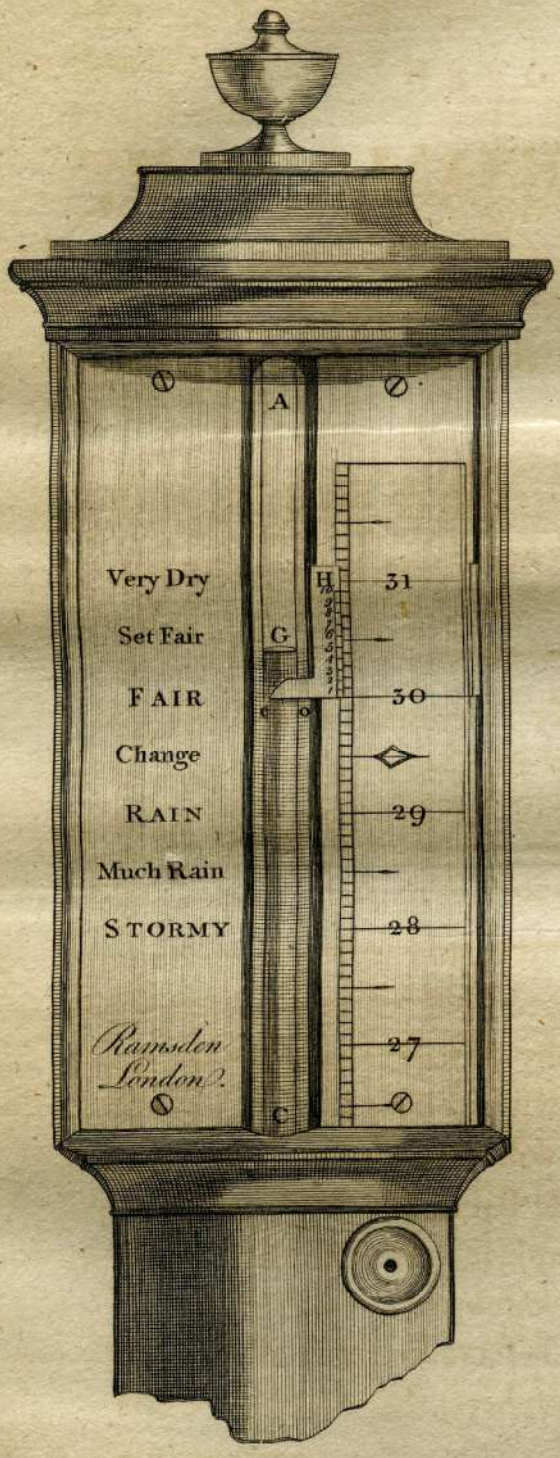
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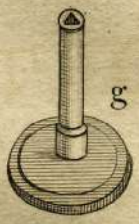
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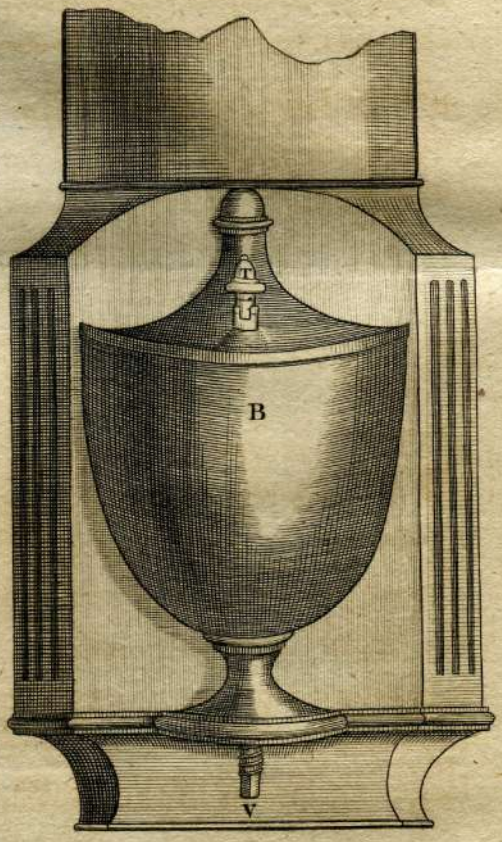
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DESCRIPTION

OF THE IMPROVED

PORTABLE BAROMETER,

AS MADE AND SOLD

BY J. RAMSDEN,

MATHEMATICAL, OPTICAL, AND PHILOSOPHICAL

INSTRUMENT MAKER,

Next ST. JAMES'S CHURCH, in PICCADILLY, LONDON.

☞ *In hanging up this Barometer for uſe, be careful to unſcrew the bottom ſcrew beneath the vaſe, before the ivory ſtem is turned, otherwiſe the mercury will flow through the opening of the ivory ſtem, and in a great meaſure empty the cyſtern.*

SOME years ſince, when I firſt turned my thoughts to improve the Barometer, thoſe made with an open cyſtern, only could be relied on for giving the height of a mercurial column, with any tolerable degree of accuracy; although the Portable Barometer, on account of the facility of tranſporting it from place to place, was in ſome uſe, yet it having no gauge point, or other means, whereby to know the place of the ſurface of the mercury in its cyſtern, it ſerved only to ſhew thoſe larger variations in the preſſure of the atmoſphere, that uſually precede conſiderable

conſiderable changes in the weather, wanting the neceſſary exactneſs of a meteorological inſtrument, or to ſhew the preſſure of the atmoſphere with preciſſion; indeed, if we attentively examine the preſent conſtruction of the Barometer with the open cyſtern, it will be found much leſs perfect than has hitherto been imagined; for however large a cyſtern may be, yet the height of the ſurface of the mercury therein, muſt vary by a greater or leſs height of the column in the glaſs tube; moreover we are obliged to empty the glaſs tube of its mercury before we can with ſafety remove it from one place to another; and to refill it again, requires much dexterity, and experience.

Nor when done, have we any means whereby to determine the perfection of the vacuum, or whether it be the ſame at the different times of filling the tube: But by a proper conſtruction of the Portable Barometer, theſe and many other defects may be obviated; having occaſion to fill the glaſs tube only once, it may be done in a place convenient for that purpoſe, and we may at any time examine the perfection of the vacuum above the ſurface of the mercury, by inclining the Barometer till the mercury runs to the end of the glaſs tube; alſo by having a proper apparatus for determining the height of the ſurface of the mercury in the cyſtern; it may be ſet to the true place from whence the ſcale of inches commences, by means of the ſame ſcrew that ſerves to make the Barometer portable.

Hitherto the height of the mercurial column has been meaſured by ſetting the index to the edge of the mercury that is in contact with the interior part of the glaſs tube, but this muſt evidently be liable to great uncertainty, from the coheſive attraction between the mercury and the glaſs; nor can the height of the column meaſured from thence, for the ſame reaſon, be equal to the preſſure of the atmoſphere; whereas, the middle part of the column being in tubes of a moderate ſize, little, if at all affected by this attraction, gives the trueſt meaſure of the

the weight of the atmoſphere, and is alſo the moſt ſenſible to any change in the preſſure thereof.

In order to meaſure the height of the middle part of the mercurial column, which in a tube properly filled, has its ſurface always convex; inſtead of a cock or index, on one ſide of the glaſs tube only, I have another immediately oppoſite thereto behind the glaſs tube, ſo placed, that if a plane was to join the lower edges of theſe cocks, it would be at right angles to the direction of the glaſs tube, and the eye being placed in the direction of this plane continued, which may be known by raiſing or lowering the eye, till the opening between the lower edge of the cocks and the ſurface of the mercury appears greateſt, will determine the height of the column to the exactneſs of the thouſandth part of an inch.

Fig. 1. Repreſents the upper part of the Barometer with the metal plates whereon the words and ſcale of inches are engraved, which are covered by a bent plate of glaſs to prevent them from becoming dirty, or being corroded by the action of the air, *A C* the upper part of the glaſs tube that contains the mercury; the plate towards the right, has a ſcale of inches graduated thereon, the zero or beginning of this ſcale being at the ſurface of the mercury in the cyſtern, each inch is divided into ten parts, which are again ſubdivided by a vernier of ten diviſions cut on the plate *H*, equal in length to nine of the diviſions on the ſcale; from the well-known properties of the vernier, theſe tenths of inches on the ſcale are thereby divided into ten parts, viz. to the hundredth part of an inch. The vernier plate *H* alſo carries a cock together with a ſimilar one immediately behind the glaſs tube, the lower edge *e o* of the two cocks are in a plane, at right angles to the direction of the glaſs tube, as has been already mentioned; theſe cocks which may be called the index, with the vernier *H*, may be raiſed or depreſſed in order to ſet them to the ſurface of the mercury in the glaſs tube, by turning a key with an ivory head at *L*; this key may be taken off the

the Barometer at pleaſure, to prevent perſons from moving the index, and is ſhewn detached therefrom at *g*.

Fig. 2. Repreſents the lower part of the Barometer; within the vaſe *B* is a cyſtern containing mercury, wherein the lower, or open end of the glaſs tube *AC* is immerſed, a ſmall ſtem of ivory *T* ariſes from a float of the ſame ſubſtance that reſts on the ſurface of the mercury in the cyſtern, a circular diviſion is cut round this ſtem, on the top of the vaſe *B* is a ſhort hollow cylinder of ivory, through which the ſtem *T* paſſes, it is cut open in the front, and has two ſmall diviſions Q Q cut thereon; beneath the vaſe at *V*, is a ſcrew that may be turned by means of the ivory headed key *g*, it ſerves to raiſe or lower the mercury in the cyſtern, in order to ſet the ſurface thereof to the true place from whence the ſcale of inches on the Barometer plate commences, which will be indicated by the coincidence of the diviſion, or the ſtem *T* with thoſe at Q Q on the hollow cylinder.

To meaſure the height of the column of mercury in the Barometer.

For this purpoſe the ſurface of the mercury in the cyſtern muſt be firſt ſet to the true place from whence the ſcale of inches on the Barometer plate commences: The Barometer being placed in a perpendicular poſition, unturn the ſcrew *V*, by means of the key *g*, that is to ſay, turn it toward the left, as far as it will go without forcing; then turn the ivory ſtem *T* in the direction, as if to ſcrew it unto the vaſe *B*, till the float within the cyſtern reſts on the ſurface of the mercury, which will be known by the trembling motion of this ſtem, on being touched; this done, turn the ſcrew *V* towards the right, till the diviſion on the ſtem *T* coincides with the diviſions Q Q on the hollow cylinder, and the ſurface of the mercury in the cyſtern will be properly adjuſted. Put the key *g* in the ſocket at *L*, and turn it till the lower edge of the index, and alſo of the index behind the tube, appear to touch the top of the convex ſurface of the mercury in the glaſs tube,

or

or rather, that an imaginary plane joining the lower edges of the indices may appear as a tangent to the convex ſurface of the mercury; and the height of the column will be given by the vernier on the ſcale of diviſions on the Barometer plate.

As the mercurial column in a Barometer expands or contracts by different degrees of heat, the preſſure of the atmoſphere remaining the ſame, it may be neceſſary in nice obſervations to reduce an obſerved height thereof to ſome ſtated degree of temperature; the point I have choſe for this purpoſe, is the 55th degree on *Farenheit's* ſcale, uſually ~~marked temperate.~~ To this end, I have ſometimes put a Thermometer in lieu of the metal plate to the left of the Barometer tube. On ſuch Thermometer plates are two ſcales, that towards the left being *Farenheit's*; and the one towards the right, a ſcale for correcting the expanſion of the mercury in the Barometer tube, adapted to a column of mercury of thirty inches, and ſhewing the number of hundredth parts of an inch, to be added to, or ſubtracted from the obſerved height of a mercurial column, to reduce it to the height it would have had with a temperature of 55 degrees the point of *O* on this ſcale; the number ſhewn below that point is to be added to the obſerved height of the column, but the number above *O* is to be ſubtracted, as expreſſed on the Thermometer plate.

But this correction ſcale, being computed for a column of 30 inches, therefore, when the obſerved height of the mercury differs conſiderably from 30, it will be neceſſary to reduce the number ſhewn on the correction ſcale in that proportion.

For example. Suppoſe the temperature ſhewn on the Thermometer to be at the 6th diviſion on the ſcale of correction, and the obſerved height of the column 28 inches, then as 30 : ,06 :: 28 : ,056 the true correction to be uſed as before directed.