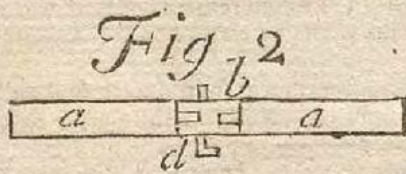
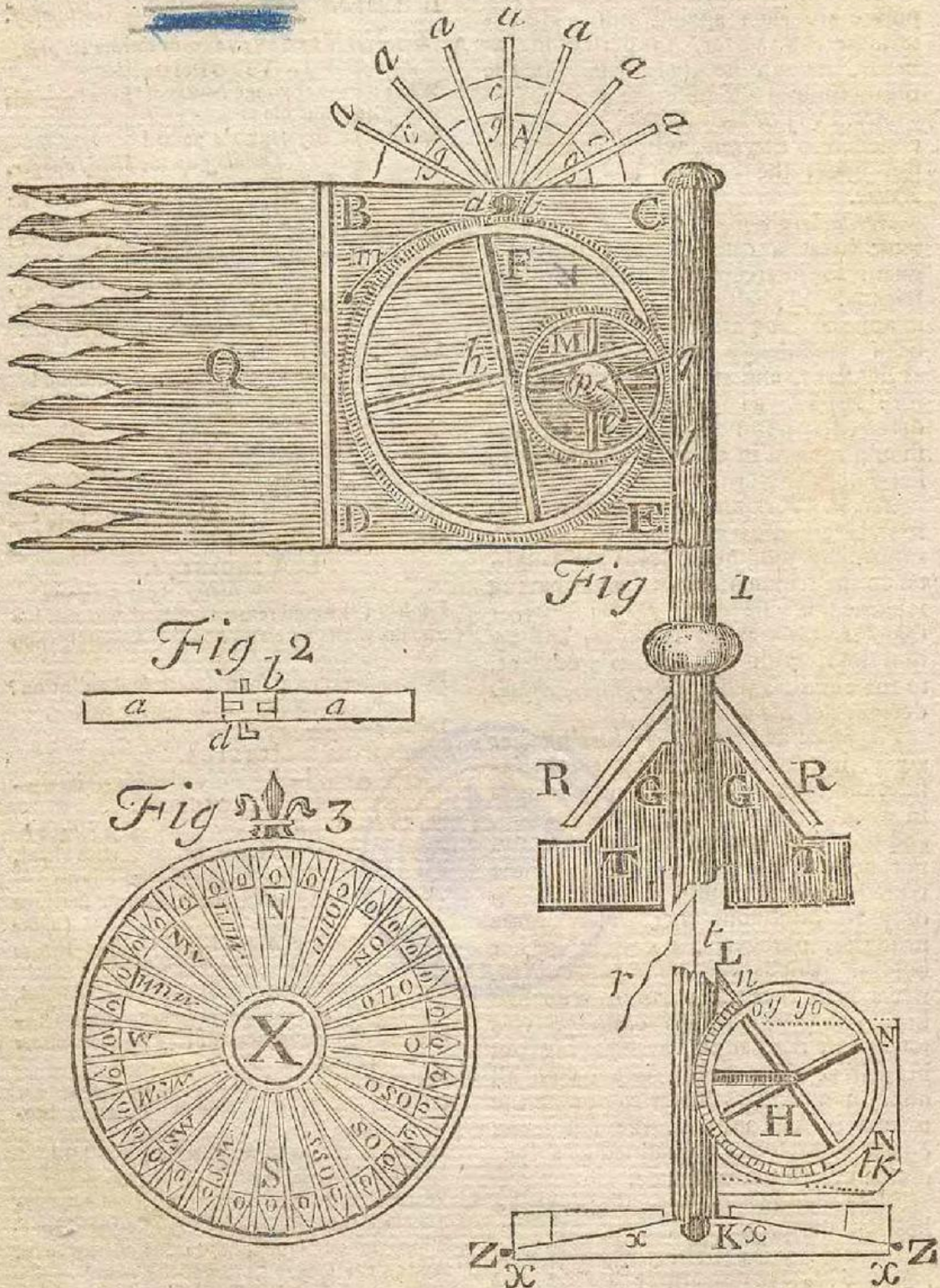


A new invented Ruffian Machine.

An Anemometer, or new invented Weather-cock, which shows the utmost Velocity of any Wind, and at the same Time all the Variations of its Directions. By Michael Lomonosow, a Russian Artist.



Construction of the Machine.

1. **L**ET the wheel A be made of beechen vanes, sixteen in number, each 24 inches long, 2 broad, but not above one twelfth of an inch thick, fixed in such a manner into the axis as to form angles of 22 degrees and an half, and, to make them stronger, let them be secured by two circles

of iron wire, passing thro' them at c and g.

2. Let the axis b, moving in apertures in the top of the wooden box BCDE, (in which half of the above mentioned wheel is included) and moving together with the wheel A, put in motion another wheel F, by means of the tooth d, two feet in diameter, and furnished

furnished with 800 teeth, which, with a pinion fixed to its axis, may turn a third wheel M, of half its diameter, and having but 400 teeth, with an axis of half a foot diameter, but in length only a quarter or half an inch.

3. Let there be two springs e and m , fastened to the sides of the boards. The former, which must be the stronger, presses the wheel M against the pinion b ; to be separated from it at pleasure by a small cord p/t ; the latter must be more flexible, and is to prevent the wheel F from having a retrograde motion.

4. Let the wheels F and M be covered with a thin board, equal to the side of the box BCDE, and every where well defended against the impression of moisture. At the narrower side of the box BD, let the board Q be fastened perpendicularly, five feet long, but in breadth exactly equal with the box, with notches made at the edge to decorate the machine according to any ones particular fancy.

5. Let the whole machine be fastened to the bar CK, whose lower part is perforated length-ways, like a tube, in order for the reception of the strings. From L as far as K let the bar be of the shape of a quadrangular prism, that is, as much as is beneath the arch TT. The rest of a cylindrical figure, of sufficient length and thickness to support the machine, and to sustain the force of the winds.

6. In the arch TT, let there be a round hole for the reception of the cylindrical bar, which must be defended by the perforated cone GG, fastened to the arch, and with another concave cone RR, covering the former, and so fixed to the bar, that it may move freely on its axis in the hole, and that rain and snow may be kept from the hole by the said concave cone.

7. To the axis p must be fixed the string p/t , rubbed with wax or pitch, to be wound about the same axis, and its other end must be wrapt about the wheel H, graduated upon the edge, whose magnitude, as likewise that of the wheel itself must be settled by practice. The index n fastened to the bar is to shew the degrees according to the different position of the wheel.

8. In the wooden box N which is deep and narrow, let there be the moveable wheel H. Let there be an even glass tube of about a quarter of an inch bore, coiled round its circumference, to

be filled with quicksilver up to both its apertures u and y , when they are in the same horizontal line. The box N must have a hole at the corner z .

9. Let the wooden circular compass box X (fig. 2) be placed on the lower extremity of the bar at K, equally divided into 32 partitions by very thin slips of wood, so that while the partition N points to the north, the opposite S will have its direction to the south, and so all the rest to the 32 points of the compass. The ends of the partitions at o terminating in an acute angle towards the circumference must be covered. The remainder, which is extended to the hole at X and uncovered, must be marked with the several winds after the manner of a mariner's compass.

10. In short, every thing must be so managed by the skill of the artificer, and so well fitted and connected, that the motion of the machine may be uninterrupted, and yet have sufficient strength to resist the impetuosity of the air. The magnitude of the vanes and the respective wheels may be increased or diminished at pleasure. The wheels F and M, as likewise the pinions, must be made of copper.

11. Before it be finally fixed within the arch, let the machine be placed where any wind blows freely, and can actuate the wheel A with its vanes, by an uniform rotation. Let a mark be fixed at the distance of a hundred fathom in the same direction that the wind blows from the machine, and let a feather be let loose at the machine, in the current of the air, and whilst it is passing to the mark, let the number of revolutions of the vane wheel be observed as accurately as possible, by the number of teeth in the wheel F; which being found out by this method for a hundred fathom, which the air passes over, you may account in the same manner for 500. This done, let the place of the index n be observed, and its distance from the point where it stood at the beginning of the first revolution, and let that be taken for the first degree, to be marked on the edge of the wheel H, according to which the rest may be determined.

The Use of this Machine.

If this machine be placed at the top of an observatory, it will answer the end of a weather-cock, for shewing the direction of the wind, in such manner that the board Q, together with all the upper part of the machine, being brought into the eddy of the air, the

narrow

narrow case N N will regard the point from whence the wind blows: and the vane wheel A being set in motion, will move the wheels P and M, whose office is to moderate the coiling of the string p upon the axle p , which by means of the said string gives motion to the wheel H in the case N N, about which it is coiled. And thus a different number of degrees ascend above the index n , according to the different quantity of air that passes: So that tho' the observer be absent, the greatest velocity of any wind may be known. When the scale of divisions on the limb of the wheel H is completed, pull aside the spring from the string, that the wheel M with its axle p may be put out of contact with the pinion b , and the wheel H be brought into such a position that the index n may point at the beginning of the divisions; then let go the string, so that the wheel M may come again in contact with the pinion b , in order to be moved by it. When the wind blows and the wheel H turns from n towards y , depress the orifice $t y$ of the tube $n y$, and so the quicksilver will drop out from the tube into the case N N, and out of that, thro' the hole k into that cavity of the point of the compass, which answers to the quarter from whence the wind blows. And, as the wind varies, the mercury, according as the aperture y is depressed, will flow into the cavities of the compass answering to the quarters whence the new winds blow. When all the mercury is thus discharged out of the tube, the wheel must be turned anew, as above, and the tube again filled therewith, by the help of a funnel, and the hole K presently stopped. The mercury may be collected from the several cavities of the compass by means of the cocks z , first noting the quantity in each. Lastly, open the hole k , that the mercury may again run from the glass tube thro' the same into the cavities of the compass, as before.

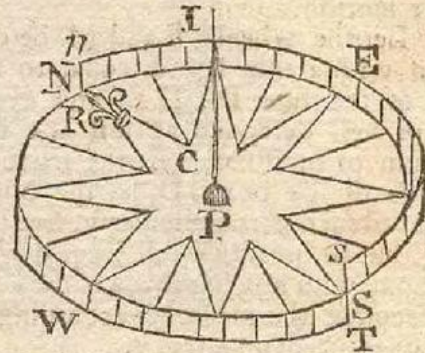
The Description of an Azimuth Compass of a new Contrivance.

Besides several other defects of the common azimuth compass, it has two very considerable ones. The first is, that it requires two observers, one to see the object through the sights, the other to note what degree of the circumference the horizontal thread answers to at the same moment. The motion of the ship renders this latter observation exceeding delicate, through

the difficulty of the two observers agreeing in the same instant, for it is not sufficient that each be justly taken; 'tis necessary that they should be contemporary too. The second defect is that the compasses in use are hardly fit for any thing but taking the sun when rising and setting, where he is the oftenest hid by clouds or vapours.

These two inconveniences I have endeavoured to remove in the construction here propos'd. I take a common azimuth compass and on the chape,

FIG. I.



which should be made as low as may be; I solder or screw a fine brass wire or stile (Fig. I.) CI, whose height is equal to the semidiameter of the compass, and set truly perpendicular to the plane of the card. On the edge of this plane from the north N of the needle, to the south S, along the half NES, I fix an half border of paper NRS, rising vertically near a quarter of an inch above the plane. I likewise fix another NRS on the semicircumference NWS, which falls as much below the said plane, as the former rises above it. These two half borders must be divided into degrees corresponding with those on the circumference of the card. This done, I place it upon its pin and hang it in the box ABCD, (Fig. II.) and throwing aside the plane glass and the ordinary threads, I cover the compass with a semiglobular glass AGH, under which the vertical stile may play freely.

Here the shadow of the vertical stile, which would be hardly visible on an horizontal plane, may be very distinctly seen, even at the sun's rising and setting, on the vertical border. If the border had rose wholly above the plane of the card, one side thereof would have projected a shadow on the other, and obliterated that of the stile, which inconvenience is avoided by turning half of it downward, and its small weight will not affect the veering, and the middle part BDHE may be cut quite