

degrees had a half from the west to the south. The point he flies upon is east-fourth-east, and the point he feet upon is

Flattened and dry grown, to tell the sun's position, viz. his distance from the east and west, or from the north and south points, or from the place in general, then turn the globe till the index points to the given hour; this being done, turn the quadrant till it falls on the place for the given day; and then the quadrant will see the horizon in the globe's mapline, from the east or west point; and from the same point you may see the sun's position, viz. his distance from the east or west point, &c. for you may reckon from either, only then named it properly, and according to it. Thus, on August the 17th, at nine in the morning, the sun will have about thirty degrees southeast from the east to the finish, or which is the same, forty degrees from south to the east; the first degree and thirty degrees make ninety degrees, the whole quarter from east to south.

[illegible]

... *... For the given day, bring it to the meridian, and observe what its declination, then turn the globe all round other degrees of the ecliptic comes under the same degree of declination under the meridian, till being done, five-and-six of the month inform us to the place where point the meridian, for this is the day required, which you may easily prove. Thus you will find July 12 and August 22 of the same year to be as*

It is to be observed, that *day* does not tell the beginning, ending, or length, or continuance of twilight. It is only in that first light, which begins to shew us the sun far in the evening, till he is high above the horizon, and is beginning to set, when the sun comes with almost no degree of the horizon on the side, and such when he rises, therefore it is plain, that *day* is only longer when *days* increase in length, but it is also much longer.

Para. 32. The *leap hours* where you are to tell what *hour* it is in any other part of the world. Rule. Bring the given place to the meridian, and for the index at the given hour, then turn the globe till the other place, or place, name under the meridian, and the index will point at the real time required. Example. When it is two o'clock in the afternoon at London, I would know the time at Jerusalem, and at Port Royal in Jamaica. Proceed according to the rule, and you will find that when it is two in the afternoon at London, it is twenty-five minutes past four at Jerusalem, and but fifty-two minutes past eight in the morning at Port Royal.

Psalm 23. The day of the month gave to tell those inhabitants that will bore the sin in their mouth, or wear their hands, in that day. This cannot happen to any other inhabitants but those in the meridian; Zephai; that is, in all flesh as have no country, three degrees and as half of latitude, either north or south. Anie. Bring the sun's place to the meridian, and observe exactly his declination for that day, then turn the globe any way, and observe what places pass under that degree of declination on the meridian; for all flesh will have the sun right over their heads some time or other on that day.

§ 202. 2. The day is *hour* given *any place* to tell *the inhabitants*, *that place*, to which the *sun* is then *vertical*, *will*, *in the month*. Rule. Bring the given place to the given meridian, and turn the index to the given hour; this done, turn the globe till the index points to the upper twelfth, or noon; then look under the degree of declination on the globe of that day, for what is the very spot, or place to which the sun is then vertical. Example. On May 13, at three minutes past five in the afternoon at London, I would know what place has the sun in their zenith. Answer, Port Royal in Jamaica. Thus also you will find, when it is thirty three minutes past six in the morning at London, on April 28, the inhabitants of Candy, in the island of Ceylon, will have the sun nearly in their zenith.

of iron, and the Matrix of Loadstones. The loadstone is a hard, brittle, and of a colour and weight as iron. However, it is not so much attracted and hammered out like iron, but flies to pieces under the hammer, and turns to a cals in the fire, which shows, that it parts with itself, and exceeds those of iron for hardness, rigidity, and, an intricate combination one with another. Its known properties are these, that it parts with iron, and without any other quality, it points north and south, so that part of it which stands to one pole never turns to the other. The way to give it a firm motion, is to let it sink in the water upon a piece of wood. Philosophers have observed, that the loadstone does not always point to all north and south, but sometimes inclines to the east or west without any rule. Though a loadstone generally has two poles pointing north and south, as an acid before, yet there are some irregular ones, which seem to have more poles. As one loadstone holds up another, so it does iron, brass, or left weight like itself. If iron shall be sowed upon a loadstone, the particles will diffuse themselves directly between the poles, and then by degrees incline to an orbicular figure, so as to lie parallel with the axis of the loadstone, unless it be one of the irregular sort before-mentioned. The loadstone imparts its virtue to iron so effectually, that iron, touched with a loadstone, appears to have all the properties of itself, though not in an equal degree. The great use of this communication is experienced in the mariner's needle, by the help whereof they readily find the north and south, and all other parts of the world.

Concerning the Sea. The facts that vast quantities of salt water, extending from north to south, and from west to east, surround the globe, and on every side, into which all streams discharge themselves, and out of which mighty gulf and bays are formed, the greatest of which is the Mediterranean. The whole is called the ocean, but variously distinguished and named from the several countries by which coats it runs. The saltiness of the sea water seems to proceed from the same cause as that of several fountains, by the boiling of which water salt is produced; for since the bottom of the sea is of fresh soil, 'tis extant, 'tis is reasonable to think that there are large mines of salt in many places of it, which, being dissolved, spread throughout the sea. In order to find out the reason why the water of the sea is not augmented, let us see whether there be not a way for its daily diminution, as well as increase.

Concerning Winds. The wind may be divided into constant and variable: the former are always, at certain times of the year, and in certain parts of the world, blowing from one point, but the latter vary so much, that they cannot be reduced to any rule. Now first it is easier to find out the cause of our regular winds, than of many irregular, let us, in the first place, treat of constant winds. And here we must take notice, that the winds are constant, not periodical only in the open sea. Now the universal cause may most properly be divided into three parts. 1. The Atlantic and Ethiopic oceans. 2. The Indian ocean. 3. The great South Sea, or Pacific Ocean; and through these seas do all communications by sea, yet as to our present purpose of the periodical winds, they are sufficiently separated by the interposition of great tracts of land; the first lying between Africa and America, the second between Africa and India, and the last between China, Japan, and the coast of America. There is in the Atlantic and Ethiopic seas between the Tropics a general surface wind all the year, excepting that it is subject to vary and defect some few points towards the north and south, according to the position of the place. The winds in the Indian ocean are partly general; and in the Ethiopic ocean partly periodical, that is, half the year they blow one way, and the other half near upon the opposite points; and these points, and times of shifting, are different in different parts of this ocean; the limits of each tract of sea, subject to the same change, or monsoon, as the natives call it, are

The variable winds are, first, the S. by E. and, in such parts of the Sea as are without the limits of the constant winds to the north and south of that line, in the eastern parts of the ocean, and all over its eastern bays, the principal of which are the Mediterranean and Baltic, it forms a constant and powerful current, others are more peculiar to some particular parts. Of this nature for the most famous are the hurricanes which chiefly prevail in the Caribbean, but are not unvarying, nor equally frequent. Their fury is so great, that they throw down all before them, uproot the strongest houses, tear ships prodigiously, and blow about things of vast weight. They are not even, but blow in pulses, which suddenly come and go; neither do they extend very wide, but are sometimes confined to a narrow compass, and at other times take a larger scope. As for their duration, it is but for a few days; and sometimes only a few hours. They are more common in America than any where, though Europe and Africa are not altogether without them.

Wind being properly defined to be the stream, or current, of the air, and where such a current is perpetual, and fixed in its course, it is necessary that it proceeds from a permanent, unaltering cause, which we conceive to be the action of the sun beams upon the air and water; as we observe every day over the oceans, considered together with the nature of the soil, and situation of the adjoining continents: therefore, first, according to the laws of statics, the air, which is left rarified or expanded by heat, and consequently more ponderous, must have a motion towards those parts thereof, which are more rarified and less ponderous, to bring it to an equilibrium; and, secondly, the preference of the sun continually shifting to the westward, that part towards which the air tends, by reason of the rarefaction made by his great meridian heat, is with him carried westward, and consequently of the air, which is thus generally rarified, and thus more ponderous, and thus more inclined to be formed, which being imposed upon all the air of a vast ocean, the parts impel one another, and so keep moving all the next parts of the fan, whereby so much of the impression against heat is again repeated, and thus the westerly wind is made perpetual.

With respect to the bodies over which they pass, the dry ones are the most barren, and the vapours which they raise are the least copious. In the northern tracts the yields but view vapours, in comparison of those which come from warmer parts of the ocean; and from thence towards the line from warm and vapourous parts. The Western Ocean seldom fails to send us rainy winds; however, this property varies according to the various situation of countries. Such winds gather clouds as below from the quarters where the vapours arise, which, in conjunction with the vapours of our own region, fill the air. On the other side, those winds make fair weather, which bring little vapour along with them, and bear away that which hangs over us.

When the air gets loof from thick broken bubbles in which it was before imprisoned, that which happens to be pent in twixt: the clouds is necessarily very much dilated by the inflammable substance, and therefore, being heaved up on every side by thick clouds, which, contrary to the heap together round it, or by the falling in of one cloud upon another, does, by its expansive force, burst in passage through them with a violent explosion, and causes that crack or rumbling which we call thunder. The clap fens continued or reiterated by reason of the sound being reflected from the surface of different clouds, which causes so many repetitions, or echoes.—When a flash is projected through a large extent of air, or sets fire to a train of other inflammable matter within the sphere of its action, it is what we call lightning.—If the quantity of airy particles issuing from the bubbles of water upon the collision of two clouds be very small, forming only a little globe of fire, which shoute out like a small grain of light in the air, and straight-way disappears, this is what the common people call a falling star.