No 1

Mechanics

1 sufficient time and a sufficient to
exert his machinery in, had been
given to Archimedes, could he have
found matter of which he have
made levers large enough to
move the earth? — As the tendency
of every body to breath by its own
weight, increases in a higher proportion
than the strength of the body,
the dimensions every given, it was
impossible for Archt. to find any
material of his globe fit for
his purpose, the lever would fail
to perform by its own weight long
before it could reached the necessary
dimensions —

2. What is the proper angle for the sails of a wind Mill? Is not Emersons determination wrong? — The best method of ascertaining this is by Experiment — Let a large model be made with moveable sails — Place two opposite sails at the same angle and the other two at a different angle and worse inclination the pair which preponderates will shew the best angle —
— Are five or more sails preferable to the usual number four? —

3. What proportion is there between the velocity of a body moving over a plane, and the pressure of the body on every point of the plane?
— A boy can slide over a piece of ice which will not bear him when standing on it —
— Newtonian Power the Canonical —

4. When a body is struck in a line not passing thro' the centre of gravity how is the ratio between the velocity and motion forward determined?

5. Is not the supposition of bodies being composed of particles, ideal? may not all bodies be considered as continuous? cannot a body be divided any where?

6. Why does the dishing in old wheels diminish?

7. What proportion do the weights requisite to draw wheels of different diameters over the same obstacle bear to the diameters?

8. In a cart or car when the axle turns with the wheel the horse is less shaken than when the wheel turns on a fixt axle, because when one wheel is suddenly stopped the other is stopped at the same instant.

9. A cart or car where the axle is fixed is turned more easily than when it is moveable, because the wheels describing circles of different dimensions, one must drag.

10. If a water wheel 12 feet in D:
turns round in 5 seconds in how
many seconds will one of 24 feet
turn round, every other circumstance
remaining the same?

4. Why does salt mixed with burning
spirits give that pale yellowish
colour to all surrounding bodies?

1. Does a water wheel move faster
in the night than in the day?

2. If the vis inertia be proporti-
onal to the quantity of matter
why is a body suspended like
a pendulum more easily moved
than on a horizontal plane?

3. In carts or waggons where a
number of horses are yoked if
one is spirited he does more than
his share of the work and is soon
wrought out.

14 If a wedge of hard wood is driven
into a Mortoise in the middle of
a beam which bulges downwards
the beam ~~~~ will be raised
provided the wedge enters from
above and the Mortoise is some-
thing narrower above in propor-
tion to the wedge than below —

15. ~~A Clock~~ A Clock pendulum was found
by Experiment to vibrate in the
best manner when the arch is
25' greater than the angle of the
scapement —

16. The pendulum spring of a Clock
need not exceed one inch in length
when the pendulum is in motion
blow the flame of a candle on it
with a blow pipe till it be blue
this is said to be a great improvement

Mr. Arnold

7. Arnolds compound pendulum consists only of five bars, three of steel and two considerably thicker of a metal compounded of Zinc, Silver and Bismuth, the expansion of which is much greater than any single metal —

8. The pendulum-ball of a clock should not be supported on its lower edge nor on either its centre of Gravity or Oscillation, but on a point between those two centres
Dr. Maskelyne —

9. What is the best contrivance for making a watch go while she is a winding up?

How are the effects of pressure and collision compared together or what proportion does the momentum of a body falling from a given

given height than to the pressure
when at rest?

21. If the pendulum of a clock has
lain for some time in a hori-
zontal position, it will gain in
the first vibration
22. When a pendulum is affected
by clock work it goes faster than
when single
23. The increased pendulum is
moved by Mr. Graham
24 Irregular pendulum by Mr
Harrison, this (pendulum) by Mr.
Graham — The theory of this
pendulum must be determined
by experiment — Variations in
the expansion of the same mat

25. When the pendulum hangs by a spring the centre of motion is perpendicularly changing and occasions a motion with and down in the cycloid — This would be remedy this by substituting the pendulum on a diamond fixed in a block of wood, a groove through the upper part of the pendulum will act on the diamond

6. It is impossible for gravity to regulate a motion equal to a long pendulum — — improvements in watches —

Theory says that the force requisite to draw a wheel in the different ratio of the axle to the wheel — has not been found by Experi-

~~grown brought down to the profession~~
~~than others~~

28. A sweep is a (disadvantage to a water wheel, Mr. H— found that with a case his hammer mill would not be made to perform above 80 revolutions of the water wheel in a minute, but after taking away the case and placing an inclined plane below, he obtained 130 revolutions —

29. Skeleton wheels should not be used where there is a scarcity of water

30. By inverting any combination of pullies it may be proved that the upper pulley gives no mechanical advantage —

31. How can matter be said to be in-
active when it exerts so many actions
& resists by its solidity, solidity is the
effect of cohesion, and cohesion depends
on attraction, and attraction the effect
of activity

2. In any system of mill work
Cog and Cog is better than Cog &
Trundle — Friction Less — grain of
the wood in the staves of the Trun-
dle cross — staves gears & Cogs —
— In Trundles it is an inconve-
nient to make the staves turn
on their axis —

The following composition will
greatly diminish the friction of
wood on wood — into a quantity of
oil stirred on much black Lead as
will reduce it to the consistence of
Cream paste

Musk Paste add a small quantity of bees wax to give it consistance

34 A Body should move ~~through~~ about 32.4 feet in a second according to Mr W—+

35. In Coxes museum the streams of light were made with rods of twisted glass turning on an axis —King and Queen—

36. A Stone Mill for Bark round should be at least 18 Inches broad and very heavy. the Range of the circle should be small the stone will then act partly, as a Muller—

37. A body pushed or drawn forward on the circumference of a roller moves through double the space which the roller moves through—

28. If two pieces of wood be planed clean
and flat and a piece of blotting paper
touched in weak glue be put between
them, they will adhere with sufficient
power to allow them to be turned
or raised by any figure. They may
26 afterwards be separated without injuring the other. This is very useful
in making the Cornice sections and
many other mechanical contrivances

9. The best length of a Pendulum
Crutch is about 15 Inches and
should be made of hard steel to
prevent as much as possible the
expansion —

0. In the Pendulum Pendulum no
correction is introduced for the
Crutch —

41. What is the best method ~~of~~ of proo[ving]
the accuracy of the Quadrant, Azimu-
Inm?

42. Chain pumps are of the same di-
mensions in all the rates they
is $6\frac{1}{4}$ inches bore. The ships have
a greater number in proportion to
their size from 1 to 8 – 6. Sloops
have hand pumps

43. Much power is lost in the Chain
pump at 20 feet, 20 men are
required to work it properly and
the quantity of water does not ex-
ceed one Ton ℘ minute. It is
also very often out of repair –
– late improvement of Mr. Cole
has rendered the taking it to
pieces more easy than formerly.

No 2

Mechanics

4. Cole's improvement on the hand pump consists in placing an opening below to take out the lower piston without drawing the upper or moving the pump

5. The patent pump has both pistons moveable the rod of one passing thro' the center of the other. It is said to raise twice as much water as the common pump

6 Suppose a chain pump raises 1 Ton of water in a minute Then the Chain of 23 Inches Diam. must turn 26½ times, consequently in length of Chain equal to 165 feet must pass to give a Ton. 15 Gallons are displaced by the Chain. This

pump cannot be repaired without drawing, if there is above 3 feet w in the well-hole —

47. A pump with three pistons p to a box which includes three dou valves will make a continued str of water and raise it is said more than the Chain by the same no. of hands — model

48. Water mills were in use among the Romans. The remains of one were lately discovered at Manches

49. Machine for making combs it cuts all the teeth at once —

59. What is the principal advantag of bevel gear over common cogs?

60. In capillary attraction whether is the water suspended by the uppe or lower annulus? — Lower —

Dimensions of Carding Machine made on a Scale of 9 Inches to the Foot

	Ft	In
Diam^r of the Large Cylinder	2.	2
Ditto Ditto —	1	7 1/2
Length of both ———	1	2
Length of cards on the G^t Cyl^r	1.	——
Breadth of Ditto —— ——	0.	3 1/2
No of Rows ———		
Distance of cards ——	0.	1 1/2
Two Bevelled Tooth Wheels on the Axis of the Great Cyl^r the other on the iron Shaft no^o of Teeth in each ———	}	14 Teeth
Two Wheels for the endless Screws on the Oblique Shaft	}	40 Teeth
Pulley on the Shaft of the Great Drum —— ——	}	0. 8 1/2 Diam
Ditto on Upper with three different grooves ——	}	0-6 ——
Ditto on Cards Diff^t grooves		2 1/4 Do^s

	Ft	In
Pulley on lower roller Diam. grooves —	0 .	2 —
Diamr. of the two discharging pullies — —	0 .	3 1/4
Crank —	0	6 1/2
upright part of the crank —	1 .	3 . 0
Horizontal part —	1	0 — 0 —
Around grooved part	0 ,	10 —
nine stuff cords abt. 2 Inches each —	1 .	6
Spiral cords on the little Cylinder 7 breadth close together —		
Two feeding rollers the upper one fluted the under plane	0 .	1 1/4 each

weight hung on each end of the upper roller — The hind Cloth rollers of woo

The instrument for separating and
taking off the cotton moved by the
Crank, Describes the arch of a circle
its truth

2\. The roving machine of Arkwrights
cotton mill ~~[illegible]~~ has a Velocity
of about 5 to 1. – Two kinds Cans
with and without rollers, In this
as in all the other systems the
front roller is usually made Larger
than the rest behind. This circum-
stance must be attended to in
the train ——

London April 1787

3\. Machine for watering Lawns, Linnens,

4\. Machine for pumping a Ship
by the motion of the Ship

— Wind Chariot —

65 Patent Stove for warming a roo[m]
with air purer than that of the
atmosphere — Curved retort wh[ich]
salt petre — unclose —
66 Doctor Mouths blow pipe ap-
paratus consists of two small dou[ble]
pair of bellows connected with each
other, between which are two wo[oden]
tubes for letting in air, to these ca[n]
be screwed bladders filled with in[flam]
flam^ble or Dephlogisticated air. The
pipe is on ~~the~~ left hand side
and has both a vertical and
horizontal motion —
67. Rotative motion may be produ[ced]
by two wheels on the same arbor
both move on the axis, sides ne[xt]
each other are hollow, thick ratchet whe[el]
fixed on the arbor two stops, a Dou[ble]
rack, teeth not directly opposite, bu[t]

distant the thickness of the thick
teeth of both sides of the teeth in the
thick at the other end ——

8. If two springs could be contrived
of the same strength and equally
affected by heat and cold. Then yet
a double watch be made to go
should direction the mean time
to the true ——

9. If a pendulum rebates in
proportion to its length will not
any regard to weight, why
should a diminution of gravity
produce a slower motion at the
Equator?

The Thermometer affixed to the
new Chronometer can now pro-
duce their effect unless the

watch was regulated previous to the application of the Thermometer

71. It is affirmed by some Clock-makers that soft pallets will wear longer than hard ones.

72 Some Clockmakers make their Scapement such that the plane of one pallet passes when produced thro' the point of the other

73 The Maundrell of a Lathe for polishing buttons is of Steel the Collar of ~~Tin~~ Pewter, wear long 14160 revolutions ℘ minute — It is a foot Lathe — wheel 31 In in D^r. pulley ½ Inch velocity of the foot wheel 180 ℘ minute

4. A new method of conveying a
circular rotary ~~motion~~ motion
exhibited at the Royal Society
9 June 1787. — This is performed
by means of an Elliptical groove
on the surface of a Cylinder —

5. Method of supporting a horizontal Shaft on friction Rollers
— Marine Barometer — How to
boil the mercury in any part
of the tube without risk of breaking
it — Clock with one wheel, shewn
10. Hours and Minutes

Circular plates of the same
thickness are equally strong
whatever be their diameters.

78. Nailing machine for belows
a small cylinder of steel with
a handle, held a little obliquely
like a turning tool—

79 Best wrench for fixing chucks
on the Lathe a circle with
a small edge corresponding to
to a groove in the chuck—

80. The wheels of turning lathes
should be made of cast iron
with axes with cylindric not
conical gudgeons. The latter
act as a wedge and greatly in-
crease the friction—

81. The common mode of comparing
the effects of a Battering ram and

cannon, tho' mechanically true
is not just when applied to practice
the slow motion of the ram is an
advantage —

22. The principal advantage of a gold pendulum spring for a watch is that it does not rust — Query is not the gold mixed with some other metal? —

23. Machine for washing gauze lace fine linen &c —

24. Wyatt's Lathe for turning bone or ivory moulds for buttons —

25. A machine for drawing Epicycloidal teeth for Large wheels

26. In what proportion does the resistance of the air increase :: height 5

87. Does not Borkowski's Theory lead to this that motion is inherent in matter?

88. It is asserted by Millar that a watch should move with greater velocity during the night than during the day — If so prove the cause —

89. Will the balance of a watch be affected by the Earths motion in different Latitudes similar to that of a pendulum? Will the watch go slower at the Equator?

90. The wheels of the Roman carriages (were exceed) 2½ feet in diam. the Roman shewed great skill and ingenuity in their Fortifications, is not this a presumption

that they were right in the use of their wheels? — Should wheels of this use be introduced what a great saving both of iron and wood! —

1. The invention of the balance is attributed to Astrea, the goddess of justice, always represented with scales in her hand, the instrument was placed among the constellations — reason — The Astrea Romana is mentioned by Aristotle under the name of Rhadamys. Balance — Libra — with regard even early and hence Aristotle mentions Zygostatai or officers to look after the balance — could abuse — The Jewish Standards were kept with great religious ceremony in the Sanctuary and the care

committed to the priests and levit[es]
92. The invention of the Lever is ascrib[ed]
to Neptune, and is represented by
his trident. In greek both are called
by the same name ~~triaina~~ Mochlos
— The property of the Lever W: P::d: D
is mentioned by Aristotle in his
treatise on Mechanics — Archimedes
— Vitruvius — Aristotle calls the
fulcrum Hypomochlion, vitru-
vius Pressio, Ubaldus fulcimentum
and Dan: Barbarus scabillum.
93. The axis in peritrochio is by
Aristotle called Onos —
94. Two pullies above and two below
called by Aristotle dispastos, three
Trispastos — Latin Cochlea pull[ey]
95. Is it not equally reasonable to deman[d]
a definition for rest, as for motion?

The former has never been attempted
why then the latter? —

96. What change takes place in the
vibration of a pendulum, when the
point of suspension is higher than
~~the~~ the pallets?

97. The Chariot ~~to~~ go without horses
was invented by Mr. Richard a Phy-
sician at Rochelle and was exhibited
at Paris more than 100 years ago.
it is described by Ozanam in his
Recreations Mathematiques

98. ~~Vessels~~ Carriages to sail on Land by the
wind are said to be frequent in
China — wheelbarrows with sails —

99. Two sympathetic clocks which
go and stop alternately —

100. A Clock is best regulated by a
screw at the point of suspension this
may be done without stopping the Clock

101 The velocity of a body may be in-
creased to such a degree that the friction
will thereby be diminished - the eminences
have not time to drop into the cavities
102 If attraction be hurtfull in many
cases there are some in which it is
usefull - Files - &c -

103 A Gun discharged on the water or
from one side of a river to the other
is said to carry a ball not so far as
on land, owing to the resistance arising
from the vapours of the water - This
is a vulgar error arising from a wrong
estimate of distances ~~at sea~~ on water,
which to a landsman always appear
less than they realy are ——

No 1

Instruments

1. Mr Cullocks small Instrument for laying off right angles consists of a brass cylindrical box with a plane mirror placed at an angle of 45. with the sight vane ——

2. A new glass vessel with these cork and leaden balls added to the whirling machine ——

3. Tide table added to the whirling machine ——

4. Mr De la Hires pump the water vessel by the ascent and descent of the piston ——

5. Rope pump said to have been invented by Dr Franklin

(N. B. This I have since found to be a mistake, it was invented by a common letter carrier in Paris

6. Exp. of the Dutch smokers may be much improved ——

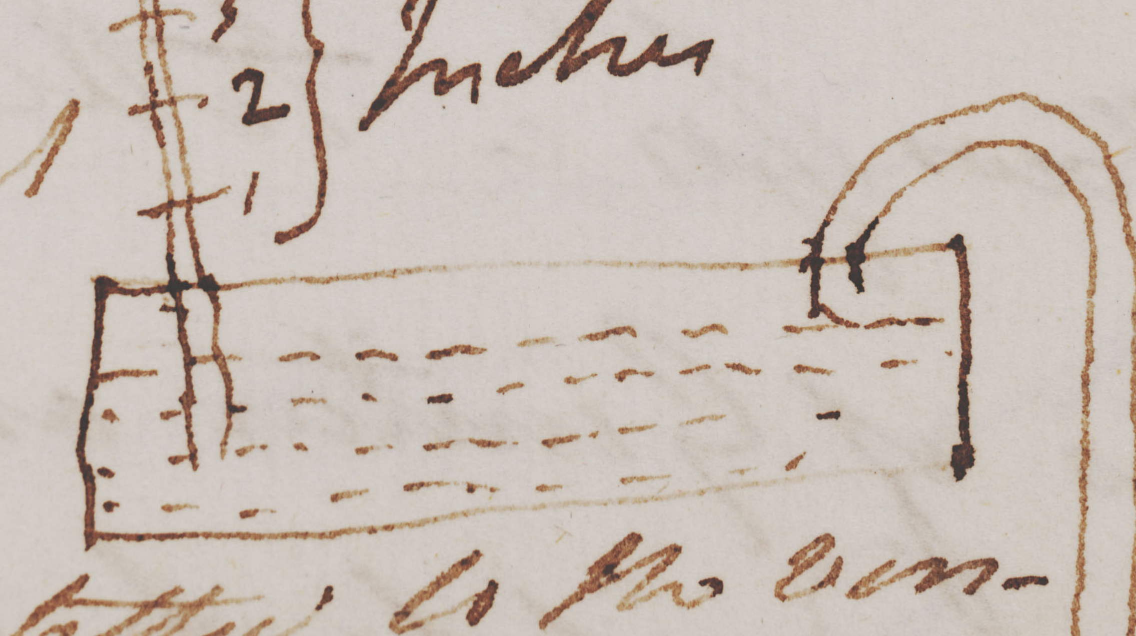
7. Martin's Apparatus for exhibiting
~~the~~ Phenomena of the Transit of Venus
in 1769. extremely well adapted to
ye business — (Description. —
8. Nairn's Air pump raises the
valves without the aid of the
spring of the remaining air
9. In a rolling press the smaller the
rollers are, ~~the better~~ — Small rollers
may be inclosed between large ones
10. In Ferguson's Paradox, ~~the~~ the fixed
wheel has 39 ~~teeth~~ the middle
~~thick~~ wheel 39, the undermost of the
three on one axis 39 this produces
the Parall: of the Earths axis. The
middle wheel has 37 this carries
the moons nodes. The uppermost
44. This goes forward and carries
the moon's apogeal point
for return the Nodes revolve in 18 yrs
and 225 days, in the Machine in 18½ y^s

The Apogeum in nature revolves in
8 yrs 312 days; in the machine in 8 4/5 years
The Part. of the axis is perfect in
~~the~~ machine.

11 Electric Powder Magazine compound
of pieces joined ~~with~~ hinges, may be
blown up either with G. P. or inflam.
air Oct. 1786

12 Zurich bridge — Hair Hygrometer
Mill room — Bucket wheel — Rope
pump — Thunder house & Mortar
with a bladder tied over it — Saw
mill — Pallets — Albion Mills — Organ
— Moment of a light and heavy body
floated in water — Pulleys and Glasses for
the Whirling table —

3 Anemometer for an organ



by this Inst. the :: of wind is ascertained by adding more or less weights to the bellows

tube B fitted to the wind-chest of the Bellows
three inches of water in the tube A is sufficient
for any size of an organ

14 Scale for the configurations of
Jupiter's Satt:s

15. Whether is a great or small dist:
of the sight vane from ~~the~~ horizon
glass, least liable ~~to~~ error in ~~the~~
sextant?

16. By a good Sextant and ~~Watch~~ the
Long:de may in general be found to
within 10 or 15 Miles —

17. A circular Saw for cutting out
wooden tubes for Telescopes — Three
or four tubes cut out of each other

18. The cutting press answers for
heavy work but light better done
with ~~the~~ a little hand machine —

19. What is the best form of a
pair of bellows for a table furnace?

20. The divisions of Gunter and other
scales are made black by rubbing

the scale, when finished with lamp black. ———

21 Various Alarums —

22. — Contrivance for keeping a hot house always at the same temp:r — will give notice to the neighbourhood when the fire is neglected

23. A pump to raise water by fire — air rarified within a cask —

24 A short Thermometer tube is preferable to a long one, the perpendicular pressure causes the ball to change its ~~shape~~ figure, hence ~~the~~ mercury stands lower when ~~the~~ it the thermometer is in a perpendicular than in a horizontal position — Mr. Ramsden —

25 The Lapidaries wheel is a simple

instrument — For seals of all sorts a leaden polishing plate with Emery is used. The Stones or seals are fixed on the end of a little stick, and the different surfaces are ground without either rule or measure

26. Some of the Stopcocks made use of in the Philosophical fire works are wound with thin cloth proba-bly to prevent the ~~[illegible]~~ passage of the fire into the bladder

27. Saw at Doctor De la Roche's an instrument for measuring the angles of Chrystals

28. Steel and flint for striking fire in Vacuo

29. A condensing machine enclosed in a bone case

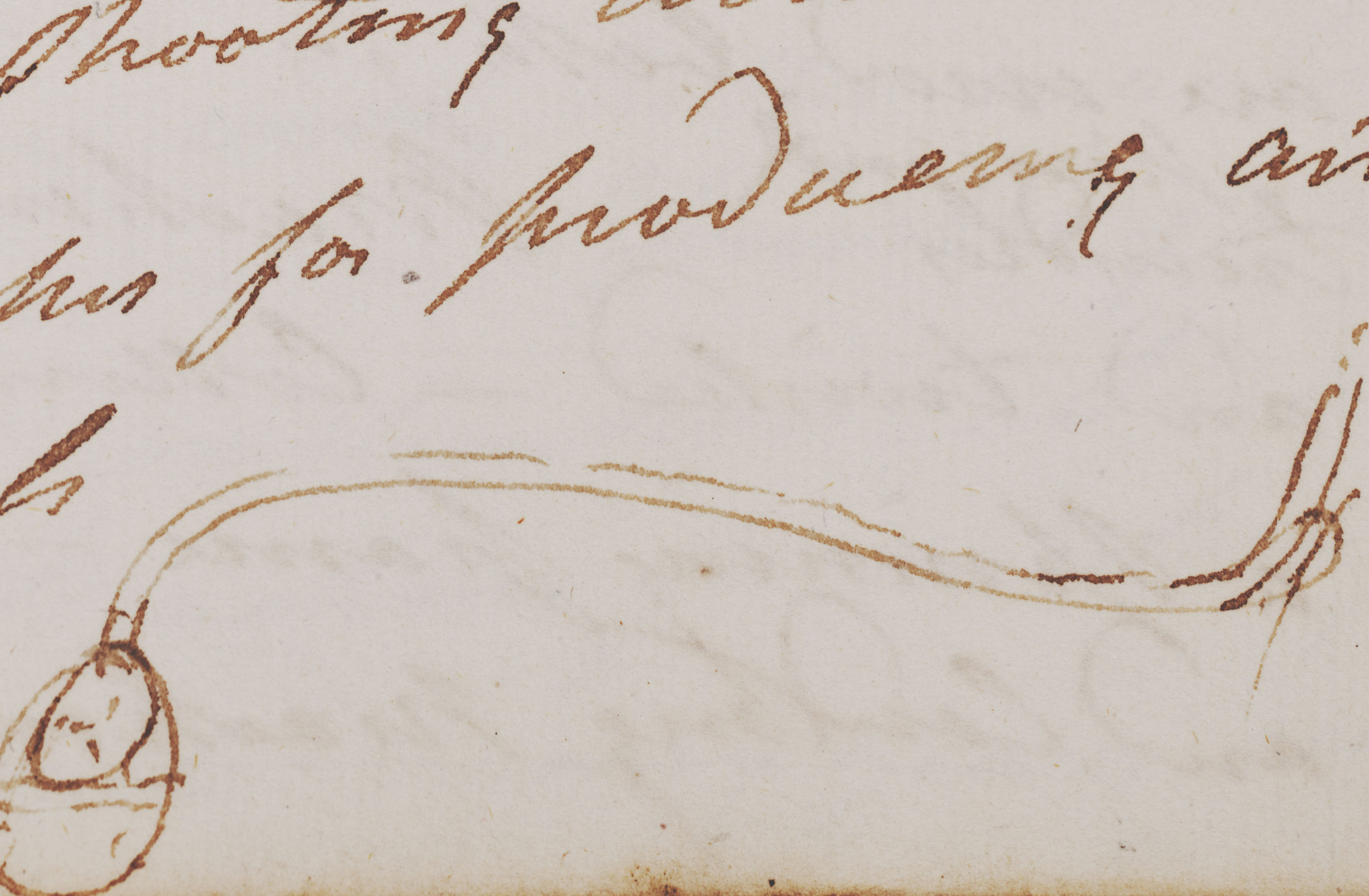
30. All the Electrical machines I
have seen in Paris are constructed
with Cylindrical plates —

31. In Demonstrating those several of
the Lathes have an elastic stick
above like the old turning loom
in Scotland. Those that have
wheels have the wheel above
the lathe — turned as in England
by the foot —

32. Spoons are made of Platina for
the blow pipe and sold in Paris
for three Crowns —

33. Guns for shooting arrows —

34. Apparatus for producing air
from coals



35. Apparatus for Shifting a Belt in
Vacuo —
36. Instrument for Shifting Fire in
Vacuo —
37. An Improved Dividing Engine. Surgeon's Saw —
Sawing Engine — Different kinds
Drills — Machine for making
Chains an excellent contrivance —
— Clothing frames several sorts —
Cloth of different colours woven on
this machine — Silk mill
this Chains made by the machine
are new Cloth for Dresses and
Linsigns
Handles — Machine for reeling
and twisting — Cotton Machine
a Spinning frame — Roving frame
and Carding Machine, These not

of the latest and best construction
— Double Crane with combi-
nation for pushing in or out the
bale and Quadrant for weighing
the bale as it ascends or descends
— Pile Engine by a Lever alternate
motion like that in a Saw mill
— Machine for transporting statues
Watts Copying machine — Ramsden's dividing Engine — Fluting
Engine — Machine for working
wire cloth either brass or iron
— Bucket machine whatever way
the handle is turned — Machine
for teasing wool, better machine
is the hand — Spinning wheels
of different constructions — Straw-
cutter — Machine for making
whips invented many years since

in Germany. Lately revived in
Birmingham — Paris 1708

38 The rope pump was invented
by a Letter carrier in Paris. The
Double Crane by the Queens dancing
master —

39. Weights perpendicular a box
like a common snuff box. the lid
and bottom of Glass not quite filled
with water - a thread with a piece
of cork at one end, and a small
ball of wax and black lead at the
other or lower end. this does not
touch the bottom - cork perpendicu-
larly uppermost —

40 A Thermometer should have a
small quantity of air left in the tube
to prevent the separation of the
quicksilver. — W. H. n

41 A Thermometer may be made by balancing the tube on its centre of gravity at the medium temperature — when the temperature increases the last Thermometer will rise —

42. An alarum may be constructed on the same plan as the above.

43. One in the Alarum the Thermometer tube may be placed nearly perpendicular, the upper end of the tube open & small Platinum wire one end of a bel: the other end connected with the detent, when the heat of the room increases the mercury flows over the tube into the bucket and depresses the bel: detent disengaged —

44. A Globular body for a Barometer?
is preferable to a flat one, as the
latter being more liable to be broken
cannot, consequently, be made so thin

45. A Thermometer may be made of
two bars with an axis. The two
bars compose the arms of a balance
one made of a metal the most affected
by heat, the other a substance the
least. Balance the instrument
at a medium temp.? In all other
states of the atmosphere, the Equil.
will be destroyed and consequently
may ~~be~~ have a scale fitted to it

46. A hole made along the equal
part of the frame an imperceived
current of air —

47. A Short Barrow which takes
the exact Shot of a Gun by going
round it — Sort of Pantographic
Instrum —

48. Machine for making Nuts of
Phosphorus — Glass Jars Bottle
Neck Neck Tube — Valve &
Receiver and —

49. Air Bubbles of Spirit Levels
Short Long, Short and Broad
not so sensible —

50. Circular Gunter by Margaret

51. Instrument for Drawing segments
of Circles to a large radius / Diam
2 Inv rollers on a ruler, one a little
longer than the other

52. Instrument for Large Angles —

453 Machine for drawing parallel lines
contrivance for moving the triangle
forwards, for stopping the tracing
point always at the same angle
– making double lines near each
other in order to be bit into one with
4 aqua fortis N. L – 4 –

~~54~~ ~~Is it not probable that coal~~
~~has been peat and that peat~~
~~is produced from vegetables? Some~~
nat. Hist. peat very hard and heavy resembling
coal.

54 ~~L~~evel without a fluid – b

a point of suspension b.c. telescope

55 Given any number of
wheels with ~~their~~ respective
number of teeth, and the wheels

being so disposed that the first
turns the 2^d, the second the 3^d &c..
Required the Number of Revol.^{s}
of the 1st Wheel to bring the
1st and Last wheel to the same
position as at first, also the
N^o. of Revol.^{s} of the 1st wheel to
bring all the wheels to their 1st
position

7^d Make the teeth of the 1st
the Num.^{r} and of the last
wheel the Den.^{r} of a vulgar
fractions, Denom to lowest term
the Den.^{r} expresses the Number
of Revol.^{s} of the 1st and the [illegible]

Rule 2nd Find the Least Number
to bring the 1st and Last to the
first Position

2nd For all the intermediate
(Divide the Least Common
Multiple of the Leaves in all
the wheels by the No. of Leaves
in the 1st. The Quotient is the
No. of Revol. of the 1st
wheel to bring Leaves all the
Wheels to their 1st Position

Exp.

1st — 17 — 25 — 29 — 35 = $\frac{17}{35}$ Leaves
C.M. 06275 / 17 = 5,075 1st wh: to bring
all to the 1st position

Ex: 2^d

$22 . 25 \quad 22 . 35 = \frac{22}{35}$ jumps

Com: Mult: $\frac{3850}{22} = 175$ R^s. of the

first wheel to bring all to the

same position —

Experiments

1. To cut a piece of of flower glass into a circular or any other form — Bend a wire into the figure required, heat it red hot lay it on the glass for a few seconds, let a drop of water fall on the heated part of the glass and it will instantly crack and the fracture may be carried round in any direction

2 — A candle newly blown out moved upwards with a sudden jerk it will frequently be lighted when blowing on it has failed

3 A Black smith at Black rock near Dublin is said to make a large nail red hot by a few strokes of his hammer so as to light his fire with it — (Done by others)

4 From the weight of a solid to find the weight of any fractional part without seperating it from the mass

5. To discover a Good shilling from a bad one lay it on a hot poker if good the dye will appear

6 Butter milk and unslaked lime makes a strong cement which dries immediately

7 Juice of Garlick makes a good cement but long in drying

8. There is a particular kind of earth found in Derbyshire on which if oil be poured it takes fire

9. A contrivance for informing servants in the Kitchen what is wanted above

10. A contrivance to make windows fall down of them selves when a shower comes on

11. When Phosphoric spar is thrown on a hot iron it appears very luminous

12. Cassius's glass tho' clear like other glass has this property, when heated red it assumes a beautifull ruby colour which it retains ever after — Beads and other toys are made of this

13. A blast of air thro' a blinded pipe much weakned, also weaker through a square than a round hole

14. A piece of oiled silk will dry ~~with dry~~ sooner in a close room than when a current of cold air is admitted, the same with oiled silk

which will dry rooms in the cellar than in the Garret —

15. This day 19 June 1784 a Balloon 6 Inches in D^r. was ~~[illegible]~~ filled and floated at M^r. Parrow's — Walworth It kept up several hours —

16. In couching the Cattaract the incision is made in the cornea on the outside of the eye. In extraction the incision is made in the lower part of the Iris

17. M^r. Argand of Geneva has taken a patent for a Lamp where a current of air passes thro' the flame —

18. If a bit of twisted paper be held across the flame of a candle it will be found that ~~those~~ parts only which are in contact with air as well as flame burn. —

9. A rope may be made to cir-
culate over the same part of a piece
of wood till the wood takes fire —

0. What wood do the Indians make
use of to light their fire by friction
and what is the manner of performing
the Experiment? —

1. The Chinese turning loom or
Lathe —

2. A red hot iron plunged into spirits
of wine will not set them on fire

3. A piece of iron feels hotter to the
touch than the surrounding water

4. The smaller the bellows the
more powerfull the blast — the
reason.

25 On the common Hydrom' three
degrees of the Therm. will, near
the proof-point, alter its strength
one ⅌ Cent.

26 May not a sucking pump or syringe in the inside or forcing pump above, be applied to the Diving bell? —

27. Phosphorus burnt in pure air gives a very brilliant light —

28. A Fly with a Stop cock to a bladder filled with Inflam^t air produces a circle of fire

— Octr 1786 —

29. What is the reason ~~that~~ a leather belt always ~~tends~~ ~~to~~ the ~~thickest~~ part of ~~the~~ drum?

30 The waving motion of a top is owing to ~~the~~ points being round

31. Small light ships may be wrought by concealed magnets in the presentation of a Naval Engagement

32 May not the effect of burning Lenses
and Mirrors be greatly augmented
by throwing on the focus a Substance stream
of fire by Dephlogisticated air?

33. Dancing balls spiders &c may
be made of proper Large Ladies
Electrometer —

34. Arbor Dianna made by a solution
of Silver in the Nitrous acid, a small
quantity laid on a slip of Glass
this laid on the bench of the Micro-
scope, then lay a bit of copper or
brass wire in the solution the Rami-
fications will instantly begin the
solution must be weak, let down
with water. —

5. The Arbor Diana may be made
as follows into a Glass Globe
about 2 Inches in Diam. put a few
Drops of the solution of Silver, hang

a copper wire thro' ~~the~~ its neck
which may be about the size
of a common Cork — the Obvious
Ungation will ascend to the top.
Dip a little cotton in Oil Turp
and set it on fire in the inside
of the Globe this will make it
blaze and show to advantage
the Arbor
36. Is there any method of rendering
the Elastic Gum hard after it
has been melting?
37. For the method of manufacturing
Ising lass see Encyclopa: Brit:
Ichthiocalla
38 If the body ~~or~~ a clothes are burnt
with an acid, apply an alkali
oil of Tartar &c

39. It is said that butter of wax is added to the Phosphorus in the Philosophical fire Machines — some say Sulphur —

40. To separate Silver from copper by a menstruum which does not act on the copper —

41. Sap Green is now frequently made from Lettuce —

42. If Mastic Varnish be ground with Sugar of lead in Linseed oil it forms a composition much admired by the painters

Gum Mastic — Sugar of Lead or red lead — Boil the lead in the Linseed oil then add the Varnish this is called Gumshion, Its properties are Durability — Transparency also Body

43. Vegetable green may be made of Elder leaves — Plaister of Paris ground with drying oil — It would probably answer as well without the plaister of Paris ———

44. A self moving Pump wheel.

45. A Horizontal Pump machine may be so contrived that the pump will be perfectly concealed by a proper case representing some proper device ———

46. Why does the sun shining on a fire tend to put it out? Is it by rarefying the surrounding air — Fires generally burn ill in hot weather when the pressure of the Atmosphere is heavy ———

7. The only red colour which can be burnt into glass at present known is made by uniting a small quantity of Gold in Aqua regia with a solution of tin in Aqua fortis — The Colours of Lake Carmine &c fly off with the heat

— The Nitrous acid employed must be of the fuming kind otherwise tho' ever so strong the colour will not be good —

8. A Silver or gold headed cane blackens the hand or Glove — This is owing to the Copper in these metals, which when perfectly pure will never stain

9. Derby three spar metaled by a composition put on the inside of a Glass jar — Mr. M—d

50. What kind of Stone or compound will take fire by applying a little water — so as to light a Paper?

51 Mr. Magellan thinks that the common notion of the sun putting out a fire is a vulgar error

52. The Jews sweat the Guineas with Aquaregia. They precipitate the Gold with oil of Vitl: this last has a greater affinity with the marine acid of the Ag:a than the nitrous acid has with the menstruum. The nitrous acid is left alone. The gold is precipitated in a fine powder — It may also be precipitated by Alkaline salts but then the precipitate will fulminate — This is readily decomposed with Sulphur.

3. It is asserted by Lapidaries y

a Diamond may be cut with a Silk thread —

4. In setting Diamonds the dust is made to stick to the setting wire by oil

3. Diamonds are ground by rubbing them on each other in the hands

5 No cement of any kind is made use of in setting of stones. Foil is placed below, to give them their proper brilliancy —

6. May not a contrivance similar to the patent Lamp be introduced to prevent smoke?

7. May not Philosophical fire be used for illuminations?

58. In the Pallais Royale at 12 o clock a Lense fires a small cannon when the sun shines Lense elevated according to the Declin

59. In the Jardins du Roi a hair is burnt by a Lense this disengages a hammer which strikes 12 o'clock

60 A method of Etching on glass with the Fluor acid. To prevent evaporation the spar was at first powdered and wett: acid poured on it — another method is said to have been lately tried —

61. Tar made from sea coal by a ~~very~~ simple apparatus very whole

No 2

Experiments

52. If oil be poured on [illegible]
Derby shire it taken fire by this
a match may be lighted.

53. Some time ago a man walked
across the Seine on Air shoes &
Stilts — Paris Sept. 1780

54 Corrode copper with the Nitrous
acid and spirit of wine make
a beautifull green flame — Zink
with the Vit: acid and Spirit
of wine a blue — Bismuth
with Spirit of Nitre a vast quan-
tity of flame inclining to a Lay lock
colour — A Solution of blue
Vitt: with some filings of Zink
makes a green bordering on blue

63. Contrivance to make a window fall down of it self at the beginning of a Shower

66. An Alarum to awaken the Gardener when to take in his hot bed Plants

67. To write the Diamonds out of a ring — Throw the ring into aqua fortis —

68. To make a Gyphen with the hunters sheath —

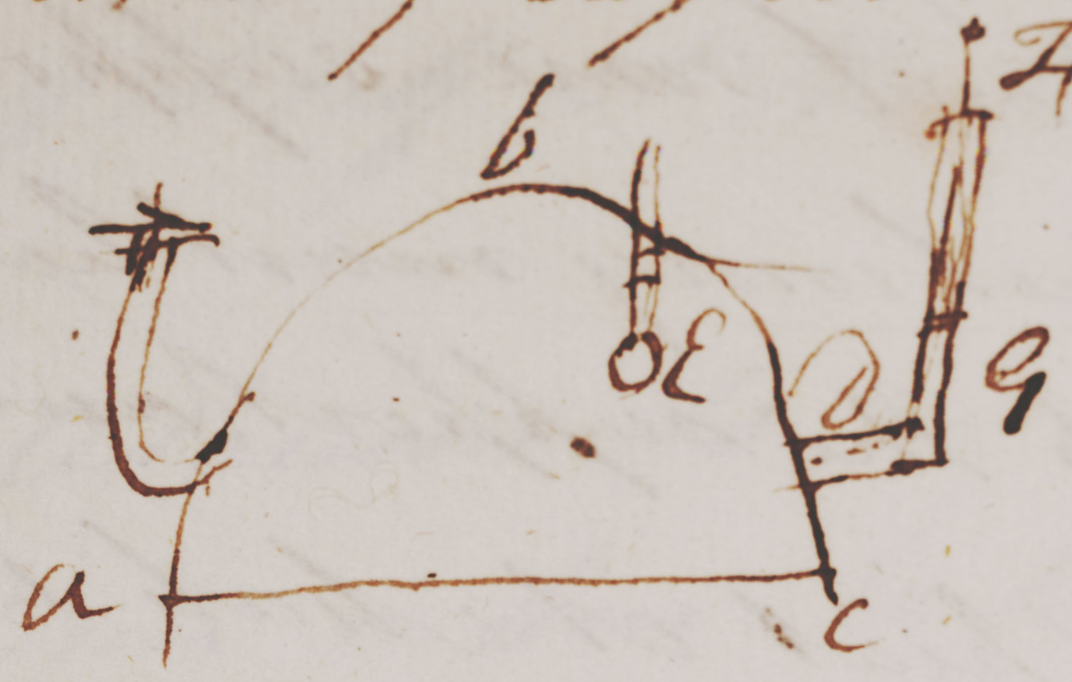
69. If the tail of a Sparrow be cut short with the same care and certainty — ascend and descend what then is the use of the tail?

0. It seems impossible for man
to fly without some support in the
air, the machinery must be sufficient
to raise both the support (and) the man

1. Degrees of heat at which water boils
under different pressures of the Atmosph:

Degrees of Heat	Inches of Mercury	Atmospheres
100	1 Inch Mer.	
119	2	
130	3 1/2	
135	4	
149	6	
156	7 3/4	
192	15	1 Atmosphere
213	30	
236	44	1 7/15
252	60	2
275	90	3
293	120	4
308	150	5

The Table was constructed from the following experiments



a, b c a boiler, D a box filled with mercury. F, G a wooden floating Gauge on the surface of the mercury E a thermometer. The Density of the Steam is measured by the floating Gauge, and the Heat by the Thermometer —

12. Mr Watt's Experiments prove y^t steam produces in water five times the heat of boiling water — A pipe from a boiler was immersed in water suspended from one end of the beam of a balance. The increase of weight from the condensed steam was ascertained and the heat by the thermometer By this experiment it was proved that steam contains more absolute heat than water — oil on the surface of the water will prevent Evap^n —

3. ~~The~~ A piece of whip cord was first applied as a hygrometer by Mr Wm Mollineux, the beard of the wild oat by Mr Hook, a human hair by Mr Saussure and a piece of whale bone by De Luc —

Q. — Quere which is the best? —

94.

Coffeyng Ink of Mr. Wall—

Extract of Galls	3/4 oz
Coffee	1/4 oz
Alum	1/8 oz
G. Arabic	2 1/2 drs
Water	1/2 pint

Dissolve the Gum and extract in hot water: when dissolved and cold add the Coffee and Alum— Leave it two days in air then filter it— Cant it and keep it close corked to prevent the fermentation of the air—

— The extract of Galls may be made thus — Reduce the Galls to powder boil the powder in soft water for about half an hour when cold filter and wash it by

boiling to dryness —

5. Receipt for red Ink

Raspings of Brazil wood 4 oz

Infuse for two or three days

in Strong pale Vinegar 1 or 1½ pint

according to ~~its~~ the strength of the colour

in the Brazil wood — Boil it gently

for an hour in an earthen vessel

and filter it thro' paper while

hot into an earthen vessel then

put in again over the fire and

dissolve in it first ½ oz G. Arabic

and afterwards of Allum and

white Sugar each ½ oz

— This ink grows while they cloudy

its colour may be restored by boiling

for a short time. The phial with

the ink may be put into boiling

water —

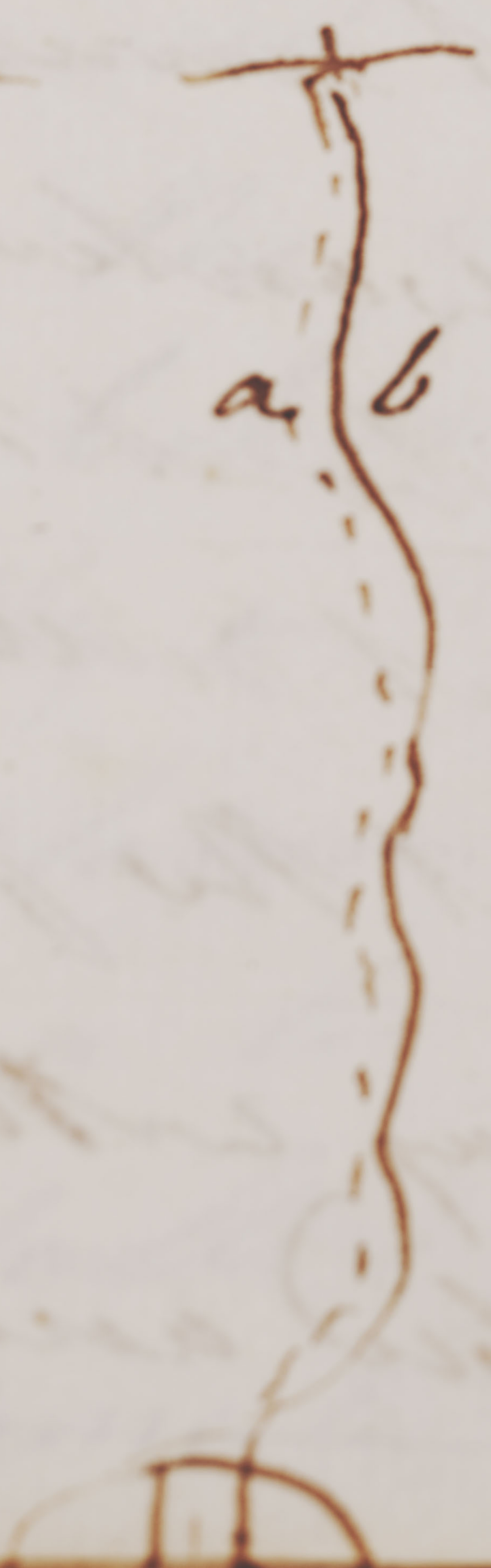
76. Ice cream is made by putting the cream into an oblong tin ~~box~~ vessel, this is placed in a mixture of snow and salt in a wooden bucket

77. What is the best method of laying the paper on a globe?

78. A Thermometer in a finger ring, composed of three semicircular arcs, the outermost iron, middlemost tin and the innermost copper. The iron fixed at one end by a pin. The other end acts on a short piece moveable about a center which is made fast to the middle, this is likewise in manner to the innermost by means of a short moveable piece — The

the end of the last one there is fixed a rack which moves the center pinions ~~to~~ which carries the Index —

The inventor of the above, who is a watchmaker in Paris makes his Pendulum rod for a clock thus —



composed of two rods one of copper a, the other b of iron —

79. Gold beaters leaf is extended not by the stroke of the hammer as such but by the stretching of the skin which after the blow shrinks back and at next blow takes hold and pulls it forward —

80. In horse ferry boats over the Vistula, there are two draw bridges at the ends of the boat which when laid down quickly facilitate the entrance and exit of the horse — A similar contrivance much wanted in Brit[ain]

81 The Rhone is about the breadth of the Thames, but much more rapid. To prevent the ferry boat being carried away with the current a cable is stretched across over

two stone pillars and each
and fixed to a windlass - A
moveable pulley runs on this
cable to this pulley one end of
the boat rope is fastened the
other is made fast to the boat
between the head and beam -
- The position by this means
becomes oblique to the stream
which consequently pushes
her forward - The pulley runs
along the rope by starts some-
times behind at other times
directly a head -

22. An alarum may be made by
fitting a tin or pewter tube
with bellows. On this let a piston
rest, connected with the detent -

83. An alarum is said to have been proposed to be made of platina
— quere how —

84 Would not a contrivance to turn the leaves in playing music be useful? Music might be printed on a long roll to turn round two rollers moved by a pedal-foot.

85. What is the most effectual method of preventing lead pipes from bursting?

86. If a bottle be filled with Liquid plaster of Paris the moment the plaster sets the bottle bursts

87. Butter is frequently sold in penny rolls — Machine to make

it perfectly cylindrical would
be useful —

28. Might not the Dust carts be con-
trived to take up the dirt them-
selves as they move along the
street?

29. Lime made of Oyster shells
would perhaps answer some
purposes better than from stone
— arguentum pulmonans —

30. A large retort filled ~~with~~ flour,
nuts or many other vegetable
matter, placed in the fire with
a tube rising upwards and
projecting into the room above
~~the~~ chimney might light a
Coffee house for a whole evening
and at a trifling expense —

91. Chaos first and then the na
of the Almighty in the triangle
appearing chaos retires, and
the Solar System appears —
fire works —

92. New Mahogany is made to lo
like old by rubbing it over w
lime water — soap ashes, or othe

93. An alarm against house brea
a lump of lead at the end of a
bit of twine the noose at the othe
end of the twine fixt on a pin
in such a manner that in ope
the door the noose is slipt off
and the Lead falls —

94. Oil Turps: or any other Essen
oil will take out a stain of pai

Soap has the same, but this last
is apt to injure the cloth —

5. Lemon juice, or Essential Salt
of Lemons, or Sal nixium, best
for taking out ink stains —
Sal nixium sold for Ep:s. Salam

6. A mixture of Starch and Verdi-
grease makes a fine green flame
— Starch itself is very inflamat—
when blown out of the Salt makes
a fine Gerbe —

7. Fumes of Phosphorus or oil of wax
will carry a flame to a conside—
rable distance — Fire ball — Metear
— Lamps easily coloured with Phos—
phorus

98. On what principle is the ascent of a whip explained?

99. If a watch balance be held on the fire for sometime it will be heavier on one side than on the other –

100 Varnished wood is polished with rotten stone on a cloth and fine with flour – Quere would not fine starch do better?

101. Doctor Priestley purified his mercury by triturating it with water – by this operation the lead is calcined

No: 3

Experiments

12 Abraded glass on paper best for polishing wood. Fish Skin now laid aside

13. To clean Laquered brass, rub it with Florence oil on a piece of flannel or soft rag —

14 It is said that water which has been boiled freezes sooner than when it has not — Hot — cold —

15, Pour boiling water on paper till wet — add a quantity of Glue and whiting — Ornaments for Chimney piece — Papier Mache &c —

16. A flint laid on the hand or any thing soft is easily broken, but on any thing hard will bear a very hard blow —

107. Will the sun's rays collected in a
lyne melt glass?

108. What is the best method of pre-
venting a carriage coming down on
the falling of one or both lowes?

109. — Ans. Dust getting into the
carriage in hot weather —

110. An oil to burn in a lid chamber
without injuring the eye —

111. Composition for cleaning mou
discoloured with smoke
1 Quart of strongest soap Lee
1 Lb Oil of Vitriol
1 Pint Whiting
mix with a painters brush to
it on the mould let it remain
3 or 4 Days wetting it every day
with the mixture —

2 would not a tube filled with cotton filter the air of its dust when passing into a coach?

3. Captn Phipps in Lat
found the temperature of the sea at 780 fathom to be 26° — querie why was not the sea frozen?

4. Sedative Salt disolved in Ether produces a beautiful green

5. Blow soap bubbles with a mixture of pure and Ethereal air, a hot iron ~~touch~~ prodigious explosion — The best way — fill a bladder 3/4 with pure air, into this pour about two tea spoon fulls of Ether —

116, Liquor Silicum and Aqua Ammoniae produce a Solid - very hard -

117. Nitrous Acid with ~~half~~ an equal bulk of water dissolves chalk to saturation this with saturated oil of tartar produces a Solid

118. into a Proof of Candle fixed at put a small bit of Phosphorus apply heat - Vapor - the air with a strong lather of soap forms a bubble which explodes -

119. To make the Liquor Silicum put some green glass into a fine powder mix equal parts of fixed Alkali - Coated retort to a strong heat in three or four days a substance is produced which deliquesces in air

10. Manganese exposed to the proof
to heat - taper or lamp - produces
purer air than Nitre - The new salt
called the Muriated alkali or oxige-
nated salt produces the purest air of all
substances yet known —

11. Pure air should always be decanted
thro' lime water —

12. The Manganese like Crystals
the best — Exeter —

13. In the Experiment of the Crystal-
lization of Glauber salt, it will
sometimes succeed by pouring it
out sometimes by returning the solution ~~it~~ into
the phial.

15. In preparing muriated lime the
marine acid should not be diluted

16. The last eleven Articles belong to
Chemistry —

125. It is possible that a bag filled w[ith]
Euphorbium will by its peculiar qua[li]-
ty knock a man down? — Mr. Fox

126. Inflam^e. air from iron turnings a[nd]
steam lighter, cheaper, not so d[is]-
agreeable a smell — best for fire w[orks]
and Balloon —

127. Charcoal is the best substance
for cleaning glasses that have a
bad smell — water at sea — Fill
— 5 lib to every butt ———

128. A perpetual motion with a v[ane]
like a ventilator, hot iron

129. The saw dust of Sandal wood wi[ll]
effectually prevent rust — L-o

130. A negro's foot was bleached wh[ite]
by dephlogisticated marine acid,

131. Every vegetable substance is blea[ched]

very white, by the dephlogisticated marine acid. Wool was tried and ~~little~~ or no change was produced, tho' the wool was well washed in an Alkaline Lixivium ~~to [illegible]~~ free it from every oily and greasy particle

2. In the Exp. 130, the negro's foot and afterwards his hand was passed thro' water first cold and in the second a ~~little~~ warmed — colour in ~~the~~ first Exp. ~~returned~~

3. In the East Indies bullocks buffo[e]s are killed by ~~thrusting~~ a knife or point into ~~the~~ spinal marrow

34. Manner of diluting ottar of roses so as to perfume a room at a small expence.

35. To discover English from foreign Nankeen — a drop of green tea turns the first black, but does not affect the other

136. Engraving with the Fluor Acid

After putting on the common etching ground as it is called, hold it over a Lamp and blacken it, then trace with a point as in common etching put pounded spar with oil of Vitriol into a crucible or retort and apply a little gentle heat, place the glass in the vapour, and in a few hours it will be bit. Or put some of the pounded spar with oil of Vitriol on the tracings. This a better mode than the former —

Composition for the Etching ground

2 oz Virgin Wax
3 — Asphaltum
1 $\frac{1}{2}$ — Rosin
1 $\frac{1}{2}$ — Mastic

first pounded in a Mortar
then melted with the wax over a
slow fire — This is put into a silk
bag and the plate is rubbed with
the bag — A. Inqi —
37. Make a paste of prussian blue in
spirit of ~~wine~~ salt, then dilute with
water makes an excellent blue
which will not corrode the paper.
With Vitt.^c acid it will corrode the
paper
38. In burning metals in Dephlogis-
ticated air — order — 1 Tin 2 very fine
brass wire 3 Copper wire, 4 Fine plate
of Zinc 5 Lead 6: Platina —
39. Welch's spunges good: proton-
neal in the fire
40. Bottle prepared for Dephlogisti-
cated air, for melting the above metals

141. Dissolve Phosphorus in genuine oil of Cloves, put somewhat more than the oil will dissolve, apply a gentle heat, shake it ~~thoroughl~~ strongly till cold. If put into a square stoppered bottle, it will shine when the cork is taken out — Saturns ring on the bottle —

142. Put a bit of phosphorus in a flask of warm water into another vessel of water, blow from a bladder of dephlogisticated air, it will make flame in the water ——

143. ~~When~~ Do the Chinese bleach their silk so white? — Process of rearing silk worms —

144 If a bottle be filled with melted wax or plaister of Paris, when the

wax cools and the Plaister sets
the bottle bursts — Name the reason
why wax candles cannot be cast in
moulds —

43. If a parachute be inverted it
descends with a more steady motion
—quere will it move faster? —

44. It is said that the Chinese join
together two large umbrellas with
a stick between, on this they rest
the breast, and descend from a height
of 50 or 60 feet —

45 What effect has blowing on the
Thermometer? — with a current of
air of the same temperature? same

42 Ball painted black — flat —
Advantages Disadvantages —

146. What is the difference in effect between boiling beef in salt and in fresh water

147. In what manner can the traces of black lead pencil be fixed on paper? wet them —

148 To measure the depth of the sea — Sea Gauge by Drs Hales and Desaguliers — Hooper —

149. Hydraulic dancer — Figure on a conical funnel over a jet of water

150. Marvellous vessel — small holes in the bottom — pipe when full cover the end of the pipe, no water will run through the bottom &c —

— A similar experiment with a glass filled with water and a piece of paper which covers its mouth being drawn dexterously away, the water will remain in the inverted Glass —

1. A bit of metal and cork ~~put~~ made ~~to~~ sink in water, under ~~the~~ air pump
recd. it will rise. ——— N-2

2 — Phial of the four elements — Glass
7 Inches long and 3/4 Inch. diam.
— 1 pounded glass 2. oil: Tar: p. delig.r
3. 4th Tincture of Salt of Tartar 4th. Distilled
rock oil — Earth, water air and Fire
N-2

3. Experiments of the Images on the air
pump — Feathers heavier than lead
— Butterfly suspended by its foot —

4. Boil in a small Earthen vessel a
little bit of Phosphorus size of a pea
in a half glass of clear water — take a phial
with a narrow neck and glass stopper
and plunge it first into boiling water
then empty it and put the boiling
mixture into it, instantly stop the vial
perfectly — shine very bright when shake
— returns &c ———

155. Take a common rose faded and
hold it in the fumes of Sulphur over a
chaffing dish it will become white
Dip it in water — in 5 or 6 hours after
wards it is quite red — N — 2

156. Magic picture — Two pieces of glass, glass
is best, about 3 by 4 inches place one
on each other about $\frac{1}{20}$ Inch asunder
This effected by papers at the corners
join the glasses by a cement of slaked
lime and the white of an egg. Cover all
the borders with parchment or bladder
except a small opening on one side
to introduce the following composition
Dissolve by a slow fire 5 or 6 ounces
of fine hogs lard and put into half
an ounce of white wax and to render
it still more sensible to the heat an
ounce or more of linseed oil — This
when liquid must be poured between

the glasses, and then stopped quite close with the glasses clean and hold them before the fire to try whether the instrument is tight— Paste a picture framed on any thin substance or a coloured print with its face to one of the glasses whole in a frame— When cold the picture is invisible, seen when hot—

157. —Colours that appear & disappear by the influence of the air— Copper filings dissolved in Volatile spirit put into a decanter produces a fine blue— Stop the bottle and the colour will presently disappear —unstopped return— &c several times

158 Sympathetic Inks— All acids for a red ink when the veget: infusion is passed over the writing,— Alkalies a green— Symp: inks rendered visible by heat very numerous— Strong solution of salt: in water— juice of lemons onions &c—

Sympathetic Inks

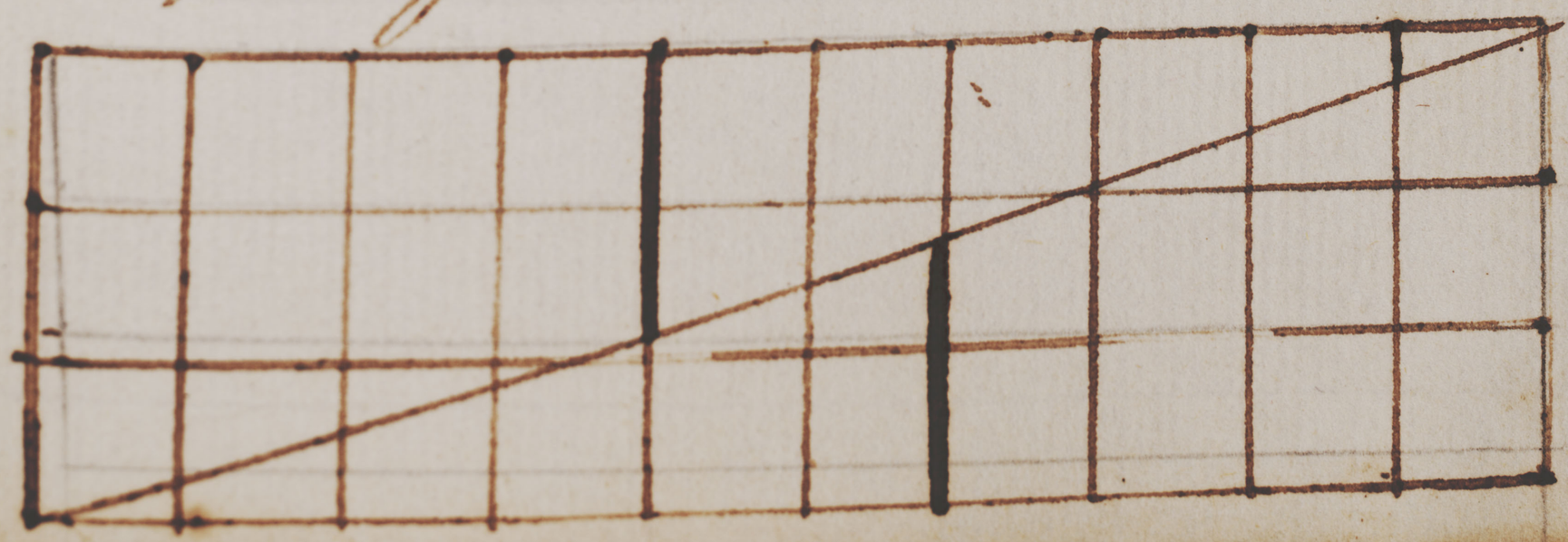
—Green. Take Zaffre in powder and
dissolve it aqua regia for twenty four
hours—Pour the liquor clear off and ad
to it as much or more common water
—bottle well corked— This may also
made from the Regulus of Cobalt tho
the process more difficult—

—winter changed to spring—

—Allum mixed with Lemon juice to
become visible by being wetted—or
Allum it self— All Saline liquors
such as Vit: Nit: and M: acids dilu
solution of fixed vegetable alkali
produce the same effect — N—

159. Arbor Dianae—1 oz fine silver in
3 oz strong aqua f:—when dissolved p
the aqua fortis into another glass vesse
set it at bot: with 7 or 8 oz Mercury and a
quart of common water. To this add the dis
silver—remain untouched—few days tho la
months

Experiments

№ 4

60. Geometric money — Let the first
of 10 inches by 3 be divided into
30 squares. Draw the diagonal and
at the fourth division from the bot
cut each triangle — Then with them
be two triangles and two trapeziums
Place them at first and make
a piece of money in each figure.
Then the first piece weighs as
he make 32 instead of thirty
The two trapeziums form a triangle
5 by 4. and the two triangles a
2 triangle of 6 by 2