

CHAPTER II

THE CLEAR DAY

We owe our fair weather to that department of atmospheric activity called *anticyclone* by the weatherman. The anticyclone is an accumulation of air which has become colder than the air surrounding it. This accumulation typically has an area near the center where the air is coldest. About this coldest area the air currents revolve in the direction of a clock's hands. Since this cold air is contracted and denser than its warmer environment it has a perpetual tendency to whirl outward from the center into this warmer environment.

One comes to think, therefore, of the anticyclone as a huge pyramid of cold air moving slowly across the country from west to east and all the while melting down on all sides, like a plate of ice-cream, into the surrounding territory. It is such an immense accumulation that often while its head is reared over Montana the first shivers of its approach are beginning to be felt in Texas and Pennsylvania. It does not extend equally far, however, to the north and west of its head. A long slope of increasing pressure and cold will sweep in a gentle gradient from Pennsylvania to Montana and then decrease by a steep gradient to the Pacific Coast.

The anticyclone draws its power from the inexhaustible supplies of cold air from the upper levels. This air is very dry and accounts for the almost invariably clear skies of the anticyclone.

In winter when the intensity of all the atmospheric activities is greatly increased, the anticyclone develops into the cold wave. The rapidly rising pressure rears its head and rushes along upon the heels of a storm like a vast tidal wave at sixty miles an hour, tumbling the mercury thirty, forty, fifty degrees.

These cold waves first appear in the northwest. They cannot originate over either ocean and a high-pressure area building up over the southern half of the country will not attain the sufficient degree of frigidity, for even cold waves have been standardized by the Government. But although nearly all the cold waves choose Montana or the Dakotas as a base, they have at least two definite lines of action. Those which are born amid the mountains or on the great plains of Montana have a curious habit of bombarding the Texas coast before starting on their eastward march. It is not unusual for us to read of zero weather in the Panhandle and freezing on the Gulf while the mercury may still be standing as high as fifty in New York City.

It is this rapid onslaught from Montana to Texas that produces those notorious blizzards of that section called northers, during which the cattle used to be frozen on the hoof. The record time for a drive of this extent is about twelve hours and the normal about twenty-four which gives scant time for the Weather Bureau to warn of the impending assault. When the cold wave, after following this path, does swing toward the Atlantic Coast, as most of them do, it has lost interest and usually produces only seasonably cold weather along the Appalachians.

Those cold waves that recruit their strength in Canada and enter the United States through Minnesota or, rarely, this side of the Lakes move along the border and supply intensely cold weather for a night or two to New England and the Middle Atlantic States.

Cold waves almost always follow a storm. The storm, being an area of low pressure, makes a fit receptacle for the surplus of the high pressure, and since the whole business of the weather is to seek peace and pursue it, the greater the discrepancies, the more violent the pursuit. Consequently we have a ridge of cold dry air following and trying to level up a fleeing hollow of warm moist air — but rarely succeeding. This principle of action and reaction is almost the sole principle of the weather and is nowhere more clearly demonstrated than in the winter's succession of storm and cold wave.

In summer, the anticyclones are more moderate than in winter. But their influence is still the same, — clear skies, cooler nights, dry, westerly winds. During the year the anticyclone furnishes us with about sixty per cent. of our weather. The cyclone is responsible for the remaining forty per cent. The weather depends on the cyclone for its variety and upon the anticyclone for its reputation. So it is well to be able to recognize an anticyclone when one appears.

The first and most reliable symptom of the approach of an anticyclone is the west wind. This sign is one of the very few signs that hold true for most of the North Temperate Zone. In summer over our country the west wind comes

from the southwest, and in winter from the northwest. But for nearly all forty-eight continental states for nearly all of the year the westerly winds are those that bring us fair days and nights. And it is these crisp, clear days and cloudless, brilliant nights which we have in mind when we boast to English friends of our American weather.

The west wind is so popular because it has a slight downward flowing tendency. It also blows from land to sea over all America except the narrow Pacific coast. These downward, outward directions allow it to gather only enough moisture to keep it from becoming seriously dry. Its upper sources supply it with ozone. Its density gives it weight and by its superior weight it prevails. It dries roads faster than a brace of suns could do it. It is tonic. And curiously enough, although the anticyclone loads half a ton excess weight upon us, we like it. The greater the burden the more we feel like leaping and shouting. Our good cheer seems to be ground out of us, like street pianos.

The reverse holds, too. For when the anticyclone moves off us and the cyclone hovers over us, removing half a ton of pressure, instead of feeling relieved we feel depressed, out of spirit. The animals share this reaction with us. In fact barnyards antedated barometers as forecasters, because all the domestic creatures, with pigs in particular, evidenced the disagreeable leniency of the low pressure areas upon their persons.

The only trouble about this rather extravagant tribute to the pig, versatile though he is, is that he can tell only a very

few hours ahead about the coming changes and it takes so much more skill to judge what his actions mean than to read the face of the sky that the science of meteorology finally comes to supplant barnyardology.

The coming of the anticyclone is foretold by the shifting of the wind from any quarter to the west. The course that the center of the anticyclone is keeping may be watched by the same agency. Since the circulation from the cone of cold air follows the hour hands of a clock it follows that if the center is moving north of you the wind, blowing outward from the center, will work from west to northwest and from northwest to north and slightly east of north.

If the wind has shifted into the west on a Wednesday, it will likely be cold by Wednesday night and colder on Thursday. By Friday morning the wind will be coming from the north, likely, with the lowest temperature of all. By Saturday the cold will moderate, the wind will tire and gradually die to a calm or become weakly variable. The four day supremacy of the anticyclone will be over. But there are a dozen variations of this routine. I am only suggesting a usual one.

If after blowing two or three days from the west the wind shifts to the southwest and south, you may know that the central cold area is passing south of you and that its intensity will not be great. While these anticyclones that float down and to the right of their normal path linger longer, they are never so severely cold, nor so uniformly clear as the others. It is a profound law of anticyclones and even more particularly of cyclones, that if they deviate to

the right they weaken, if they are pushed by an obstacle to the left they increase greatly in intensity.

Occasionally the central portion of an anticyclone passes over your locality. Then the wind will fall. The frost will be keen and the cold will be dry and invigorating. In summer although the sunlight may be powerfully bright and the heat great, the air will have a buoyant effect, the body a resilience. The nights will cool swiftly. Soon after the center passes, a wind will spring up from the east with rapidly rising temperature and increased humidity.

The coldest part of the anticyclone is not, as one would suppose, at the center, but in advance of it; and its authority is rapidly dissipated after its back is turned upon a place.

The intensity of an anticyclone is measured by its wind velocity and the degree of cold. But the greatest cold occurs rarely in conjunction with the greatest velocity of the wind. The calms that occur at sunrise enable radiation to take an extra spurt which pushes the mercury lower by a degree or so than happens when the wind is blowing. But, windy or calm, the period about sunrise is normally the coldest of the day, even extending in midwinter for as much as half an hour after sunrise, so slow are the feeble rays at restoring the balance of loss and gain of heat.

The greatest falls occur at the advent of the cold wave. If the temperature starts to decline gradually during the day, a further and decided fall may be expected at nightfall if the sky is clear. If the temperature rises gradually during the

night the normal processes are being displaced and a change from fair to foul is a surety. In summer the hottest time of day is not at noon, any more than the coldest part of the winter day was at midnight, for the reason that the sun can pour in its heat faster than the earth can radiate it, and the hour for the maximum temperature is pushed as far along toward evening as four or five or even six o'clock.

The average anticyclone continues its influence for clearness for about four days. Some hurry through in two. Others are interrupted by a more vigorous cyclone and are put out. Others are held up by an inherent weakness and are forced to mark time over one locality until strengthened or dissipated. And a few hold sway over the country for a week. These choose the north-center of the country in which to locate. There they pile up the cold air until its very weight causes it to move on. Its skirts sweep the Gulf coast where they are bedraggled by invading cyclones. It gives the New Englanders a fortnight of brisk days and the mercury in Minnesota and the Dakotas does not rise above zero. Once, in Montana, one of these refrigerating systems established the record of sixty-three degrees below zero. But in Siberia where the immense extent of the land surface collaborates with a prolonged night, an anticyclone reached a world's record of ninety-one below.

In summer a succession of these highs causes the frequent droughts of weeks which harass the West and New England. The air becomes so dry that it parches and shrivels the leaves. Any little cyclones that, under ordinary conditions, would suck in moist air from the Gulf and

relieve the situation with rain are dried out and frustrated by the unclouded sun. It requires a cyclone of great depth to overthrow the supremacy of these summer anticyclones.

While the anticyclone furnishes fair weather, the sky is not free from clouds under its influence. In summer the evaporation during the long days overloads the air for the time being. Normally about eleven in the morning, little balls and patches of white clouds dot the blue. These increase in number and size until about three in the afternoon, when they will have grown little black bellies and fluffy white tops. By five they will have dwindled and by eight entirely vanished. These heaped clouds, known as cumulus, are a guarantee of a normal atmosphere and continued fair weather. They mean that currents of warm, moist air have risen until they have struck a level so cool as to cause them to condense part of their moisture. This condensation sinks until it enters a warmer stratum and the cloud is dissipated. The total movement is an exchange that preserves the equilibrium of the air, very much as a person bends one way and then another to maintain his balance.

In winter there is not such an opportunity offered, and the few clouds that form because of the daily variation in temperature are flatter and are called stratus clouds. Sometimes these stratus clouds may cover the sky at midday, but in thin platings and not leadenly. In winter as in summer they tend to disappear toward evening. They are accompanied by an unpleasant wind, but rarely by the snow flurry which is the “April shower” of the winter months.

When the snow flurry does come, there is no better sign for the woodsman of coming cold. The morning will have begun brilliantly, but soon great summery puffs of cloud form and darken on their under sides. Their tops wear a veil of snow. The reason is simple. The coming anticyclone strikes the upper air before it hits the earth's surface. The sudden cold causes rapid condensation. Hence the flurries. But the anticyclone is an agent of dryness, hence their short duration. Sometimes the veil of snow does not reach the earth. Sometimes it blots out everything in a spirited squall. But it never lasts long, except in the northwest states. And it is invariably followed by a period of colder weather.

In summer local evaporation may be so vigorous that the cumulus clouds cannot hold all their moisture content when cooled. A shower is the result, usually a trifling one and mostly without thunder. The great thunderstorms are always in connection with the passing of a cyclone. The small heat thunderstorms are only the indulgences of a spell of fair weather. These tiny showers are daily and sometimes hourly accompaniments of clear weather in the mountains. The air warms rapidly in the valleys and is speedily cooled on rushing up a mountain side and a threat and a sprinkle are the result. When a performance of this sort is going on nobody need fear unpleasant weather of long duration.

Another pledge of a clear day that does not appear too credible on the face of it is the morning fog in summer. In winter it is a different matter. In August and September the rapidly lengthening nights allow so much heat to evaporate that the surplus moisture in the air is condensed to the

depth of several hundred feet. By ten o'clock the sun has eaten into this lowest stratum, heated it and begins to decline in power before the balance swings the other way, so that a cloudless day often follows a fog in those months. About three mornings of fog are enough to discourage the sun and a rain follows. This is because the anticyclone with its special properties has been losing power.

CIRRO-STRATUS WITH CIRRO-CUMULUS BENEATH



The fine-spun lines of the cirrus proper drag this veil of whitish cloud over the sky. The sun sometimes is surrounded by a colored halo due to the refraction of the light by the ice crystals. But more often it vanishes behind the veil. The mottled clouds below the veil show that a rather rapid condensation of the moisture in the air is taking place. This sky is distinctly threatening, although the direction and force of the wind will more accurately foretell the severity of the coming storm. With this sky expect rain or snow within 12 hours.

When these conditions of clear nights with no wind follow the first two or three windy days of the anticyclone, particularly in autumn and spring, frost results. In winter the chances that a fog will be dissipated are rather slim. But if it shows a tendency to rise all may yet be well.

An excellent sign of clear weather is this fact of the morning mist rising from ravines in the mountains. And even if you haven't any mountain ravines at command the altitude of clouds can be observed. It is safer to have them lessen in number rather than increase, scatter rather than combine. The higher the clouds the finer the weather. And if the sky through the rifts is a clear untarnished blue the prospects of settled weather are much better than with fewer clouds and a milky blue sky beyond.

After the direction of the wind and shapes of the clouds, the colors of the sky are a great help in reading the weather. The best time to read this promise is in the morning or evening when the half lights emphasize the coloring.

Soon after the close observation of cloud colors has commenced the amazing discovery is made that the same color at sunrise means exactly the reverse of its meaning at sunset.

“Sky red in the morning
A sailor's sure warning,
Sky red at night
A sailor's delight.”

Christ seized upon this phenomenon to throw confusion into the Pharisees and Sadducees when they asked that He would show them a sign from Heaven. As Matthew reports it: “He answered and said unto them, When it is evening ye say, It will be fair weather for the sky is red. And in the morning It will be foul weather today for the sky is red and lowering. O ye hypocrites, ye can discern the face of the sky; but ye cannot discern the signs of the times.”

The reasons for this contradictory evidence of color are not nearly as obvious as the fact itself. Taking the scientist’s word for it need not stretch one’s credulity much if he can be followed step by step. He says that sunlight is white light, and white is the sublime combination of every color. If no atmosphere existed about us the light would all come through, leaving the sky black. The atmosphere, however, which is full of dust and water particles, breaks up these rays, these white sheaves of light, into their various colors. The longest vibrations, which are the red, and the shortest, which are the violet, get by and the rest are turned back, mixing up into the color which we call our blue sky.

If the dust and water particles grow so large and numerous as to divert more of the short rays than usual we get a redder glow than usual. This is most noticeable when the sun and clouds are near the horizon for the air through which they appear is nearer the earth and consequently dirtier. If these water globules mass together so as to reflect all the rays alike the result is a whitish appearance. That is why a fog bank, composed of tiny droplets, each reflecting