

- I. *A Scheme of a DIARY of the Weather ; together with Draughts and Descriptions of Machines subservient thereunto ; inscribed to the PRESIDENT and Fellows of the ROYAL SOCIETY ; by Roger Pickering, F. R. S. and V. D. M.*

The INTRODUCTION.

Read at a Meeting of the Royal Society, May 3. 1741.

THE Usefulness and Importance of *Meteorological Tables, or Diaries of the Weather*, are too well known to this *learned Society*, to need mentioning with any other View, than as an Excuse under which the Author of the following Observations would shelter himself, for presuming to engage in a Subject, upon which so many, infinitely his Superiors, have written: For, when both the Health and Trade of Mankind considerably depend upon the different States of the *Atmosphere*, the meanest Endeavours to contribute to a Knowledge of it may not be without their Use, and are, at least, excusable.

A Sense of the Importance of observing the Weather induced *Hippocrates*, in his Remarks upon the Epidemic Diseases in *Thasos*, to premise a general History of the Weather preceding them; and with the same View did our great Mr. *Boyle* turn his Thoughts so closely upon the same Subject: whose Example, being followed by several judicious Inquirers into Nature, both abroad and at home, has brought the *Natural History* of the *Air* to a surprising Degree of Perfection, beyond what the Antients ever

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could

could pretend to, or even thought of. Had but each County in *England* Gentlemen of such Sentiments, who would charge themselves with the annual Trouble of sending a regular Account of the *Weather* to this *learned Body*, by it to be compared and digested, to what Degrees of Accuracy may we not suppose a Knowledge of the Nature and Affections of the *Atmosphere* may be brought; and how well may we not hope to be guarded against the Disorders, which, as *Islanders*, we are exposed to, by such a close Inquiry into the Nature of that necessary Fluid in which we breathe! Not to mention the Advantages which several important Branches of Trade may receive from such Measures: And were the digested Observations of the *Royal Society* compared with those of foreign Societies, formed upon the same Plan, how short a Time would bring this Part of Philosophy to the greatest Degree of demonstrable Certainty!

The Trouble of making and keeping such *Meteorological Registers*, which, in all Probability, prevents several Gentlemen from performing this Piece of Service to the Public, might be rendered very inconsiderable, by the Proposal of an easy, as well as comprehensive, Method for a *Diary*, and a Set of simple and convenient *Machines* for making the necessary Observations.

The Plan of the *Ephemerides Ultra-jectinæ*, tho' comprehensive, is, with Submission, very perplex'd; and the several others, mention'd in the *Philosophical Transactions*, perhaps, do not include all the Particulars of which such a *Diary* should consist. The Society of *Edinburgh* has prefaced to their *Medical Essays* a Scheme (which I had not the Pleasure of seeing

seeing till a great while after I had fallen into the following Method) the most calculated for Usefulness; but their *Machines* are neither so simple nor accurate, as such a Work requires; not to mention their being intirely without one for observing the *Force* of the *Wind*.

After these free Expressions, nothing but a sincere Intention would justify me to myself, for presuming to offer the following Plan; except it were a full Dependence upon the Honour and Candour of the *Royal Society*, whose Humanity and Condescension to the meanest of its Well-wishers I have more than once already experienced.

S E C T. I.

An Account of the Diary in general.

ON a Page of a Folio Paper-Book, opening broad-ways, are drawn, at proper Distances, nine *horizontal*, and seven *perpendicular* Lines; in the void square Spaces of which the Particulars of the *Diary* are written down. The first of the horizontal Lines is for the Days of the *Month* and *Week*, on which the Examination is made: The second for the *Hour* of the *Day*: The third for the *Weight* of the *Air*: The fourth for its *Heat*: The fifth for its *Moisture*, or *Dryness*: The sixth for the *Quarter* of the *Wind*: The seventh for its *Force*: The eighth for the *Weather*; as whether it be *rainy*, or *cloudy*, or *clear*: The ninth for the *Quantity* of *Rain*; and the Space

between the last Line and the End of the Paper, for the *Bill of Mortality*.

The seven *perpendicular* Lines are for the seven *Days of the Week*; which, in our *Diary*, begins with the *first Day*, according to the *Jewish* Account, by us called the *Sabbath*, or *Sunday*. If you therefore carry your Eye along the Paper from Left to Right, you may, at one View, see the *Weight* of the *Air*, and the Degrees of *Heat* and *Moisture*, &c. for the whole *Week*. If you carry your Eye from Top to Bottom down the Column, for any one Day, you see regularly the Whole of the Observations in one Line for that Day. Four Pages, or Weeks, we allow to each Month, and then leave a void Page for the *Observations* made in that Month; and the overplus *calendary* Days are carried on to the Page allotted for the next Month; only taking care to describe in every such Page, where the Ending and Beginning of two different Months are to be found, the Names of both the Months, directly over their final and initial Day.

The Abstract of the *weekly Bill of Mortality* is apparently a Part of Observation peculiar to this Plan, under which Article all *acute Cases*, depending on the *State* of the *Air*, are set down. Perhaps the Ignorance of the *Searchers*, appointed to inspect dead Bodies, as to the precise Diseases People die of, may lay this Method open to Objection: To which it may be sufficient to answer, That this being obviously a requisite Article for a *Diary*, we must be content to take our Advices on this Point from such Hands, rather than none; especially, as all *Political*
Arith-

Arithmetic has always been allowed upon no more certain a Foundation.

S E C T. II.

A View of the Machines in general.

THE *Machines* necessary to the making Observations for a *Diary of the Weather*, are these five :

1. *The Barometer.*

I have found those with *open Cisterns* more sensible than the *portable* ones. That with which I make my Observations, is with an *open Cistern*, furnish'd with a *Micrometer*, that divides an *Inch* into 400 Parts ; by which I am capable of perceiving the most minute Alteration of the *Gravity* of the *Air* : It was made by Mr. *Bird* of the *Strand* ; whose Accuracy in Graduation deserves, I think, Notice and Encouragement.

2. *The Thermometer.*

Mine is one made by *Fahrenheit's* Scale on one Side, with its Correspondence to the Graduation of the *Alcohol* Thermometer on the other.

Of the three next *Machines*, two are *new*, and the other considerably altered, and, I hope, improved, from one offered to the Society a great while ago.

Note, All the *Machines*, except the *Barometer*, are exposed to the open Air. The *Thermometer* and *Hygrometer* are placed in a little *Shed*, made for their Reception, against my *Study-Window*, where I can see the Graduation thro' the Glass ; and, by lifting up the Sash, can take them in, as Occasion requires.

S E C T. III.

Of the Hygrometer.

I HAD, for some time, made use of Dr. Hooke's *Hygrometer*, made of the *Beard of a wild Oat*, set in a *small Box*, with a *Dial-plate* and an *Index*; but I soon found an Inconvenience, without the remedying of which no Dependence could be had on this *Machine*; viz. its making more than one *Revolution* in a Night. I endeavoured to remedy this by the following Method, described in TAB I. Fig. 6.

At the vertical Point, from which *Moisture* and *Dryness* are graduated, I caused a small *Circle* to be described; the lower *Arch* of which should just intersect with that *Arch*, round which the *Index* of the Oat described its Circuit. In the Centre of this small Circle I placed a *Pin*, easily turning in the central Cavity, and furnish'd with a flat Piece of thin *Ivory* on its Head. This Piece of *Ivory*, intersecting with the *Index* of the Oat, by it was turned either to the moist or dry Side of its Graduation, as the *Index* made a double *Revolution*. I flatter'd myself with Success; but soon found, in the great Fogs we had last Winter, that the *wild Oat* is not a safe Material to make an accurate *Hygrometer* of: For,

1. In the great Fogs it grew limber; so as that the Weight of the *Index* brought it down upon the Plate, where its Friction prevented its further Motion.

2. It soon loses its *Sensibility*, grows harsh, and is absolutely unfit for Use. So I immediately turned my Thoughts upon some other for my *Diary*, and

reserved this for my Study; where, or in any inclosed Place, it does well enough, and may be very useful in the following Respects; as,

1. To examine, in Cases of Sickness, the *Dampness* of *Rooms*.

2. To examine Damps in *subterraneous Cavities*, being let down with a *Weight*, where a Light would sometimes set the Place on Fire.

3. To observe the proper State of Dryness in *Warehouses*, *Wine-vaults*, *Studies*, where Damps would be detrimental and pernicious.

4. To examine the Strength of *sudden Fogs*, and the *comparative* Dampness of particular Situations.

As a *Succedaneum* to this, I thought upon a *statical* one; it recurring to my Mind, That the Weight and Moisture of the Air being but two Properties of one and the same Body, a *statical Hygrometer* (*cæteris paribus*) promised the best Assistance towards a more complete Knowledge of the *Barometer*, which acts upon statical Principles; and that these two Machines must have a reciprocal Correspondence with each other. I then remember'd, that the great Mr. *Boyle* had mentioned something of this Nature; after consulting whom, I made the following *Machine*, acting upon his Principles, but formed in a Manner differing from his.

I caused a *Balance* to be made to turn with *half a Grain*, ordering that the *Axis* of the *Balance* should, on one Side, be drawn out to the Length of one Inch, and its End to be furnished with a *Male Screw*, to which a light *Index* with a *Female Screw* might be fixed. I had this *Balance* fastened in a *Wainscot Box*, twelve Inches in Length, nine in Diameter, and four

in Depth at Top, but gradually widening towards the Bottom, with a Back to slide up and down in a Groove. The *Axis*, already mentioned, of an Inch Length, came through a *Hole* in the Front of the Box, and then had the *Index* fastened on, which described the *Segment* of a *Circle* upon a brass Plate, silver'd and graduated into 180 Gr. as if it had consisted of a perfect *Semicircle*, or two *Quadrants*. The Reason why the Graduation did not begin exactly with the diametrical Line was, to prevent the Friction of the *Brachia* of the Balance, with the little Drop placed at the Bottom of the *Axis* already mentioned.

My next Concern was to *charge* this *Balance*. The Beam turned, as has been said, with *half a Grain*; and every such Turn, after repeated Trials, moved the Index somewhat more than one *Degree* of the 180 described upon the *Plate*; so I immediately pitched upon a *Four Penny-weight* all but *six Grains*, which contained as many half *Grains* as there were *Degrees*. This Weight I fixed with a Thread to one *Brachium* of the *Balance*, without any *Scale*, the several Threads or Silk Strings of which, as they would imbibe more Moisture, would make the *Machine* less accurate; and the other *Brachium* I charged with a *Sponge*, suspended likewise by a Thread, of such a Weight, when reduced to absolute Dryness, as made an *Equilibrium*; and then screwing on the *Index* to the first Degree of the 180, and exposing the *Machine*, thus ordered, to the open *Air*, in one Night's time the *Index* had got to the 70th Degree; which, as the *Sponge* had been absolutely dry, must have been the true *State* of the *Air*, as to *Moisture*, at that time.

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I find this *Machine* extremely sensible and accurate; it will alter 10 Degrees in a Night, and as many in a Day; and has, I think, the following Advantages:

1. It is more *portable* than any, except that of the *wild Oat*; and, upon any Accident, more easily and speedily rectified than it, or any other whatever.

2. Being graduated from absolute *Dryness*, it is best calculated for the Discovery of the true State of the *Air*, as to *Moisture*.

3. The near Correspondence between the Degrees on the graduated *Plate*, and the Weight of the *Moisture* necessary to be imbibed or exhaled, to make either *Brachium* of the Balance preponderate every such Degree, gives it the Preference to any other.

For a more perfect Idea of this Machine, see TAB. I. *Fig. 1.* where it is viewed on the Inside, the Back being slid up. At *Fig 2.* is represented the *Plate* with its Graduations and Index, as it should appear on the Front of the Case.

S E C T. IV.

Of the Anemoscope.

THE *Anemoscope* is a Machine four Feet and a Quarter high, consisting of a broad and weighty *Pedestal*, a *Pillar* fastened into it, and an iron *Axis*, of about half an Inch Diameter, fastened into the *Pillar*. Upon this *Axis* turns a wooden *Tube*, at the Top of which is placed a Vane, of the same Materials, 21 Inches long, consisting of a *Quadrant*, graduated and shod with an iron *Rim*, notched to each Degree; and a *Counterpoise*, of Wood as in the Figure, on the other.

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Through the Centre of the Quadrant runs an *iron Pin*, upon which are fastened two small round Pieces of Wood, which serve as moveable *Radii* to describe the Degrees upon the Quadrant, and as Handles to a *Velum* or Sail, whose Plane is one Foot square, made of Canvas stretched upon four Battens, and painted. On the upper Batten, next to the shod *Rim* of the Quadrant, is a small *Spring*, which catches at every Notch corresponding to each Degree, as the Wind shall, by pressing against the *Sail*, raise it up; and prevents the falling back of the *Sail*, upon the lessening of the Force of the Wind. At the Bottom of the *wooden Tube* is an *iron Index*, which moves round a circular Piece of Wood fastened to the Top of the *Pillar* on the Pedestal, on which are described the thirty-two Points of the *Compass*.

The Figure of this Machine may be seen TAB. I. *Fig. 3.* Its Uses are the following:

1. Having a circular Motion round the *iron Axis* and being furnish'd with a *Vane* at Top, and *Index* at the Bottom, when once you have fixed the artificial *Cardinal Points*, described on the round Piece of Wood on the *Pillar*, to the same *Quarters* of the Heavens, it gives a faithful Account of that *Quarter* from which the Wind blows.

2. By having a *Velum* or Sail elevated by the Wind along the *Arch* of the Quadrant, to an Height proportionable to the Power of the Column of Wind pressing against it, the *relative Force* of the Wind, and its *comparative Power*, at any two Times of Examination, may accurately be taken.

3. By having a Spring fitted to the Notches of the *Iron* with which the Quadrant is shod, the *Velum* is pre-

prevented from returning back upon the Fall of the Wind; and the Machine gives the Force of the highest Blast, since the last Time of Examination, without the Trouble of watching it.

I have carefully examined the Dependence that may be had upon this Machine, during the late Storms in *February* 174³/₄, by comparing the Height to which the Wind then forced the *Velum*, with the *Deal* Letter. The 19th of *Feb. Sabbath*, 8 *a. m.* the Anemoscope was at 75 : The *Deal* Letter for that Day called it a Storm. The *Saturday* following, being the 25th, at 8 *p. m.* the Machine was at 79 : The *Deal* Letter called that a violent Storm. The *Wednesday* following, the last of *Feb.* it was at 84 : The *Deal* Letter called that a violent Storm. So that it appears, that, in such as the Sailors allow to be *violent Storms*, the Machine has hitherto answer'd well, and has had six Degrees to spare for a more violent Gust, before it comes to an horizontal Position.

It is certainly to be depended upon in ordinary Weather, the *Velum* being hung so tender, as to feel the gentlest Breeze. But, after all, I must freely own, that I fear the exposing this Machine to all Winds, for a Continuance, must soon disorder it ; and that irregular Blasts and Squalls cannot fail in a short time to impair it. It may not therefore be amiss, to prevent this, for Gentlemen to take the Machine in in violent Weather ; and, by taking the *Tube* off the iron *Axis*, to make their Observations with the *Tube*, *Vane*, and *Velum*, in their Hands ; which, as it is very light, and far from cumbersome, is easy to do, as I have often experienced.

S E C T. V.

Of the Ombrometer.

THIS Machine consists of a tin *Funnel*, whose Surface is an Inch square, a flat *Board*, and a glass *Tube* let into the Middle of it in a Groove (the Length and Breadth of both Board and Tube being *ad Libitum*), and an *Index*. My Board is about three Feet long, to answer the Height of the Rails that go round the Top of my House, to one of which it is hung, clear of any Obstacle to prevent the free Fall of the Rain, with four little Staples that slide over as many Tenter-hooks. The *Bore* of my Tube is about half an Inch; which, at a Medium, is the best Size, a larger Bore obliging you to make your Graduation the more contracted, and, consequently, the less plain and accurate; and a lesser not permitting you to return the Water out of the Tube when full, without the Adhesion of a great deal to its Sides; which, when you have placed the Tube in its perpendicular Situation, subsides, and sometimes fills up $\frac{2}{3}$ of an Inch; which, without Care, must necessarily make great Mistakes in the *Diary*. The Method of *graduating* the Board is this:

I had a Vessel of Tin made, whose Contents were exactly a *Cubic Inch*. With this Vessel, filled with Water exactly to its Surface, I frequently gauged the Tube, till, by repeated Trials, I had found the Height to which a *Cubic Inch* of Water would rise in it. The Space answering to this on the Board I had graduated into 32 equal Parts, and took the same Method with the rest of the Tube, till in the same man-

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ner I had graduated four such Inches. Now the Surface of the Funnel being, as has been said, exactly a square Inch, no Rain can by it get into the Tube, but such as falls within the Square of one Inch; which, as the Shower is more or less, has its exact Quantity shewn upon the Board, on which a moveable *Index* is placed.

This Machine has highly answer'd my Expectation; its Form being very simple, and easily repaired, if any Accident happen. For, should the Tube be broke, 'tis only rubbing out the Graduation, which is marked with a Black-lead Pencil upon the Board painted white, and gauging your new Tube with the Cubic Measure for a new Graduation, and your Machine is again complete. I had one Tube broke, and about three Hours Pains set all to-rights. In Winter it will be necessary to let no Depth of Water remain in the Tube; for, should there be a Frost, the Expansion of the Ice will certainly break it. The Machine will equally serve for dissolved Hail and Snow. Its Figure may be seen TAB. I. *Fig. 5.*

S E C T. VI.

Of the Monthly Observations.

THE vacant Page at the End of every four Weeks, reserved for Observations occurring in the preceding Month, and giving a summary Account of the greatest Difference of the Weather in it, is a Method peculiar to this *Diary*; and one which, I flatter myself, will be allowed exceeding pertinent and useful. The great End of this, and all *Diaries*, is to furnish Materials for a Set of sound Observations

tions, upon which to build a thorough Knowledge of the *Atmosphere*, and its Effects upon Mankind : And it is easy to see what great Advantage to this Part of *Natural Knowledge* must arise from a Variety of Observations, made by different Men of Application and Judgment, upon one and the same Subject. Besides, in this Portion of our Design may be included, what could not well without Perplexity be thrown into the Columns of the Diary, all the Meteorological Appearances of the *Aurora Borealis*, Lightning, Thunder, &c. together with Abstracts of the most authentic Accounts of such *Phænomena*, as at any time in the preceding Month have been seen in different Parts of our own Country, or abroad. But this Article must be left to every Gentleman's Judgment ; it opening a fair Field for the most happy Advancements of many Parts of *Natural Knowledge*.

An EXPLANATION of the Characters in the
DIARY.

THIS — Line implies the Machine's being at the same Degree as it was in the preceding Observation.

This O Character in the Spaces for the Force of the Wind implies a *Calm*.

Note, 1st, None, but the cardinal and subcardinal *Points* of the *Compass* are commonly marked, unless in case of a *Storm*.

2dly, In the Abstract of the *Bill of Mortality*, which comes out on a *Tuesday*, the Account in each Week is to be compared from the *Tuesday* of the Week before, to the *Tuesday* in that Week where the Abstract is placed.

APRIL 1744.

Days of the Month and Week.	1 Sabbath.	2 Monday.	3 Tuesday.	4 Wednesday.	5 Thursday.	6 Friday.	7 Saturday.
Hours of the Day.	8 a. m. 8 p. m.	8 a. m. 8 p. m.	8 a. m. 8 p. m.	8 a. m. 8 p. m.	8 a. m. 11 p. m.	8 a. m. 8 p. m.	8 a. m. 8 p. m.
Barometer.	$\frac{196}{29} \frac{192}{400}$	$\frac{126}{29} \frac{45}{400}$	$\frac{144}{29} \frac{246}{400}$	$\frac{297}{25} \frac{305}{400}$	$\frac{146}{400} \frac{116}{29}$	$\frac{132}{400} \frac{33}{29}$	$\frac{392}{400} \frac{378}{400}$
Thermometer.	37 —	36 —	37 —	35 38	45 40	34 35	45
Hygrometer.	70 77	79 81	80	74 81	74 77	74	69
Anemoscope { Quarter. W. Force. 28	N. W. 30	N. W. 30	— 74	— 16	S. E. 20	N. W. 16	W. 0
Weather.	Sleet. Rains	Snow. Sleet.	Cloudy	Starlight.	Rain. Cloudy.	Overcast. Starlt.	Fine. Overcast.
Ombrometer.	1 3	13 22	3	—	—	1 13	—
Bill of Mortality.	Buried.	Males — 176 Females — 217 Total — 393 Decreased 70	Died of	Apoplexy — 1 Asthma — 8 Colic — 1	Fever — 52 Gripes — 4 Lunatic — 2	Small Pox — 22 Suddenly — 2	—

OBSERVATIONS in APRIL 1744.

Days of the Month.	Days of the Week.	Hours of the Day.
19	Mond.	M. 12
20	Friday.	P. M. 8
24	Tuefd.	P. M. 10 $\frac{1}{2}$

LAST Night, at 8¹ Hour, carefully watched, whether the lunar Eclipse had any Effect upon the Hygrometer; but could not, after several Examinations, perceive that it had any.

This is the first Day of our being favoured with warm Spring Weather. The Thermometer at 8 this Morning was at 65.

It now lightens towards the S. E. This is the first we have had this Year.

A SUMMARY of the greatest Difference of the WEATHER in *April* 1744.

Days of the Month.	Days of the Week.	Hours of the Day.
21	Satur.	A. M. 8
5	Thurf.	P. M. 11
21	Satur.	P. M. 8
6	Friday	P. M. 8
3	Tuefd.	A. M. 8
21	Satur.	P. M. 8
3	Tuefd.	A. M. 8

Mercury	Highest being then	30 $\frac{1}{4}$ $\frac{5}{8}$
	Lowest - - - -	29 $\frac{1}{4}$ $\frac{5}{8}$
	Hottest - - - -	75
Thermometer	Coldest - - - -	34
	Moistest - - - -	81
Hygrometer	Driest - - - -	65
	Quarterly moist from S. E.	
Anemoscope	Force greatest from N. W.	74
	Weather very unconstant.	
Ombrometer	Moist Rain on 7th in the Night	$\frac{24}{32}$
	Total Rain 5 Inch and $\frac{5}{8}$	
Mortality	Greatest in the 3d Week	432
	Least 1st Week -	393
	Total - - - -	1702

A Description of the Figures in TAB. I.

Fig. 1.

- aaaa.* The *Hygrometer* seen in the Inside.
- bb.* The Balance.
- c.* A small Piece of Wood, by which the Balance is fastened to the Box.
- d.* The Sponge.
- e.* The Weight.
- ff.* Two little Rings, by which the *Hygrometer* is hung up.

Fig. 2.

The graduated Plate on the Front of the Machine, with its *Index* and *Divisions*.

Fig. 3. The Anemoscope.

- a.* The Pedestal.
- b.* The Pillar, in which the iron Axis is fitted.
- c.* The Circle of Wood, on which are described the 32 Points of the Compass.
- d.* The Index.
- e.* The wooden Tube upon its Axis.
- f.* The *Velum*.
- g.* The graduated Quadrant.
- h.* The Counterpoise of the Vane.

Fig. 4. The Velum taken off.

- a.* The Plane of the *Velum*.
- b.* The Spring.
- cc.* The wooden *Radii*.

C

dd. The

- dd.* The Holes, thro' which the Pin, in the Centre of the Quadrant, goes.

Fig. 5. The Ombrometer.

- aa.* The Board.
bb. The Tube.
c. The Graduation.
d. The Funnel fixed in the Tube.
e. The Funnel one *Inch* square.

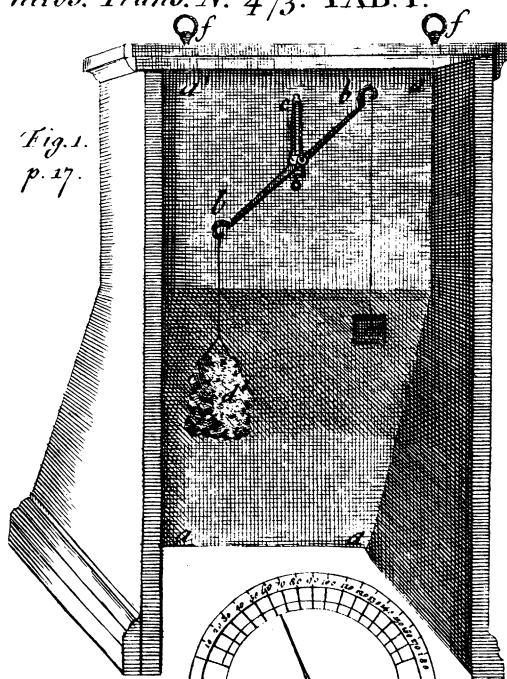
Fig. 6. The Wild-Oat Hygrometer.

- a.* The Box and Plate.
b. The wild Oat, with the Index upon it.
c. The Pin, with a small Piece of Ivory on its Head.

II. *A Letter from Mr. William Watson, Apothecary, F. R. S. to the SOCIETY, concerning some Persons being poisoned by eating boiled Hemlock.*

Gentlemen,

Read May 10. 1744. **N**otwithstanding the Number of Instances, which occur among Writers, concerning the poisonous Quality of our common Hemlock, or *Cicuta major* of *Caspar Bauhin*; such as, that of *Cardanus* mentioning a Man kill'd by a Cake, wherein this Plant was an Ingredient; that of *Brassavola*, who assures us, that it is mortal not to Men only, but to Geese and Swine; as well as those of



*Fig. 1.
p. 17.*

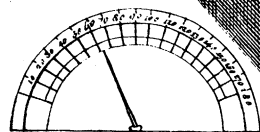


Fig. 2. p. 17

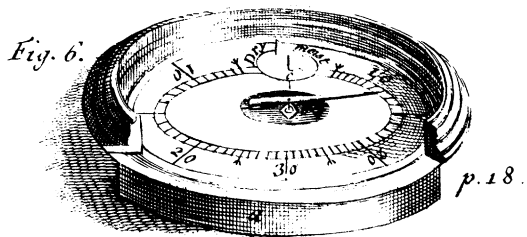


Fig. 6.

p. 18.

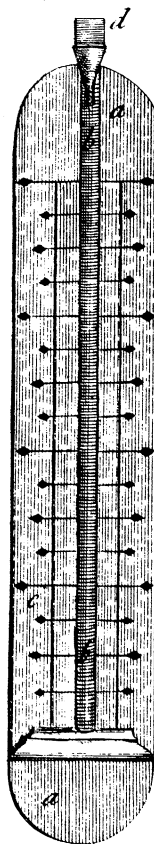
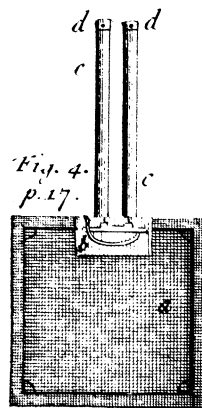
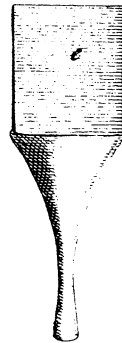
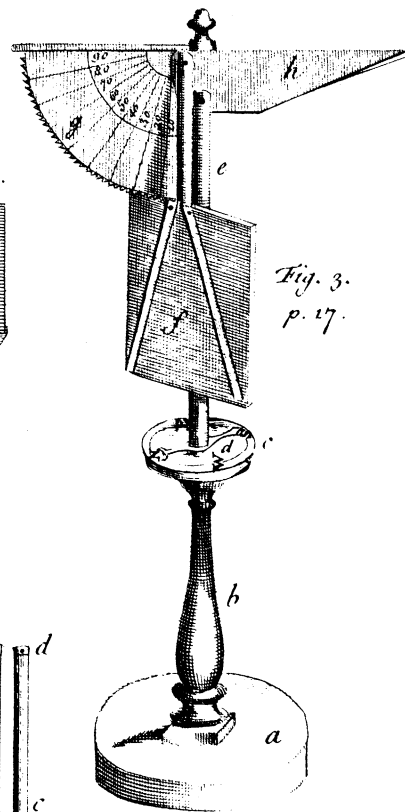


Fig. 5. p. 18.



*Fig. 4.
p. 17.*



*Fig. 3.
p. 17.*