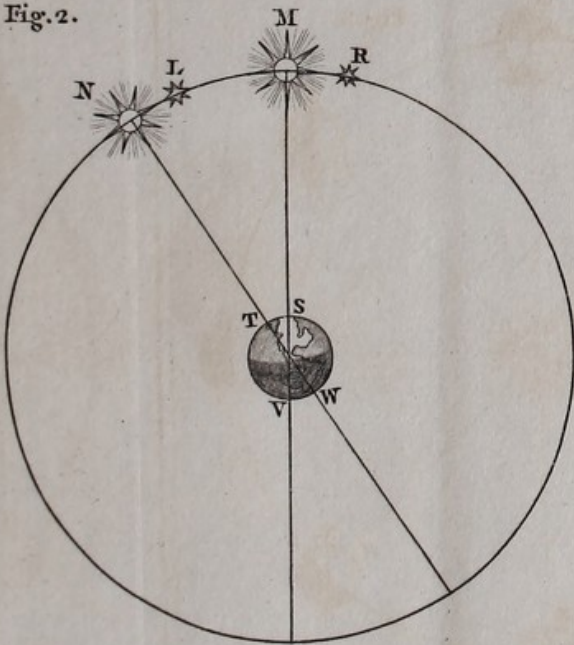


Fig. 4.

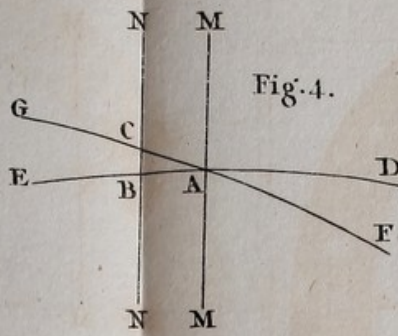


Fig. 5.

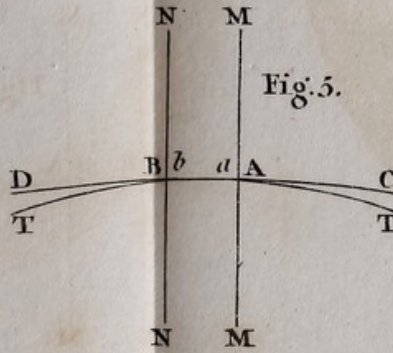


Fig. 3.

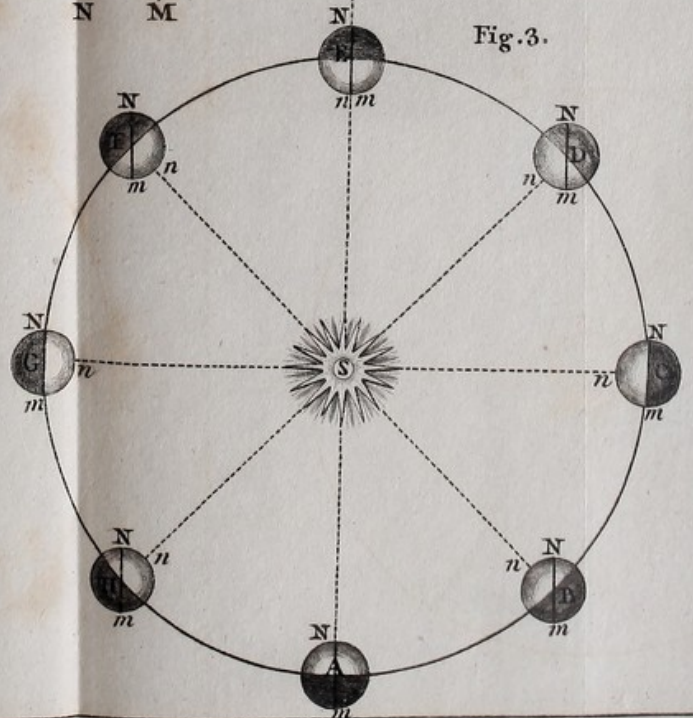






Fig. 1.

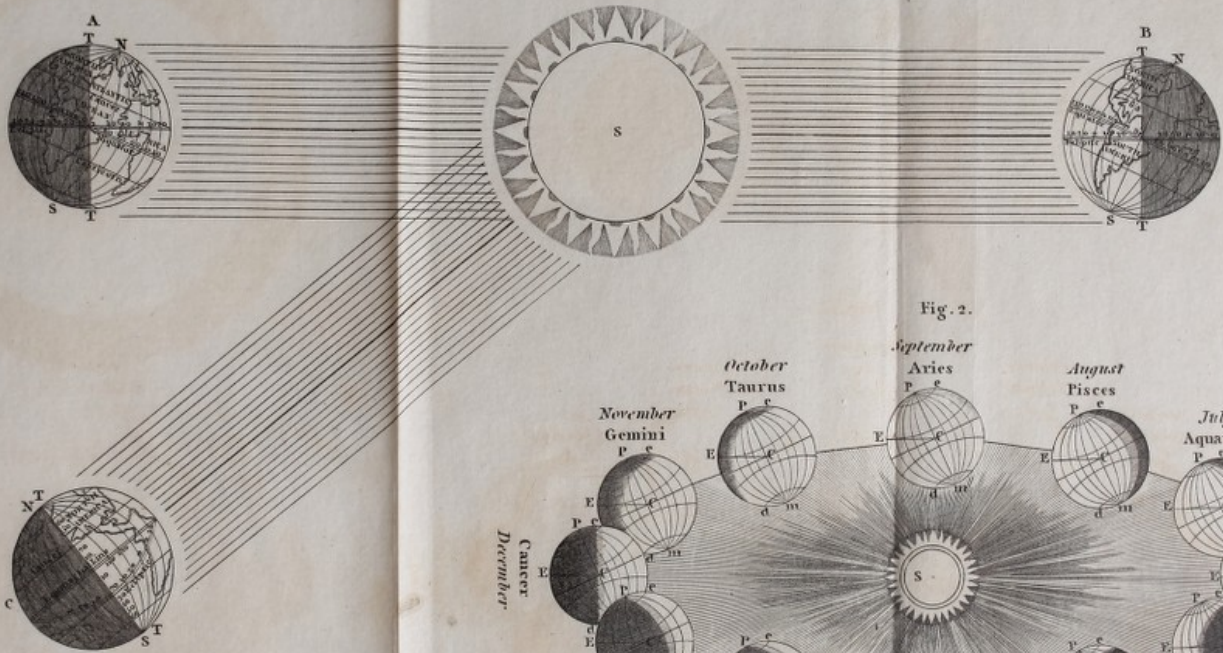
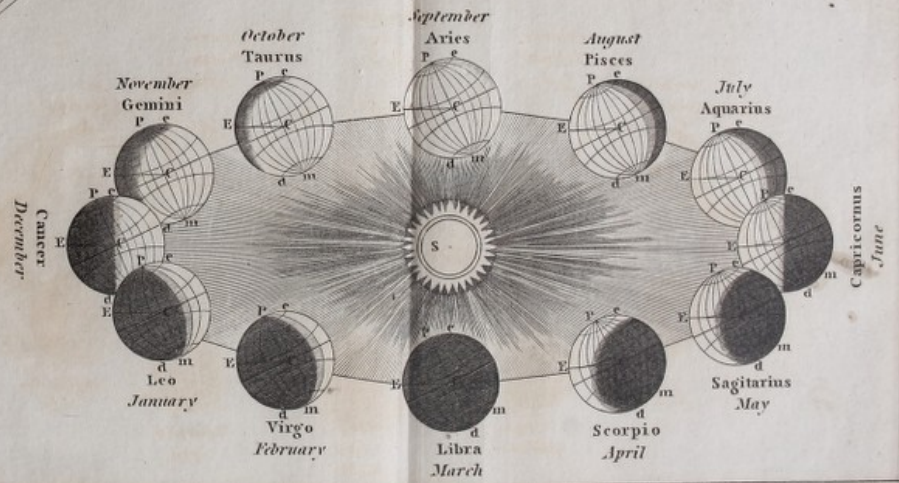


Fig. 2.





Several lines of faint, illegible text, likely a description or legend for the diagram.



A line of faint text at the bottom of the page, possibly a title or a reference.



Fig. 1.

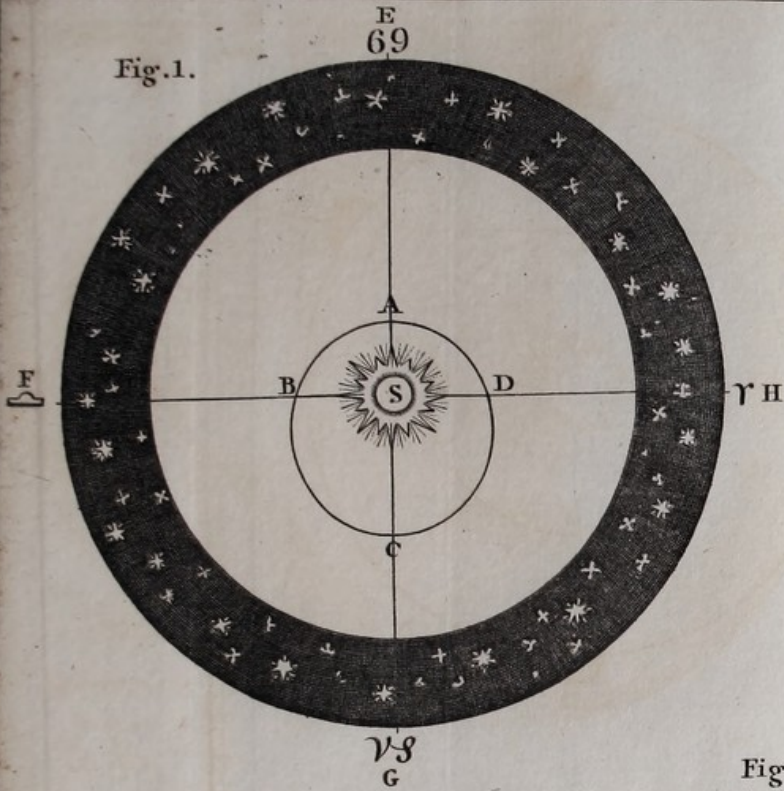


Fig. 3.

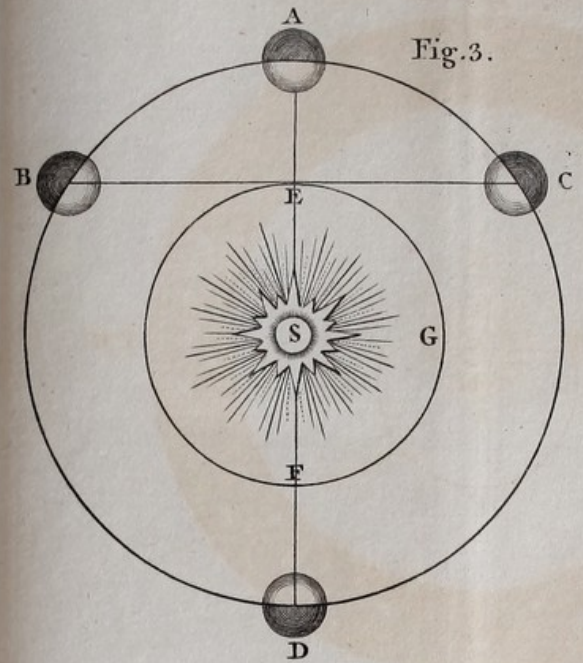
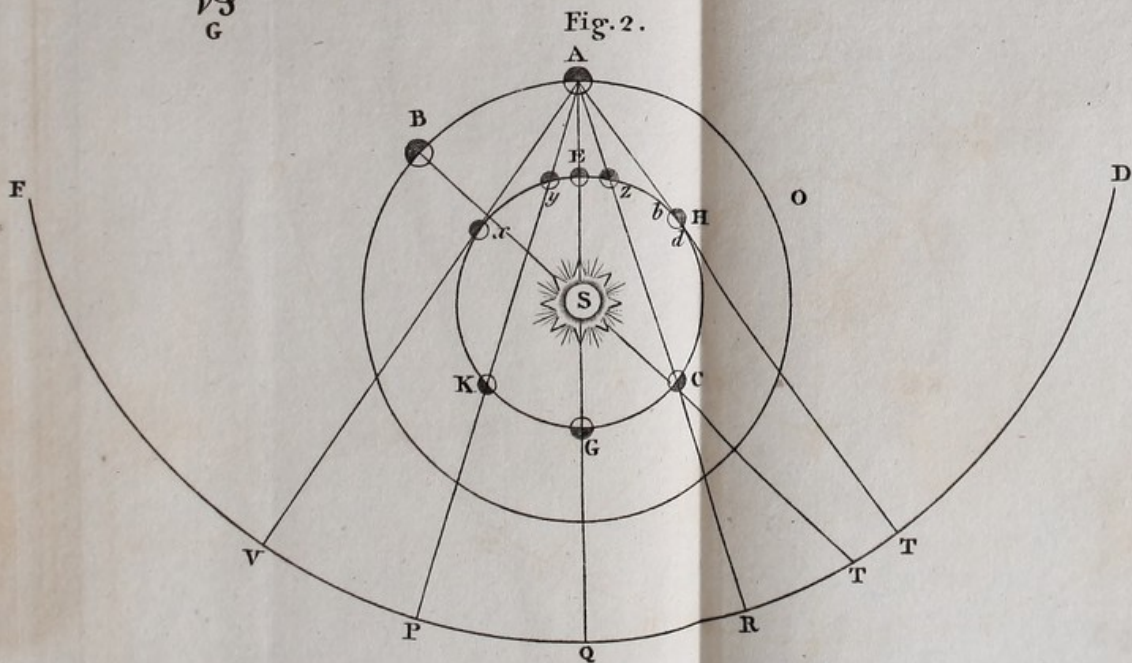
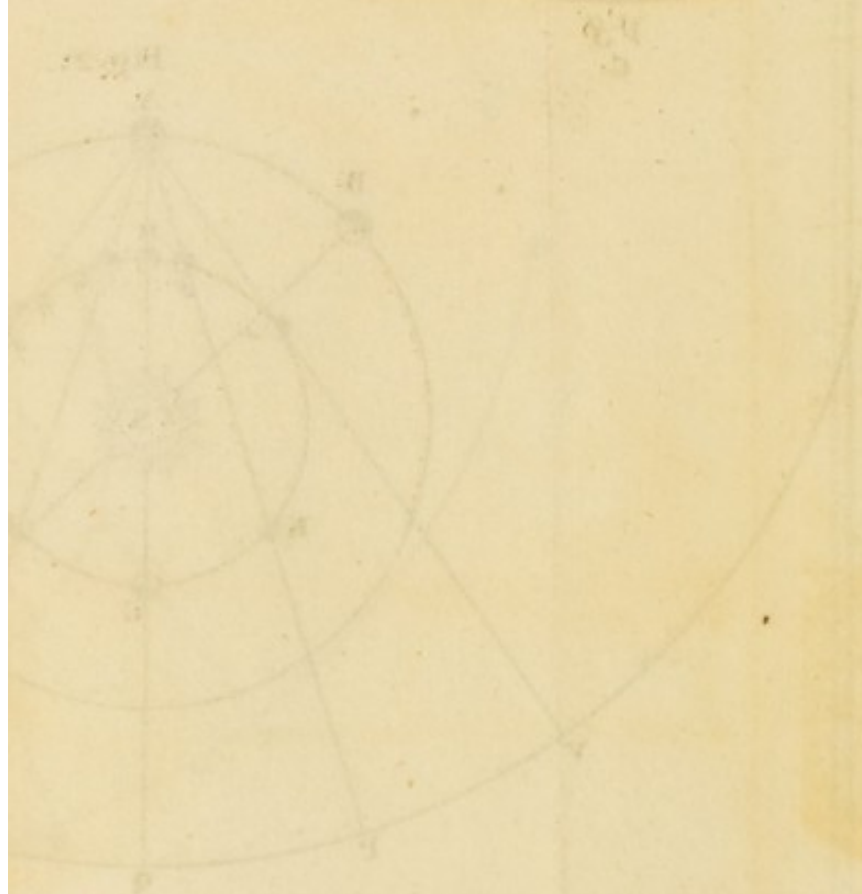


Fig. 2.







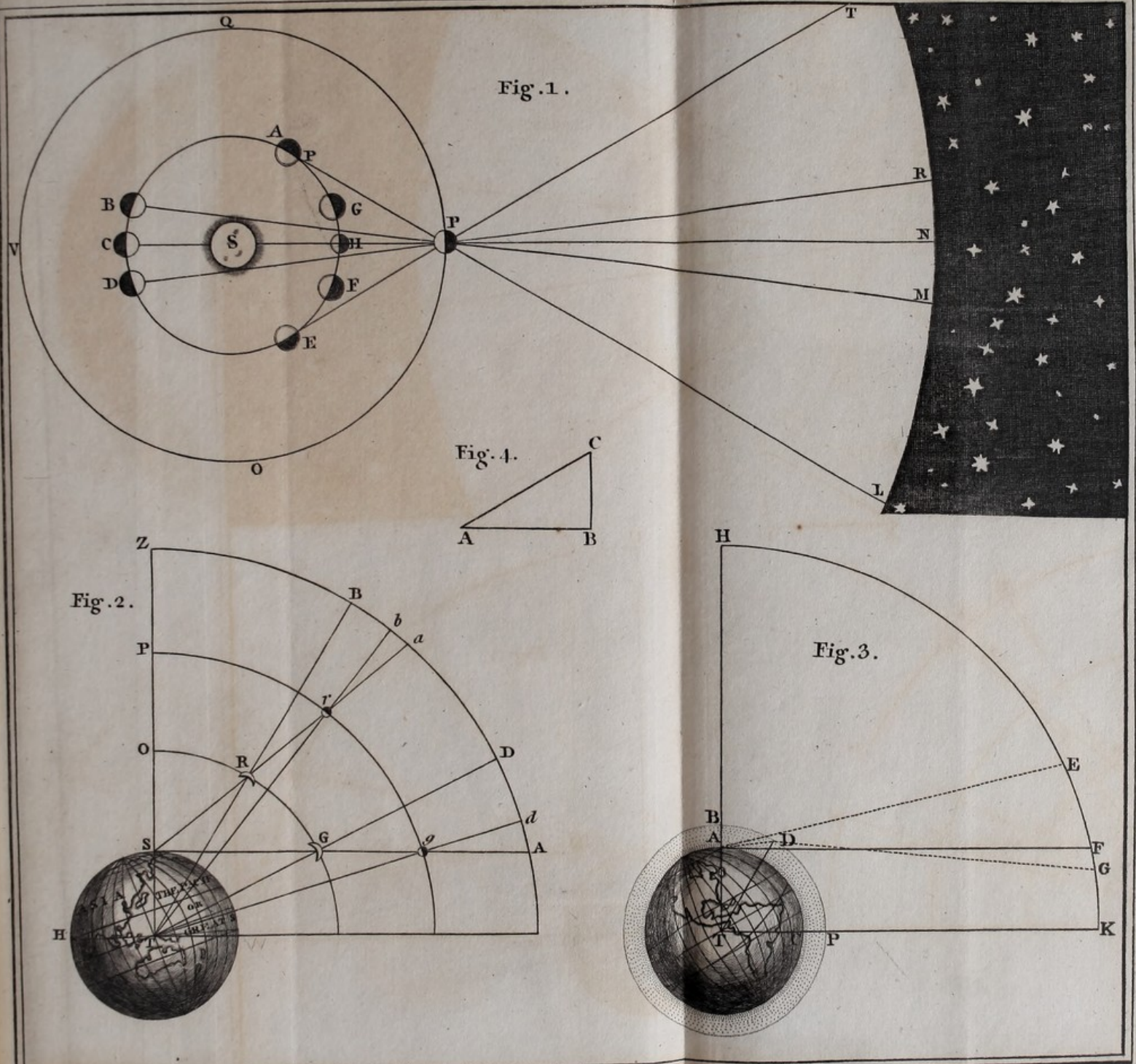






Fig. 1.

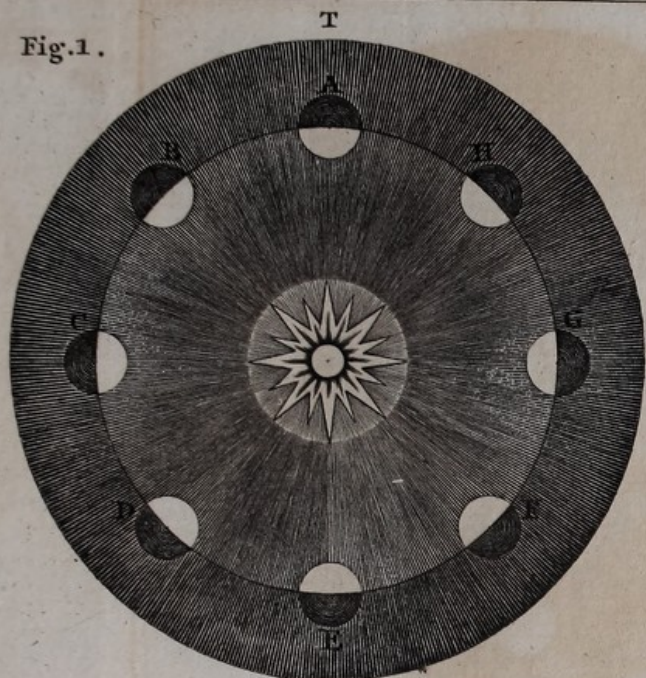


Fig. 2.

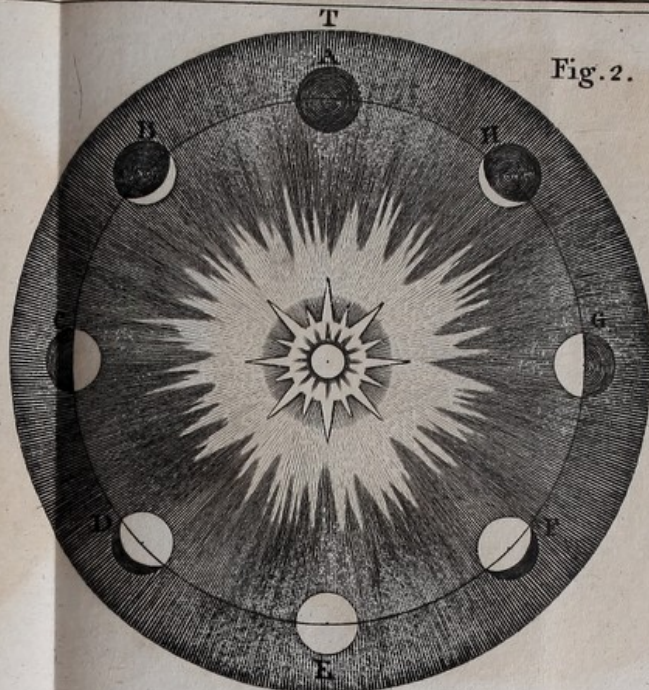


Fig. 4.

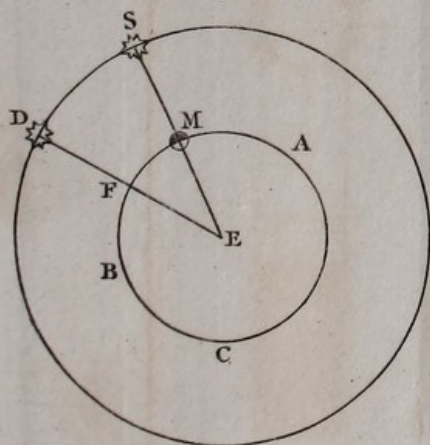


Fig. 3.

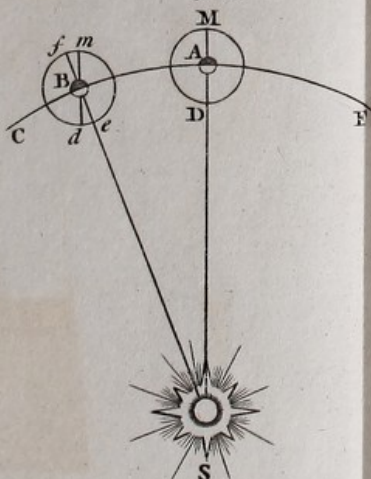


Fig. 7.

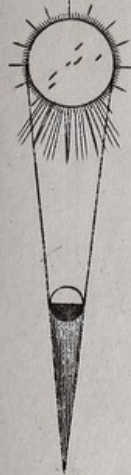
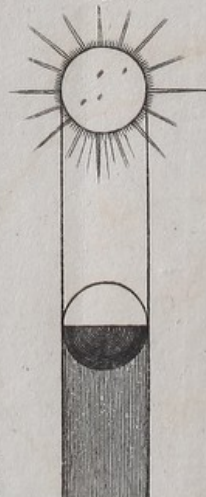


Fig. 6.



Fig. 5.



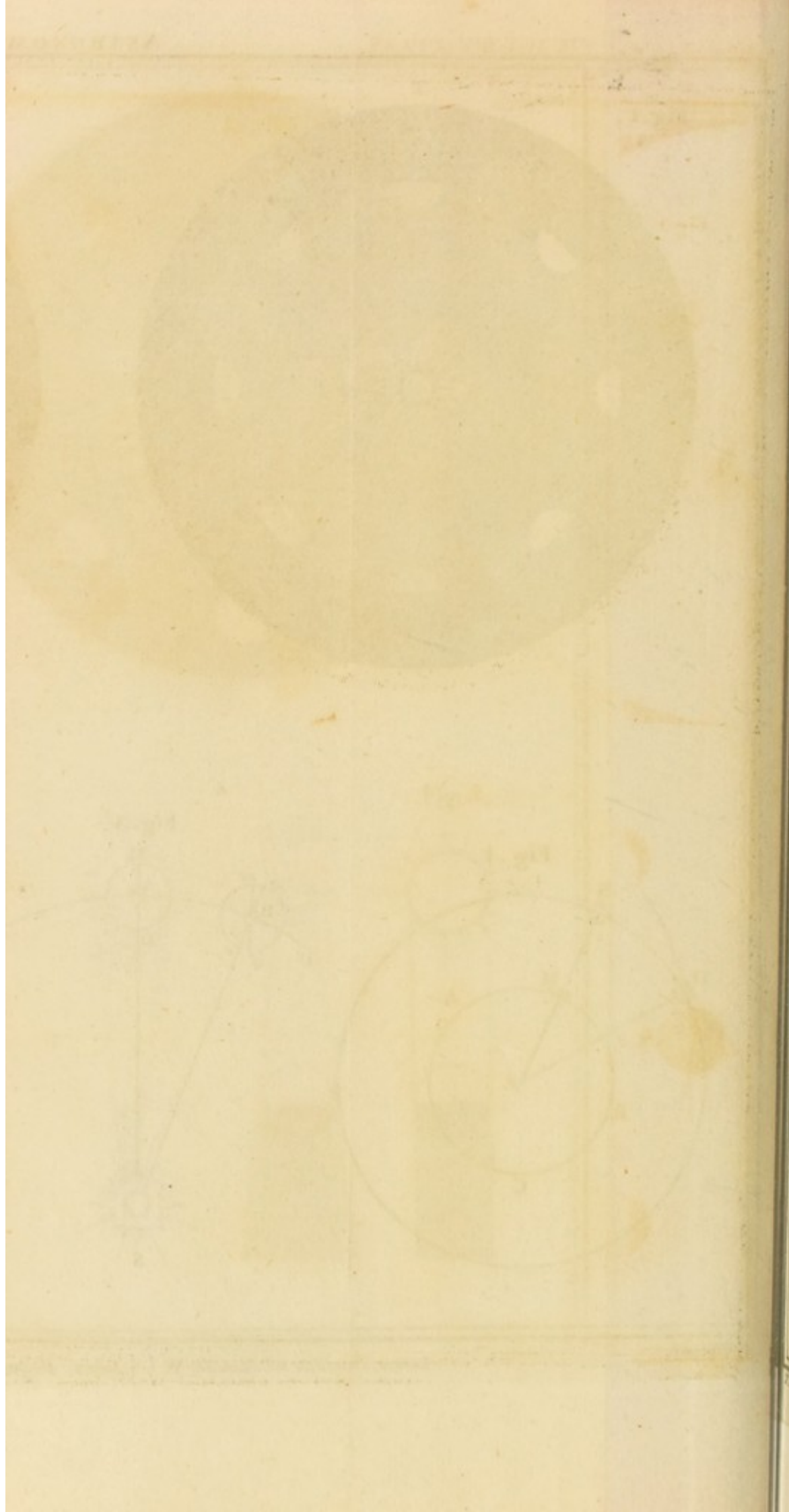




Fig. 1.

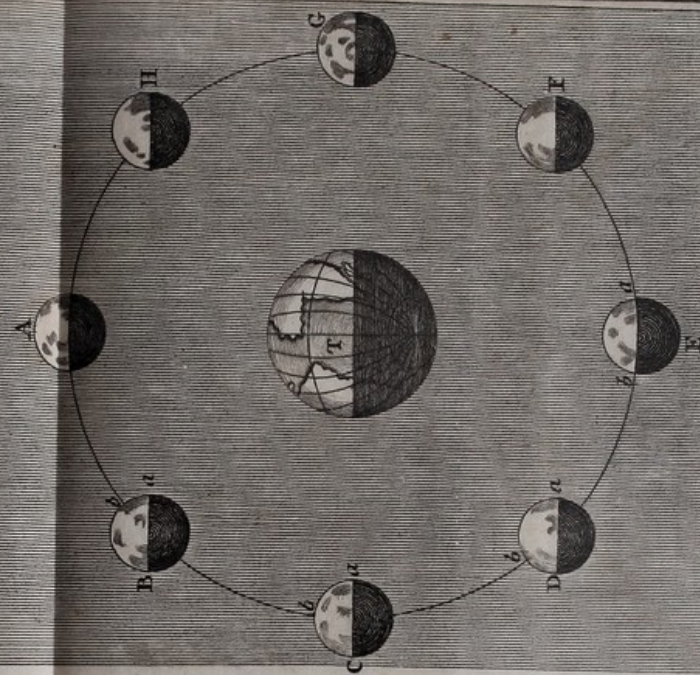


Fig. 2.

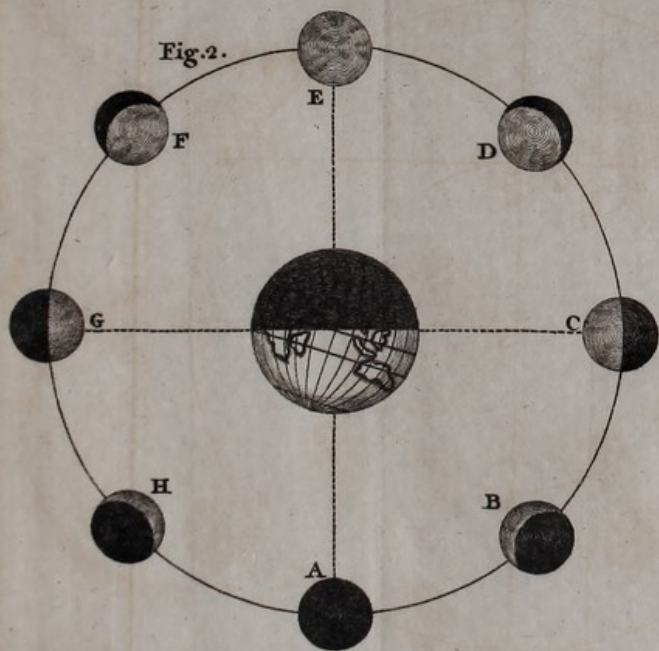
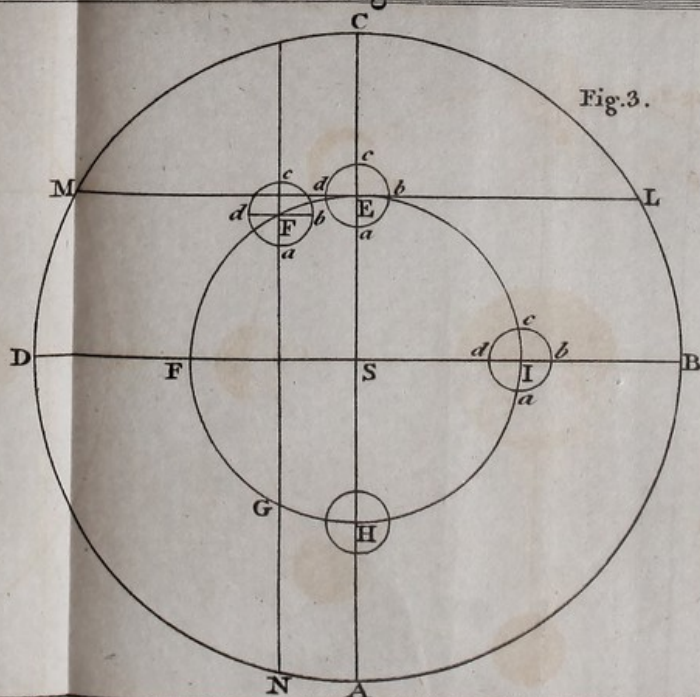


Fig. 3.



T. Milne del.

London Printed for & Published by W. & S. Jones, Holborn, as the Act directs, Jan. 1. 1799.

J. Lodge sc.

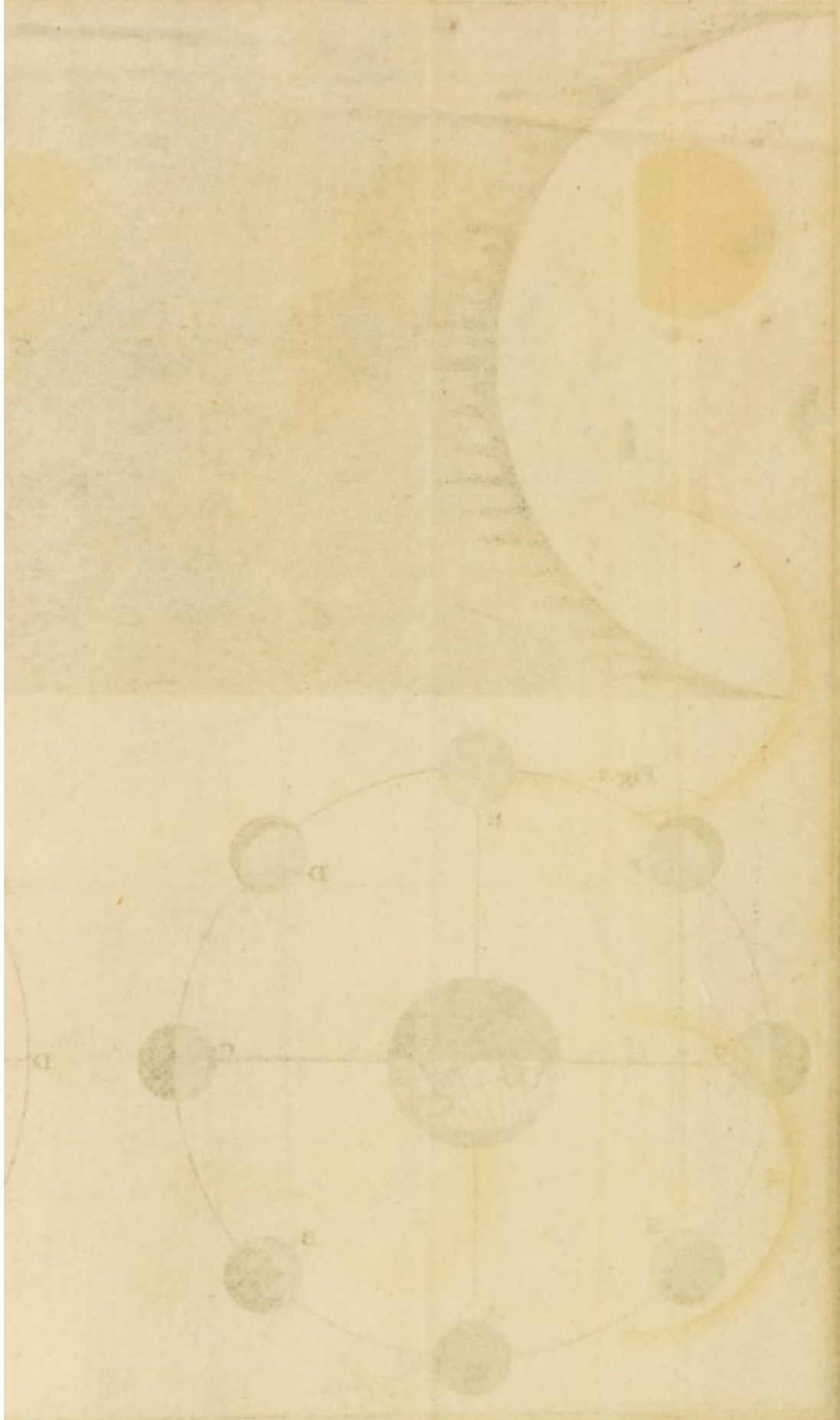




Fig. 1.

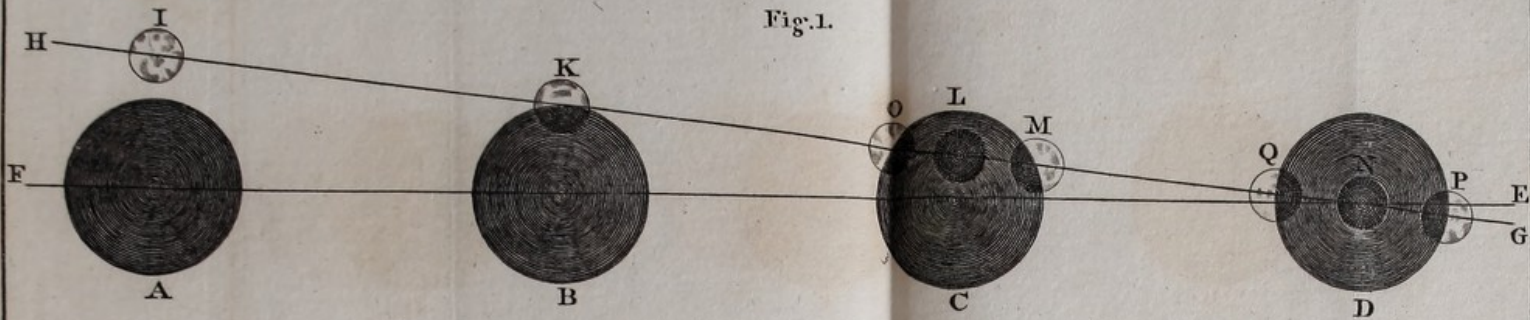


Fig. 2.

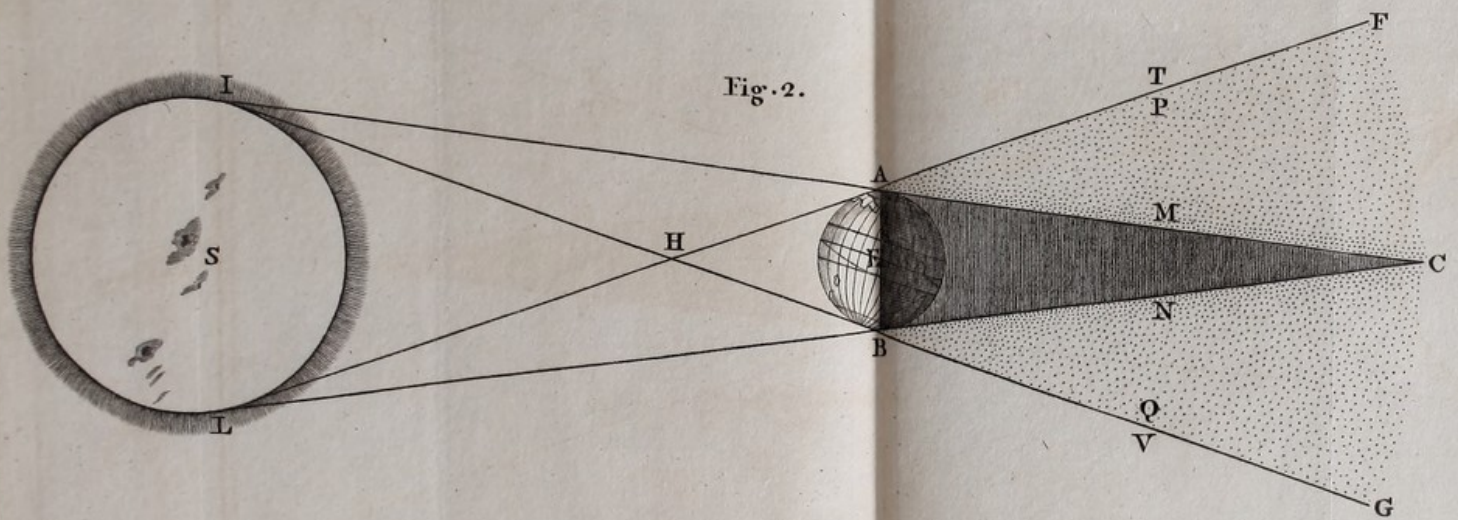
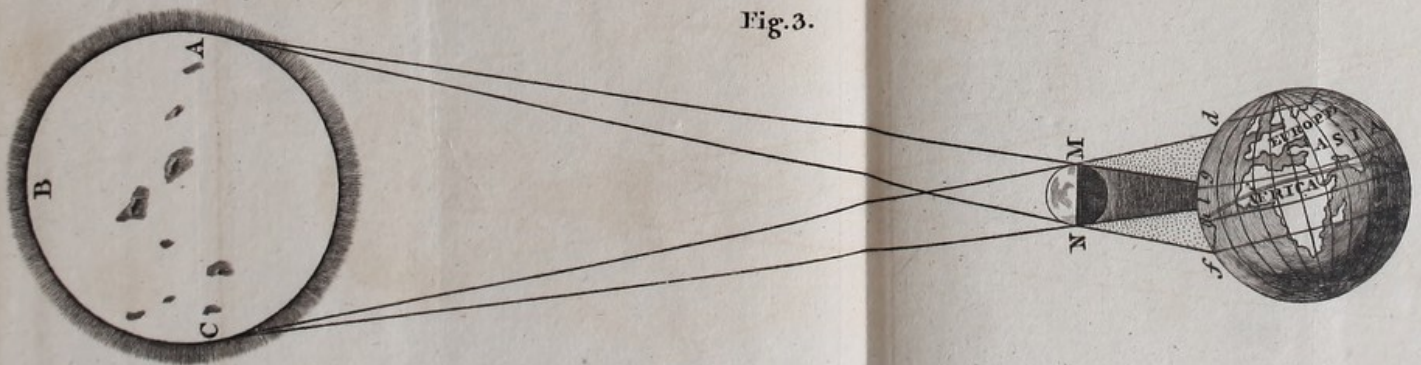
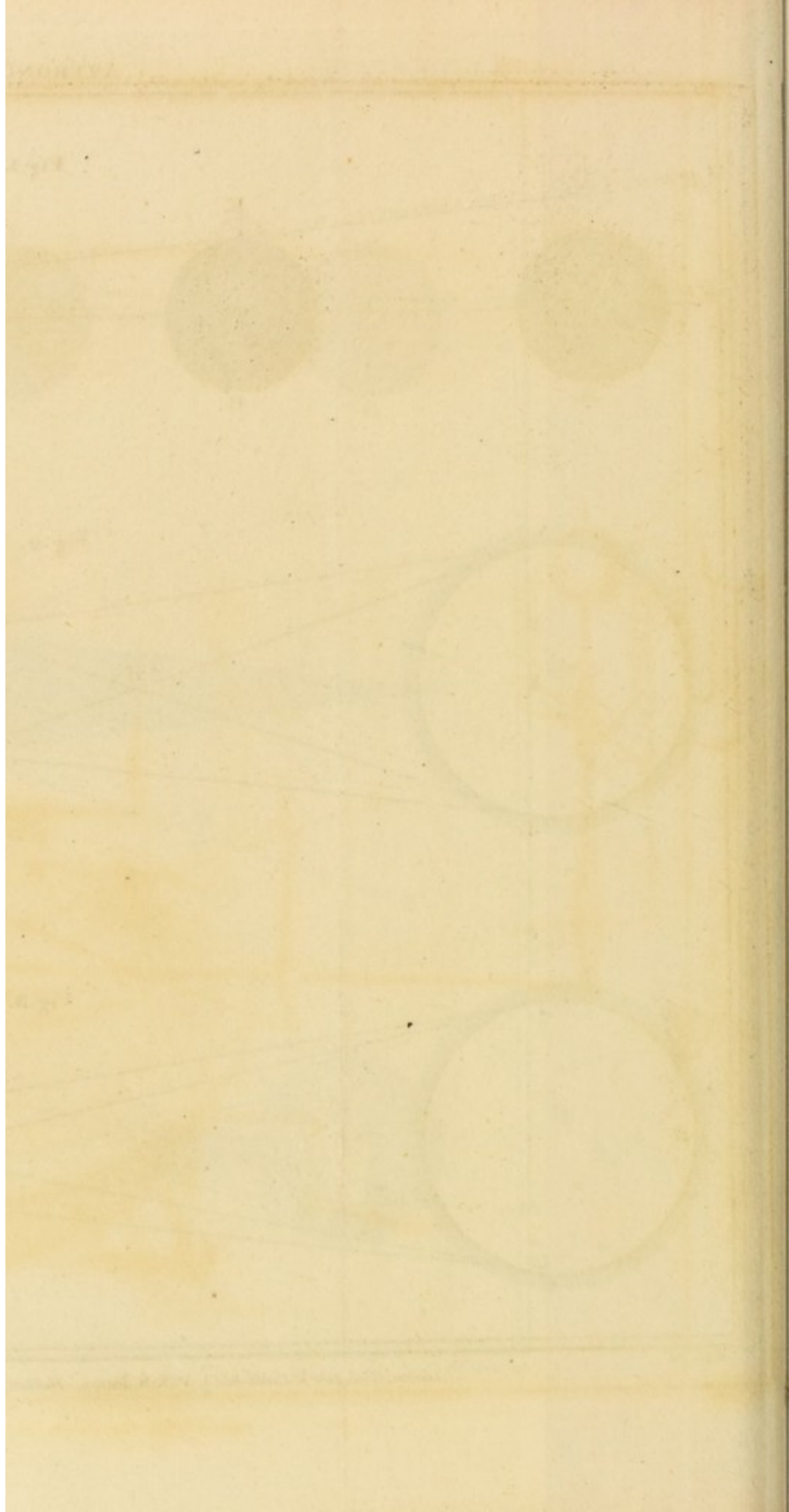
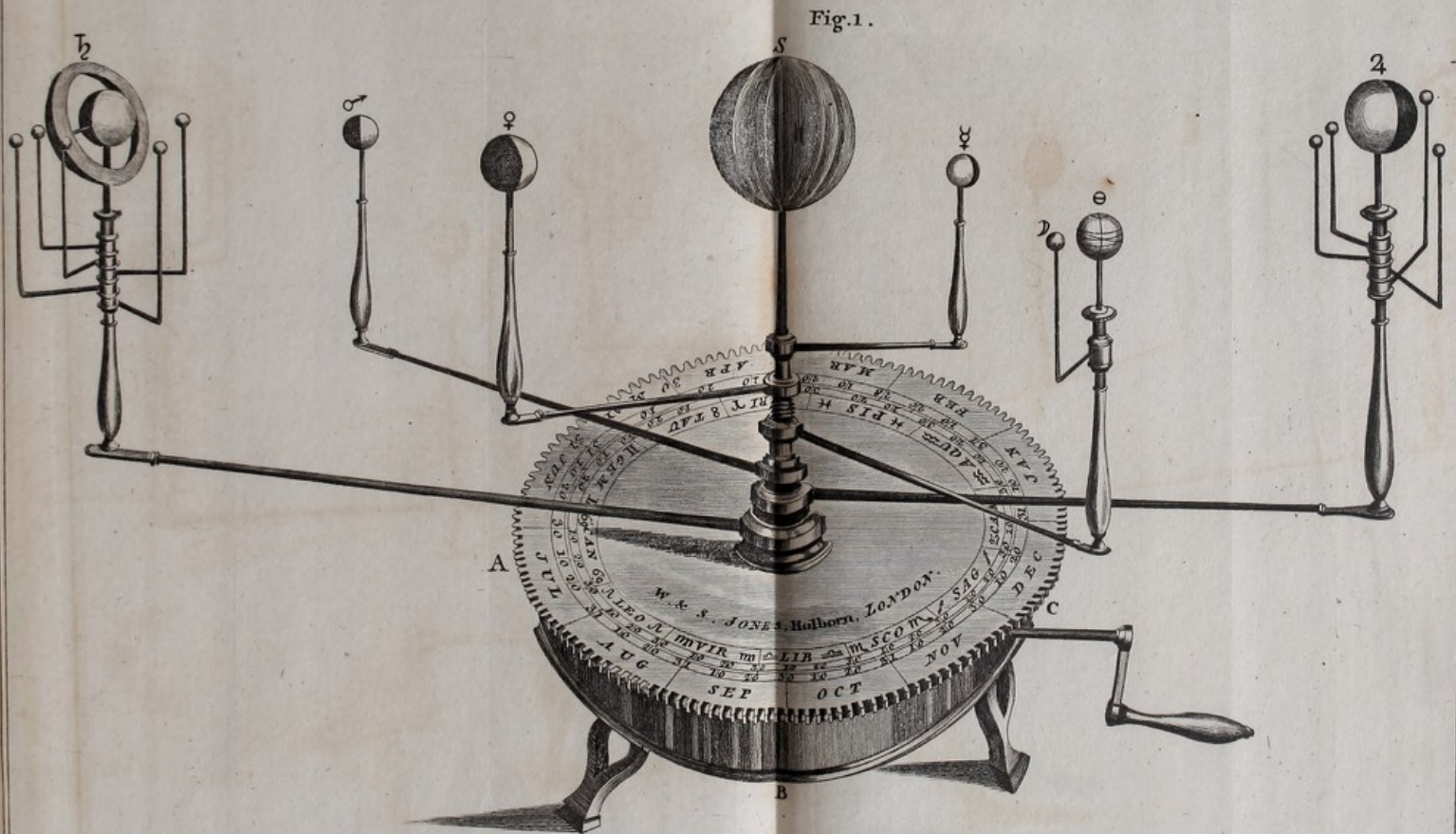
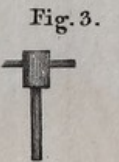
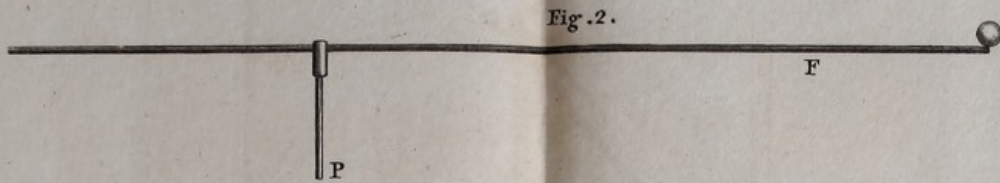


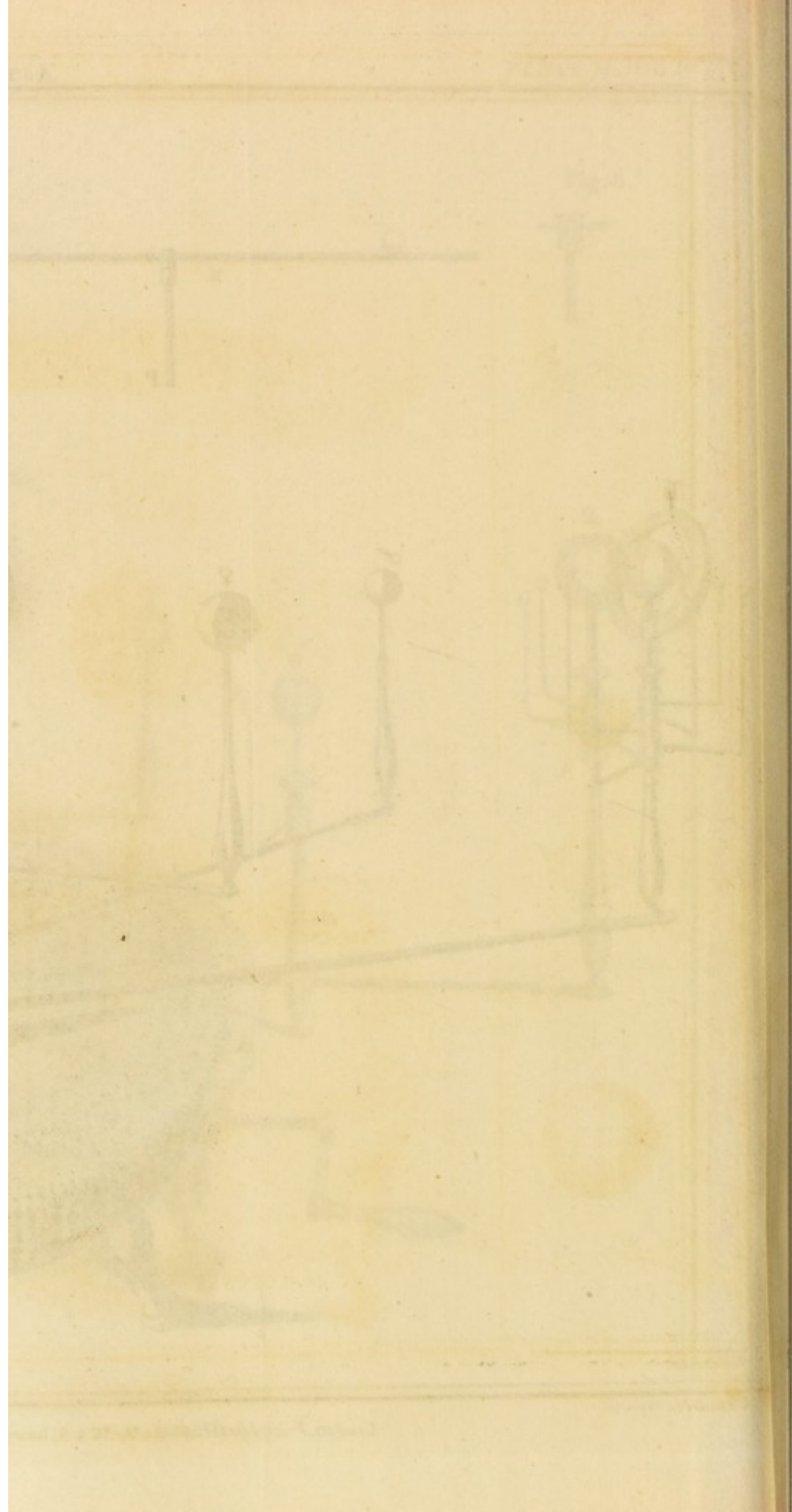
Fig. 3.



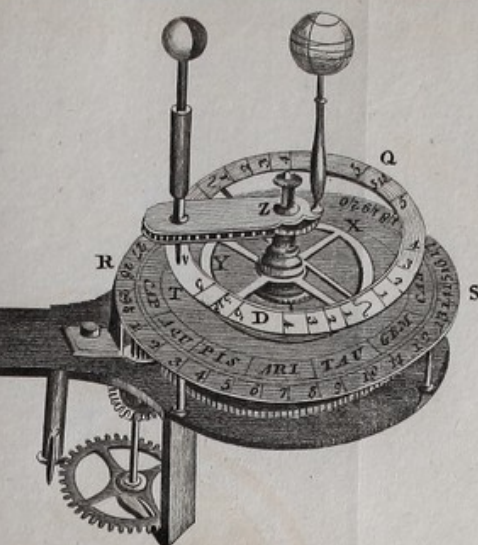
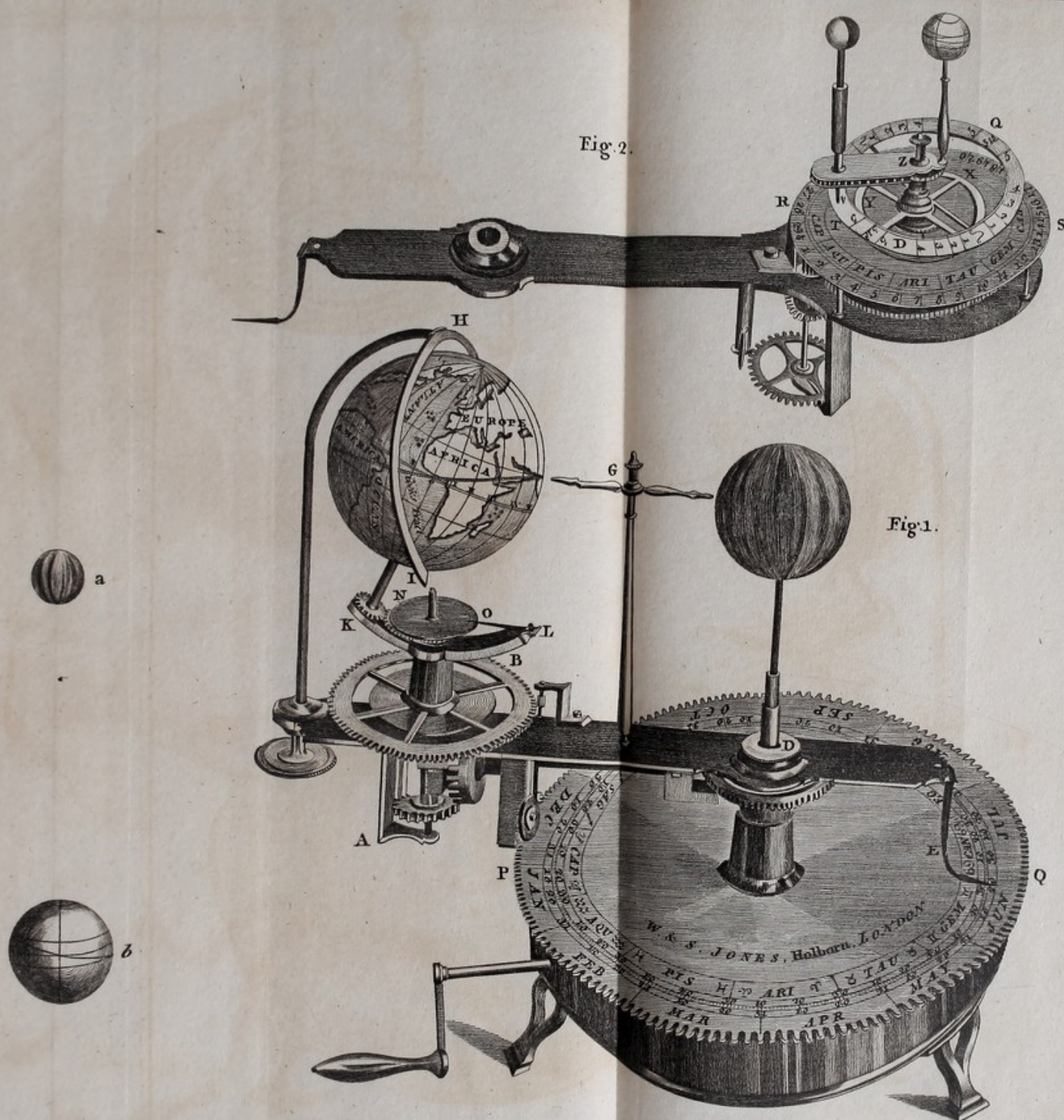












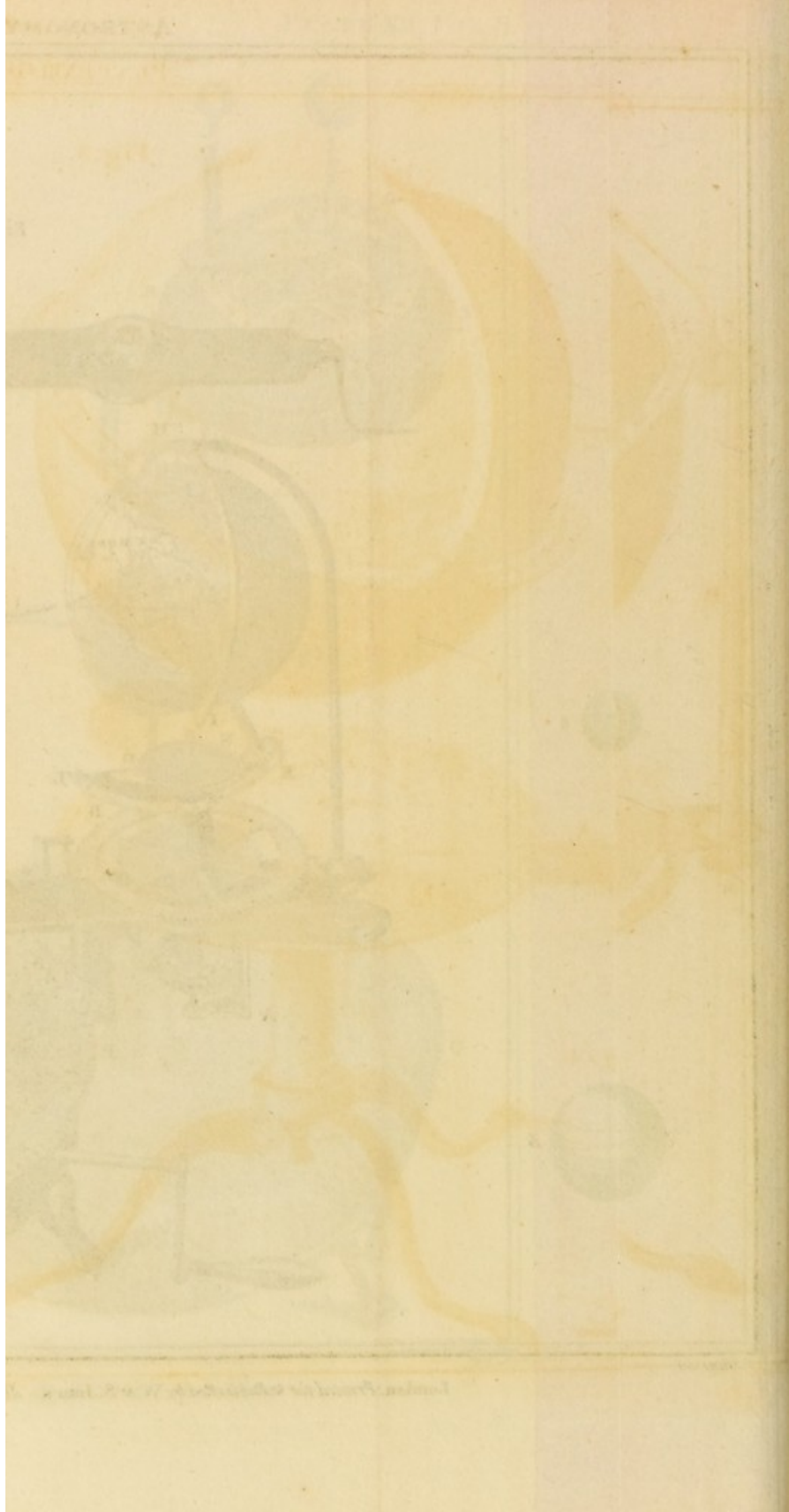




Fig. 2.



Fig. 1.

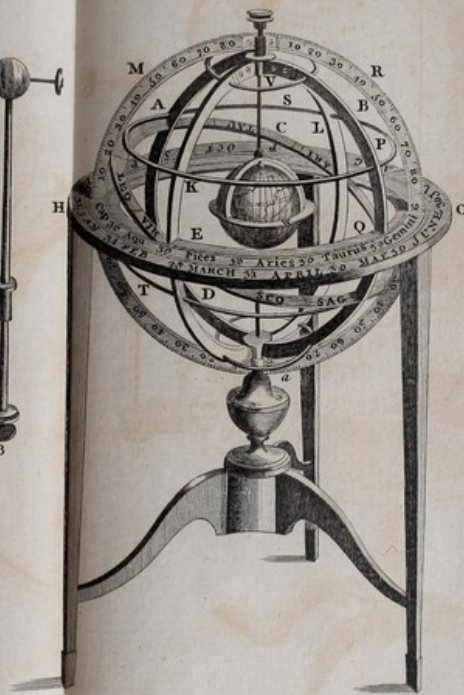


Fig. 3.



Fig. 4.



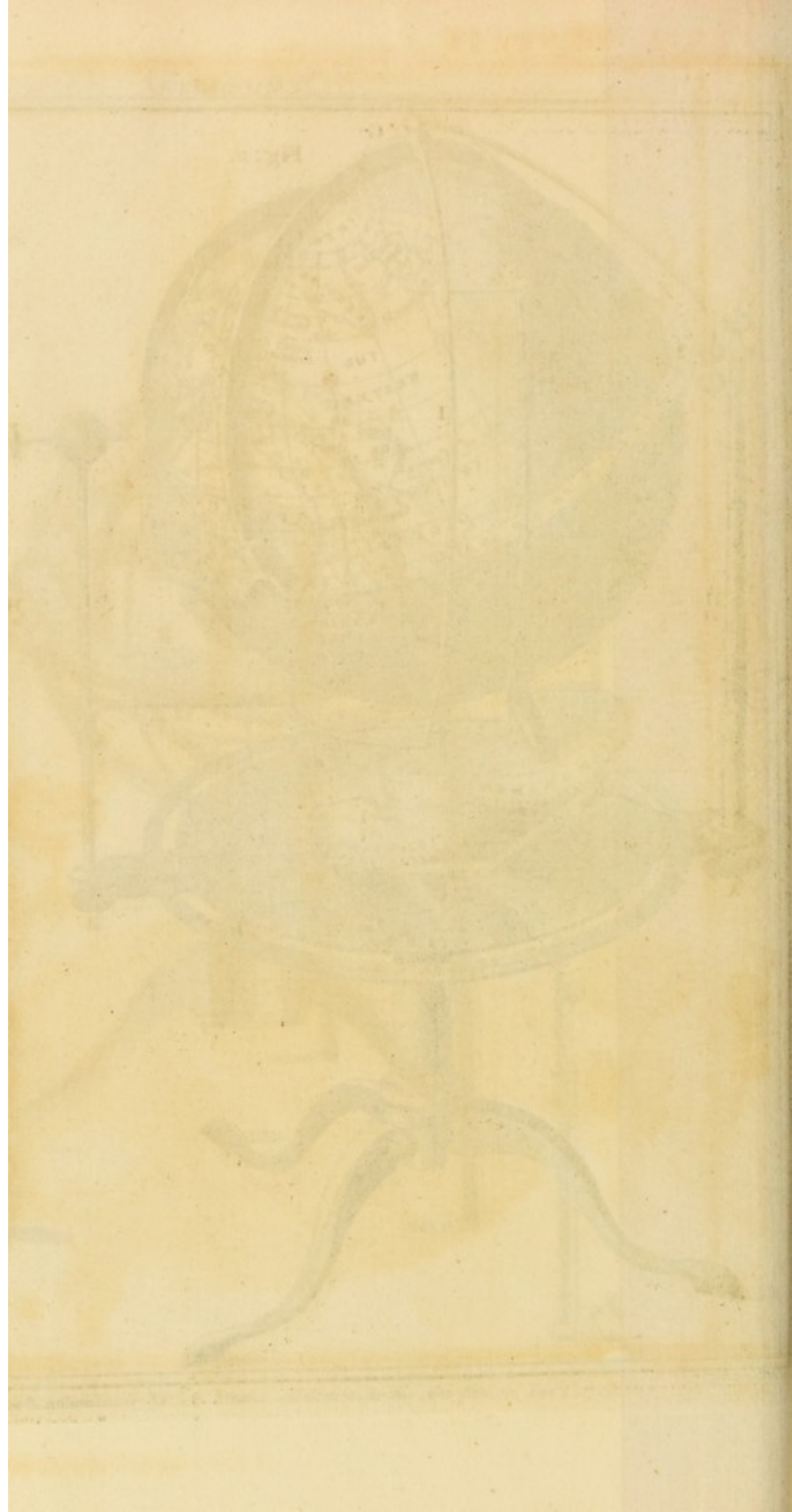




Fig. 2.

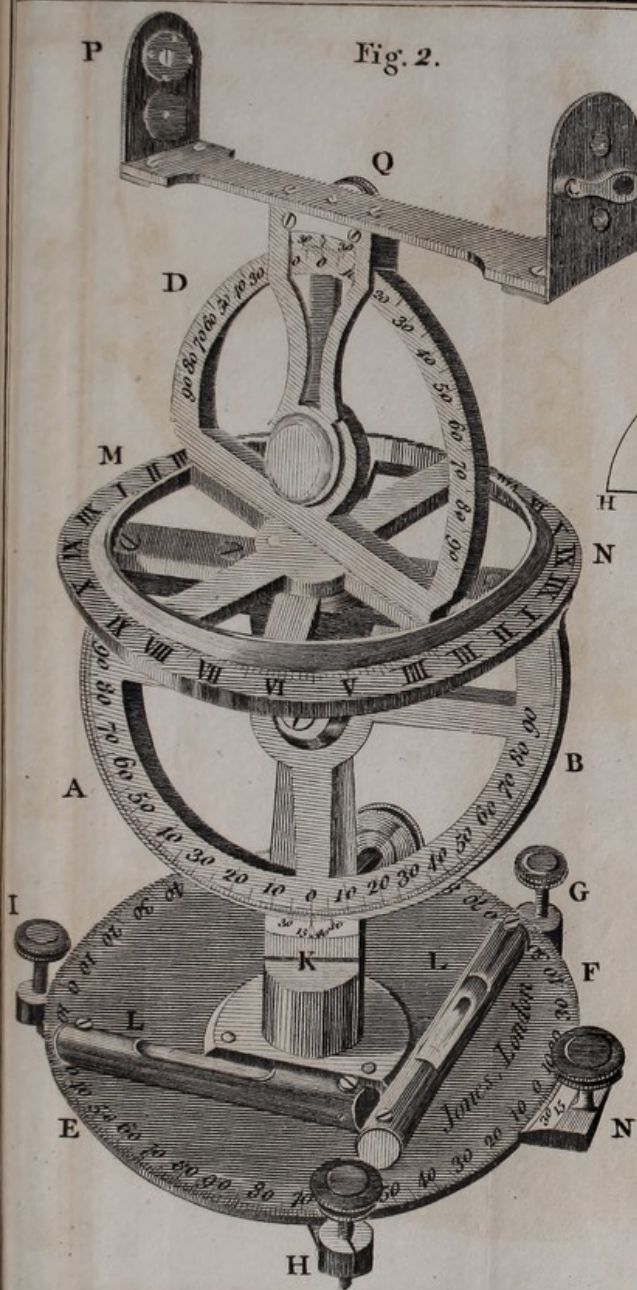


Fig. 3.

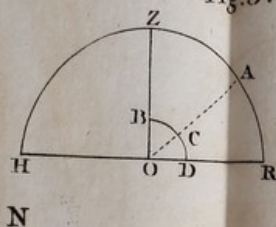
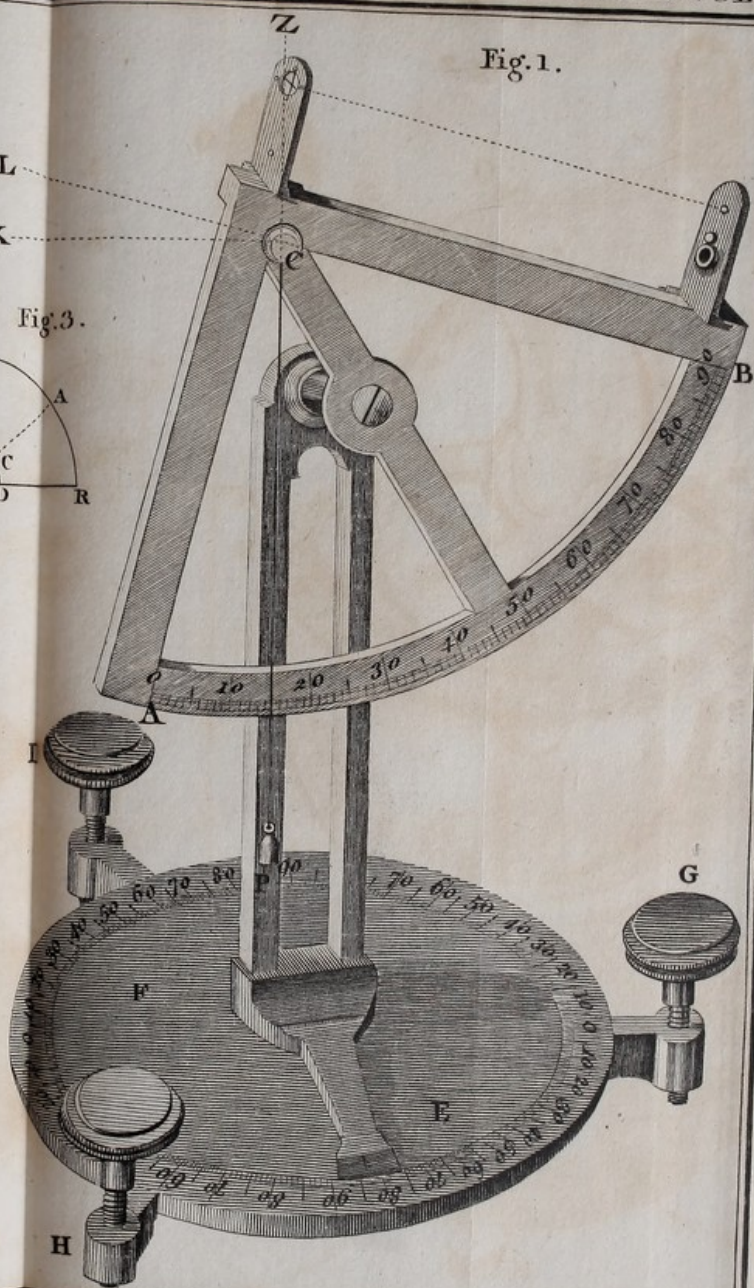
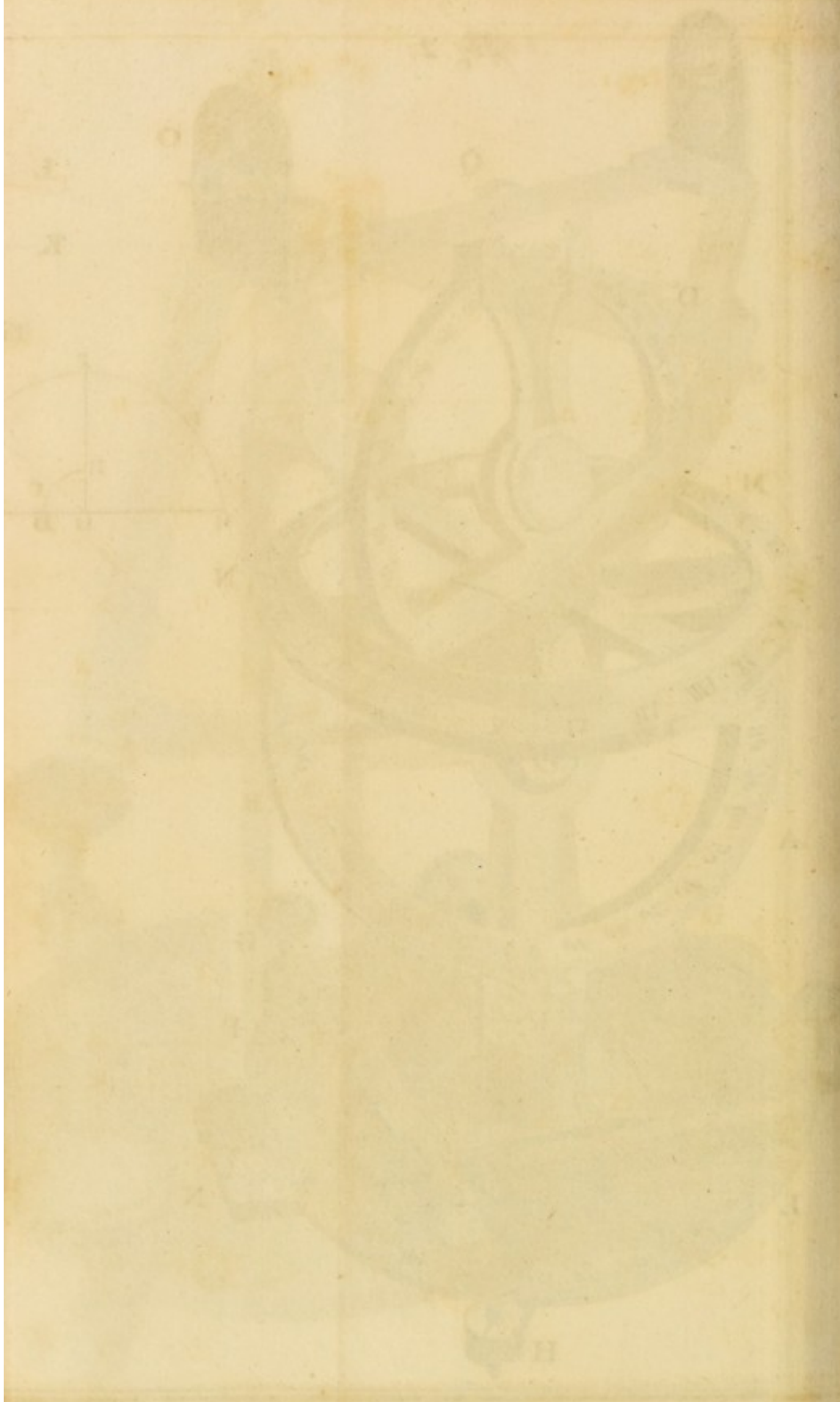


Fig. 1.

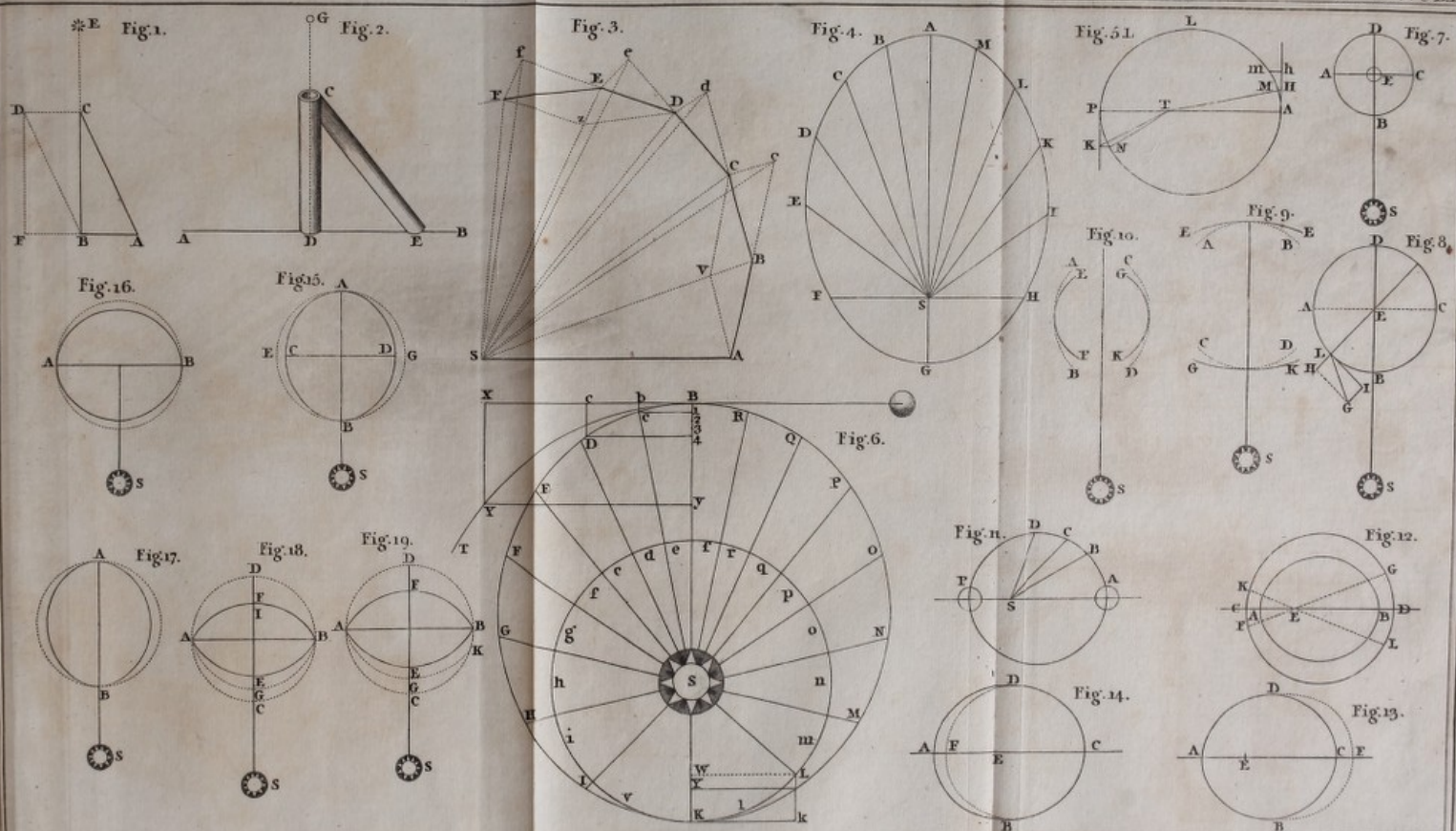


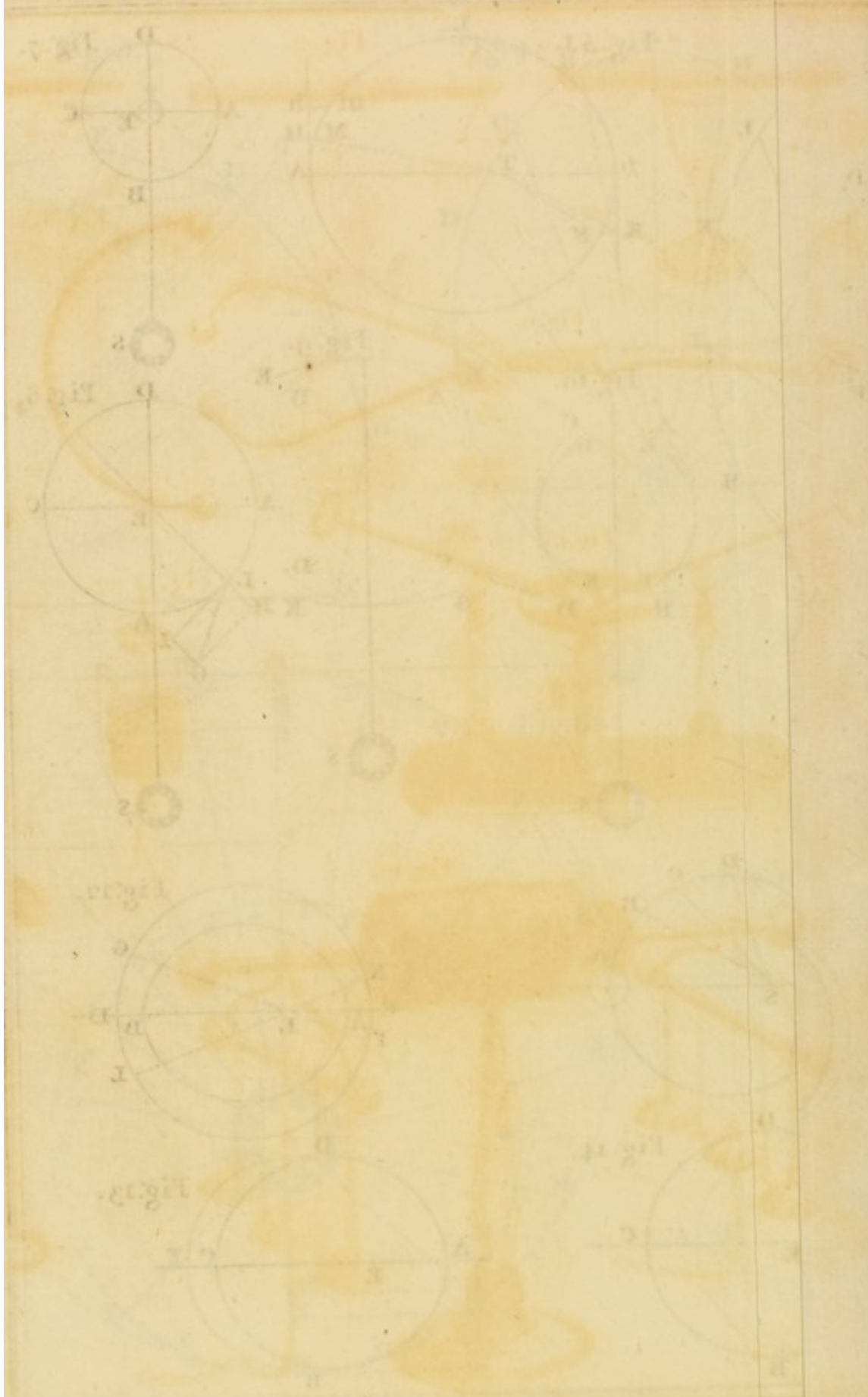
T. Milne del.

Jn. Lodge sculp.

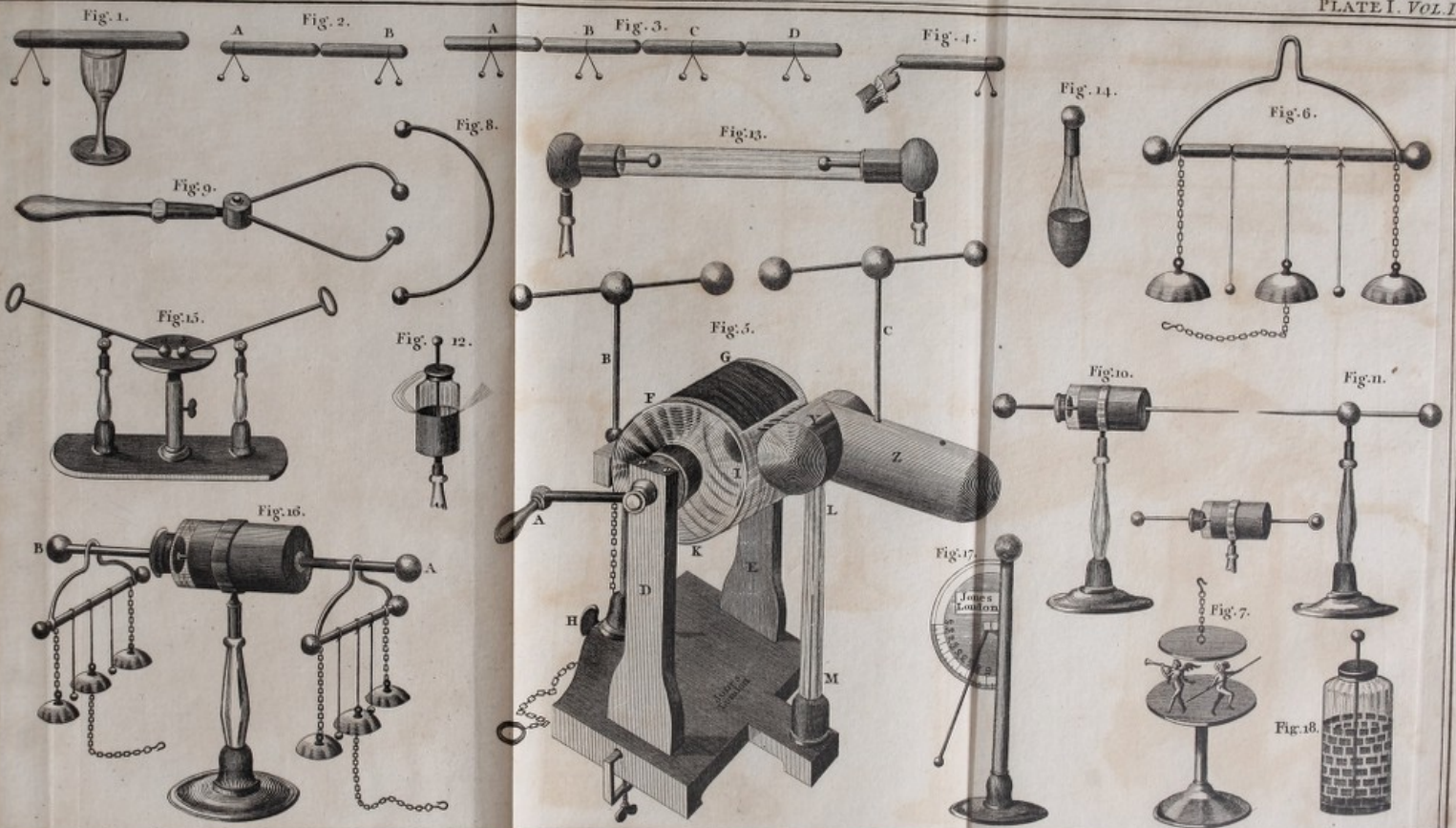


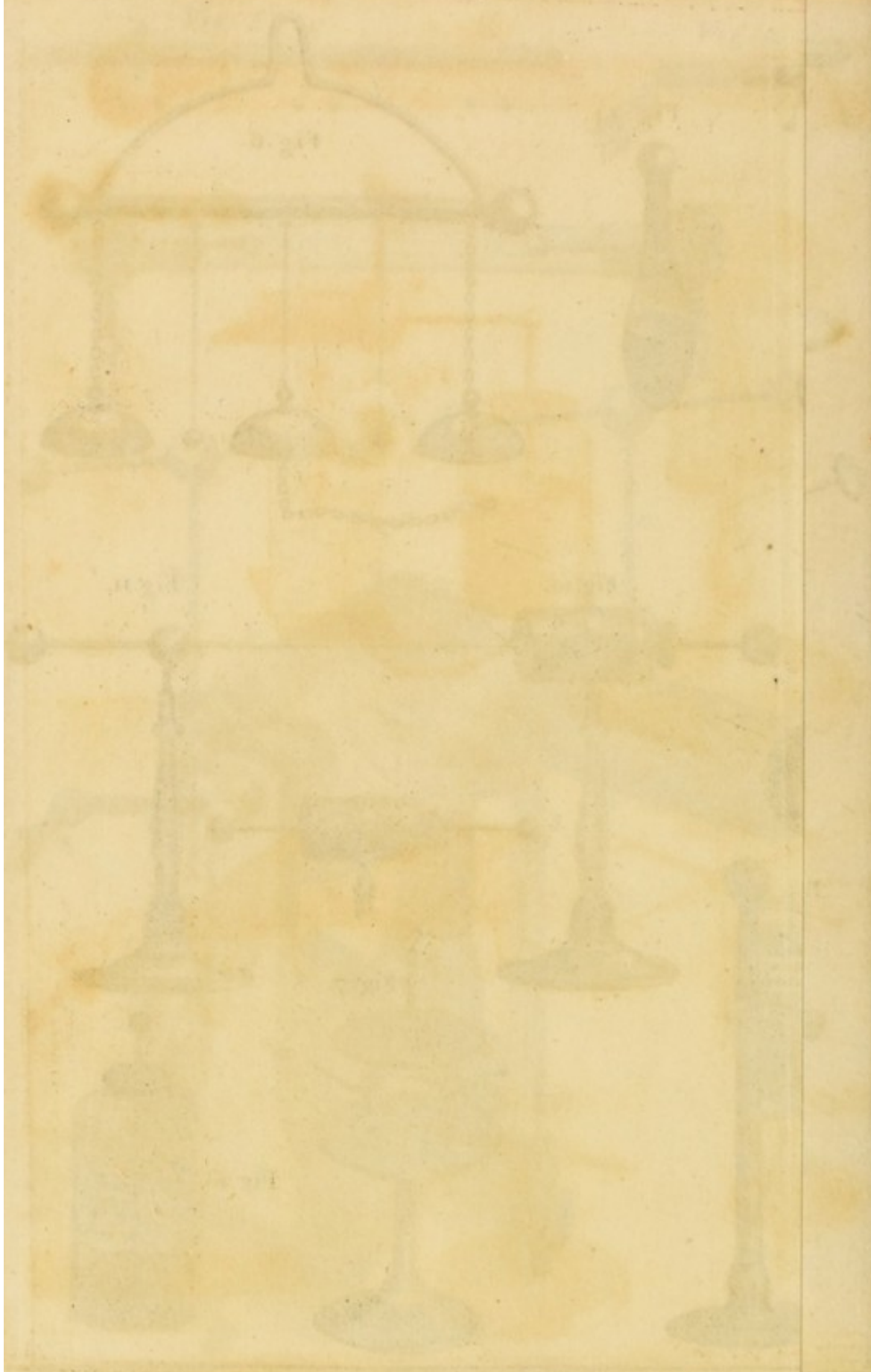














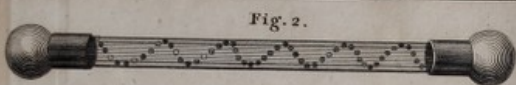


Fig. 2.



Fig. 1.

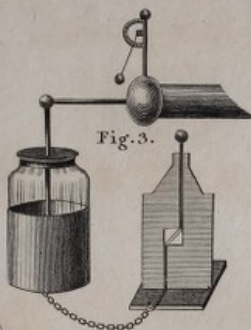


Fig. 3.



Fig. 5.



Fig. 11.



Fig. 16.

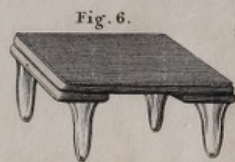


Fig. 6.

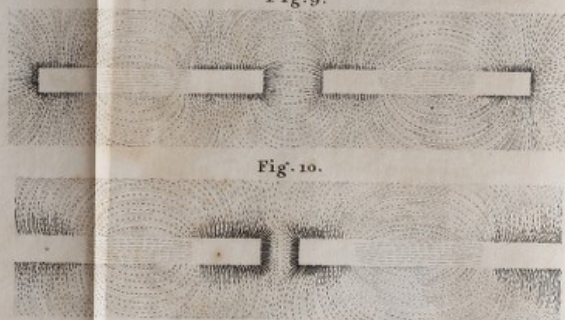


Fig. 8.

Fig. 9.

Fig. 10.

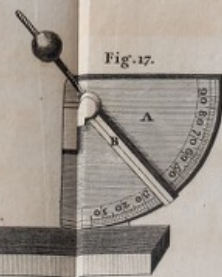


Fig. 17.

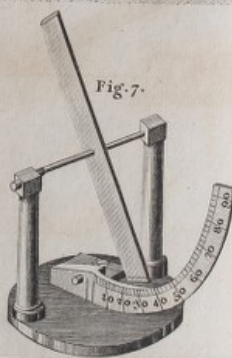


Fig. 7.



Fig. 15.

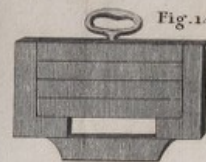


Fig. 14.



Fig. 4.

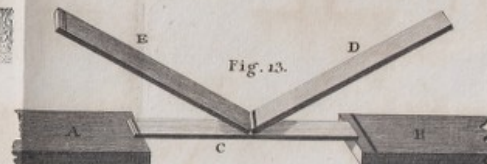


Fig. 13.

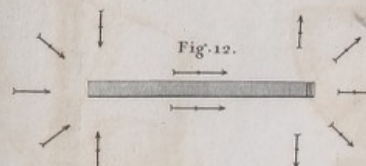


Fig. 12.

