

currents of air ascending from the equator; they have not merely lost their heat up there—they have become chilled extremely and much heavier, and come back to earth.

But they cannot come directly down, because of the continual rising of the heated upward currents, nor make contact with the earth again within the region of the steady trade winds. But beyond the Tropics of Cancer and Capricorn where there is in each case a belt of intervening calm, they make themselves felt in that portion of them which goes to make the south-west and anti-trades. Their density and the slower rate of the earth-spin in those latitudes give them a "cling"—hence their easterly direction, made north-easterly by their point of origin and the globular shape of the earth.

Turn your thought to the North Atlantic again, where these anti-trades blow from the south-west. London and New York are well above the Tropic of Cancer.

The Southern Cross, therefore, had to face and fight these anti-trades, whereas on flights from west to east they assist. There is the crux of the question: the east-to-west flight, because of these anti-trades, is a struggle against prevailing winds. In that region these winds are marked by considerable variability, due to the closing in of the North Atlantic land areas, but the general drift of them, as they go with the earth-spin but deflected by the globular shape of the earth, is against the aviator.

Now we can see why, in those latitudes, east-to-west flight is a more trying business, as well as a much longer business, than flight from west to east. Atmospheric conditions overrule all expected gain from the west-to-east earth-spin. A west-to-east air current prevails, its northward deflection adding still further, as I shall explain in a moment, to the aviator's trouble.

SOME of you, remembering what I said about the narrow belts of calm between the trade winds and the anti-trades, at about the 20th parallels, are perhaps wanting to put a question. Why did not Kingsford Smith take that belt in the North Atlantic—known as the Cancer Calm—and so avoid the opposing anti-trades? He had the best of reasons for not doing so. The Cancer Calm lies so far south of the latitudes of London and New York that to have taken a route through it would have more than doubled the distance to be traversed. Besides being so far out of the way, it goes across a broader stretch of ocean. It might have served him had he been going from Gibraltar to Florida, but even then not so well as a mere glance at a map might suggest.

Yet you have noted, in a message from him, that he did not fly straight across, and are perhaps still inclined to think he should have tried a southerly route, nearer, if not within, the Cancer Calm. But what did that message say? That he was setting a great circle course.

This indicates the most decisive reason for his electing to take a route involving conflict with the anti-trades. This great-circle course took a line north-westward from Ireland, and curving round gradually afterward to strike the American mainland northward of New York. "Why not go straight across?" you may be disposed to ask. Because that would have been a longer way. No; I am not making a feeble joke.

Remember, the earth is a ball, not flat like a map. To get from one place to another by the shortest road is seldom the same thing as taking the route followed by a straight line drawn between them on the map. To go from one to another place on the equator your shortest way is along the equator. So, in going from one place to another north or south on the same meridian of longitude, the shortest way is straight along the meridian.

But, as the earth is a ball, these journeys mean taking, not a straight line, but the curving route that happens to be the shortest.

NOW, in the mathematical language of the navigator, the equator is a great circle, and a meridian right round



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Whose "Topical Talks" from 1YA are a feature of some importance.

—S. P. Andrew, photo.

the earth, going north and south through the poles, is nearly as great—a little less only because of the flattening of the earth at the poles. If any two directly-opposite points of the earth's surface be taken, and a full circle, cutting the surface of the globe in half, be drawn through them, there will be another great circle. There can be any number of such circles. The character of a great circle is its cutting the surface of the globe in half—symmetrically. By "half" I mean half, not an approximately equal portion.

Now, apply what is known about the two instances already mentioned—the equator and a complete meridian. The shortest way between places on them is along them. Departure from that curve will lengthen the journey. That obtains with all great circles, and the problem in navigation between distant points is to find the great circle connecting them: that is, the shortest way.

On the chart it may look longer, but it is actually shorter, because the earth's surface is one rolling curve, not a flat expanse as on a chart.

TO get from Ireland to New York by the shortest route, the Southern Cross had to be navigated on a great-circle course connecting them—possible choices of altitude could not affect the route materially—and this great circle, as they both lie north of the equator in one hemisphere, has a northward, not southward curve. Therefore, Kingsford Smith, though not hampered seriously by adverse winds on the rise of

that curve on setting out, had to face them more and more as he came toward America.

Bluntly put, the position is this: to have flown across on a parallel of latitude would have taken him across a bigger bulge of the earth's surface, and made the journey longer.

SO the idea of attempting the feat by way of the Cancer Calm lying to the south was, for this additional reason, not to be entertained for a second. The distance would have made the flight impossible. There was nothing for it but to take the great-circle route and dare the adverse anti-trades to do their worst. They may not have done their worst, but they did pretty badly.

A last point—the fog. Heavy fog-banks are characteristic of the Newfoundland and the mainland coast thereabouts. This is a special peril in making the east-to-west objective. Going to Europe from America, there is little or nothing of this: the target can be struck with more certainty of vision, should dependence on navigating instruments become, for any reason, an uncertain guide. In this flight there was a lowering of compass reliability, probably because of the violent movements of the plane. Over Newfoundland, flying became perilously blind, and but for aid derived from wireless direction signals there would likely enough have been another fatal tragedy to add to the records of trans-Atlantic flight.

Radio Transmission of Photographs

IT appears almost certain that within the next six months it will be a simple matter to transmit an ordinary photograph from Australia to England, and vice versa. Tests for that purpose are now being carried out.

Pictures, newspaper cuttings and documents have been sent by wireless from England to America, but the first step in the Australia-England transmissions will probably be to send photographs only, as it is not certain that, at this stage, it will be possible to transmit written documents and suchlike on a commercial basis. Information on this point is now awaited, but Mr. Fisk, managing director of A.W.A., is very hopeful that before long it will be possible to include documentary and other transmissions, as well as photographs, and to make it a commercial proposition for all parties, including the public.

There are various methods of transmitting pictures by wireless. All, however, in effect, convert a picture into a series of dots. These dots, for the purpose of long distance transmissions on a big scale, will be transmitted between Australia and England by beam wireless under the regular service to be installed. A picture is turned into dots by means of a light sensitive cell, known as a photo-electric cell. As particles of the picture pass the cell, so the cell responds, according to the light or shades of the picture.

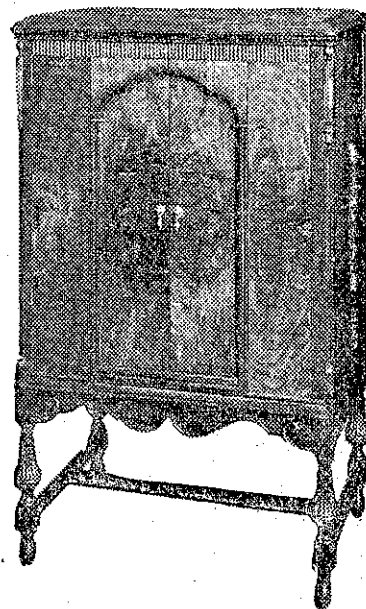
The varying dots transmitted over the wireless are converted, at the other end, into mechanical action, which causes a travelling light to re-assemble the dots as a photograph.

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