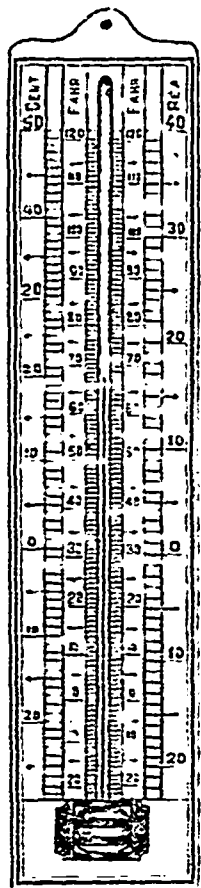


Multiply the degrees of Réaumur, by  $2\frac{1}{2}$ , or  $\frac{5}{2}$ , and add  $32^\circ$ ; you have Fahrenheit—for exa- ple, suppose we have  $20^\circ$  of Réaumur, then  $20 \times \frac{5}{2} = 50$ , to which add  $32^\circ$  and you see at once that  $20^\circ$  R. equal  $77^\circ$  F. Again, to convert Celsius, or centigrade, into Fahrenheit, multiply by  $\frac{9}{5}$  and add  $32^\circ$ . Thus, if we have  $20^\circ$  of centigrade:



Cent., Fahrenheit,  
Réaumur.

$$20 \times \frac{9}{5} = 36 + 32 = 68^\circ \text{ F.}$$

And again  $\frac{4}{5} \times \text{Celsius} = \text{Réaumur}$ ; and  $\frac{4}{5} \times \text{Réaumur} = \text{Celsius}$ . Of course, to reverse matters is easy enough—divide, after deducting  $32^\circ$ , instead of multiplying: what degree of Réaumur is equal to  $77^\circ$  of Fahrenheit?

$$77 - 32 = 45 \div \frac{5}{4} = 36 = 20.$$

Do not buy cheap thermometers, many of them vary even as many as 5 or 6 degrees, and are useless, even for dairy-work.

Lastly, we have the Hygrometer, or *moisture-measurer*. There is a simple one, not unlike the Aneroid in shape, with a pointer composed of two pieces of wood so glued together that as the humidity increases it twists through the degrees to the right, and as the air dries twists back again. It is useless alone, but combined, as it ought always to be, with the Barometer and Thermometer; with the appearances of the clouds, sun, moon, behaviour of animals, etc.; a very shrewd guess may be made, by a persistent observer, as to the probable weather for the next 24 hours.

In judging of the prospects by these instruments we must observe that the Barometer being *constant* is the surest test: if it remains low, or if it remains high, the weather will be fixed—if it jumps about the weather will vary.

The words, *dry, set fair, &c.*, on some old barometers are nonsense, if the mercury is convex at the top, the whole is rising; expect fair weather; the middle rises the most easily on account of the friction of the sides against the tube. If the mercury be concave, the whole is falling, and a change of weather is at hand. A sudden fall of an inch or so indicates a storm within 24 hours.

At St. Thomas' island before the hurricane of 1807, it sank  $3\frac{1}{2}$  in. in as many hours.

If some fair morning in early summer, with a tranquil feeling of content about you, you approach your barometer and find it at 30; tap it; if it rises convexly, if the thermometer in the shade is at  $75^\circ$  F., and the hygrometer at  $40^\circ$ , you may go about any work you please without fear of interruption from the weather. Mind, in observing the indications of either of these instruments, to bring your eye to the level of the mercury; otherwise you will fall into many an error: the observations of a 6 foot or a 5 foot man would never agree.

You will now be able to understand how the barometer is used for measuring the height of mountains. You saw that the column of air, 50 miles or whatever it is, high, exactly balanced the 30 inch column of Mercury in the barometer. In ascending a mountain one mile, it is clear that  $\frac{1}{30}$  part of the weight of the pressure is taken away; therefore, allowing for the temperature,  $\frac{1}{30}$  part must be deducted from the sum of pressure. I say, allowing for the temperature, because heat causes the mercury to expand, by evaporating the moisture in the air; and cold contracts it by checking evaporation, and thereby increasing the density of the air. Two observers are requisite, one below the other, and both must have thermometers as well as barometers. (1)

The following may be taken as pretty correct indications of the weather by the barometer:

Rise: Fair weather.

Fall: Foul.

In sultry weather, a fall indicates thunder, and the thermometer generally falls, too, before the storm comes up.

If in winter, spring and autumn, the mercury rises, there will be cold weather.

Heat, on the other hand, is indicated by a fall in summer and autumn; but frost, by a rise in winter.

If in a frost the mercury falls, a thaw will follow.

When at any season, a continuous fall happens through several fine days, continued bad weather will be the result. And the reverse.

When fine weather sets in suddenly, it will be of short duration.

A sudden extreme change denotes changeable weather.

If the temperature remains constant, a rapid rise or fall denotes wind.

A rising glass with cooler air, indicates fair weather—rising glass with warmer air—changeable.

Wind is air in motion. If you ever lived under the shadow of the Laurentian mountains, you have remarked that the direction of the wind changes every 24 hours during the summer months: this change is most distinctly perceptible in a heated term. From the hills all day, and towards them in the evening; just as on the coast in hot climates, the land and sea breezes alternately heat and refresh the inhabitants.

Why does the flame of a fire just lighted ascend the chimney? For the simple reason, that being rarefied, or made thinner, lighter, it naturally seeks the highest place. The air rushes after it and you can feel the draught. Just so is it with the winds. It is all a struggle: air heated, and therefore rising, cool air violently anxious to occupy its place. The

(1) Not strictly correct, as of course, the lower part of the atmosphere is the heavier; "but it will serve," as Mercurio says, in *Robinson and Juliet*.

sun's heat raises the temperature of the earth in the tropics, which affects the density of the atmosphere; the air ascends, and is replaced by two cold currents from either Pole, the trade winds. Observe particularly this point—heated air rises, and is followed by fresh currents of cold air. If you feel this once you will never, as many people do, make a bungle of your stable, and other, ventilation. If you want the foul heated air to escape above, you must let in the nice cool air below. A draught of some sort there must be, only keep it away from your animals' heads. This by the way; as is also the fact that a West Indian Ouragan (Caribbean, not French) has blown cannon out of the batteries!

We will now turn to some of the natural phenomena, most interesting to all, but especially to you farmers; phenomena which coupled with an accurate and regular daily notation of your instruments will make you safe prophets as to the diurnal changes of the weather. But I forgot, as I am sorry to say, I often do—I must first say a word about clouds.

A cloud is a body of vapour—often of enormous size. There is, as we saw, about  $\frac{1}{30}$  of the whole bulk of the air vapour. When from any cause the temperature of the air is reduced, the atoms of vapour approach each other, coalesce; and, as the steam from a kettle is visible in the kitchen, vapour becomes visible when condensed by cold, and takes the form of a cloud.

Their height varies from 1,300 to 27,000 feet above the sea. Layer after layer of clouds may be seen on ascending mountains; and they may be often observed moving in opposite directions at the same time. No better presagers of weather than clouds. They look as if, in form, they were innumerable, but they may be reduced to three sorts: Cirrus, Cumulus, Stratus,—multiples of these are: Cirro-cumulus, Cirro-stratus, Cumulo-cirro-stratus, the storm cloud.

The Cirrus or curl-cloud—the least dense of all. Streaks of white vapour, in fibrous forms, for instance; the *gray mare's tail*: supposed to be of snow, as Glaisher, in a balloon, went up 7 miles,—nearly losing his life thereby—and then the cirri were apparently as high as they seemed from the earth. Say they are 14 miles; the temperature at that elevation must be far below zero of F's scale. The cirrus of rod-shape with fibres is the highest; the upturned-end-rod next; the one like a bunch of feathers is approaching the earth; and the sheet-like form is not much above the denser clouds.

If, in a clear, dry, settled-looking sky, cirri appear, there will be a change: all signs of change show themselves first in the upper regions of the air. When *mare's tails* appear, there will be wind within 24 hours from the quarter to which the tufted head points. If during rain, you can see cirri through a broken cloud, in a deep blue sky, the rain will continue. *Noah's Ark*, a cirrus extending from horizon to horizon across the Zenith, indicates rain within 12 hours—when it does not reach our Zenith, rain will fall only on those places over whose Zenith the Ark is. If the cirrus and cumulus unite, and pass over the Zenith rapidly, rain in 12 hours. In fact accurate observation of the cirri will be an almost sure guide to the weather, and when joined to the indications of the barometer and thermometer, a perfectly sure guide.

Cumulus, or heaped cloud, when like a rough hay-cock, ragged at the ends, indicates rain; but smooth and regularly formed, portends fine weather.

If cumuli remain till evening, and increase in size, rain. If they form in the morning, and towards night disappear, fine weather.

*Stratus* is that bed of vapour which you may often see settle down into valleys and hollows in fine summer evenings. Most picturesque, most poetical of clouds. Spires and towers stand out above it in bold relief. If the rising sun disperses it, the day will be fine; but when it lifts, and *fingers long on the hill-tops*, there will be rain p. m.; particularly if it creeps down again towards the low lands.

When the cirrus, losing its fibrosity, forms little heaped clouds, they are generally high in the air, and in summer foretell heat. If gray ones appear in the morning, heat; if red, rain. When cirri become compact, and heavy looking, a thunder-storm will take place in 24 hours.

*Cirro-stratus* clouds sometimes appear stretched out along a hill-side, cutting off, apparently, the mountain top; sometimes they run across the field of the setting sun, and afford that glorious sight of gold and vermilion bands on their upper and lower edges. These are the clouds that produce *haloes* or *coronae*.

*Cumulo-stratus* is always dense. Cloud mountains spring from the long stratus, and the upper part is often mixed up with cirri.

*Cirro-cumulo-stratus*, a combination of all the forms of clouds, is that heavy menacing cloud we see when thunder-storms are approaching. It is too well known, and its sequel when observed too certain, to need description.

The following is a short list of cloud-prognostics.

They are not always sure, but almost always.

If clouds cling to the hill-tops, or unite with each other, rain.

If they form and vanish soon, fair weather.

Ragged edges denote rain—very ragged, wind.

If the edges are distinct, clear cut, fine weather; if rolled up, thunder.

If the edges are indistinct, muddled, rain—bad weather, at all events.

High Barometer, Thermometer, and Hygrometer—little cumuli all day, vanishing towards night—*stratus* disappearing after sunrise, and heavy dew: fine, settled fine weather.

But winds and clouds are not the only foretellers of weather. They are about the most certain, but there are many others.

Did you ever see a cat scratching the leg of a table? Wind is sure to follow. So with cattle, when they jump about and butt at each other: when sheep leap and play. When pigs squeal, twist their tails, and carry straw about in their mouths: wind and rain. What does Mr. Swirell say? "It is very fine; but last week was a pleasant one for the ducks. To day, however, I noticed a pig issuing from a tobacconist's shop with a straw in his mouth; from which, I argue that another fine week for the ducks is at hand!" (1) When geese and pigeons flap their wings much; when crows tumble about and chatter in their flight, wind is sure to follow.

Distrust the weather when you hear the Robin sing loudly in the evening—he is not a Robin, but a Thrush, and his German brother is called the Storm-Cock.

When distant objects appear unnaturally near—when you hear the rat!

(1) Dickens' *Old Curiosity Shop*.