wave radio and it was not long before a meteorograph combined with a radio-transmitter was designed. This instrument was sent up by balloon and signalled back the temperature, pressure and humidity of the upper atmosphere as the balloon travelled through space. Thus upper air data could be obtained up to much greater heights than was possible by aeroplane and provided the basis for determining the physical conditions in the upper atmosphere for forecasting purposes.

Investigation of the Physical Processes Operating in the Atmosphere.—Until twenty-five years ago, the general principle underlying forecasting was based on the movements of the high- and low-pressure systems as they were first recognized when the Canadian Service was established. The exploration of the upper atmosphere and the general extension of the area over which observations could be obtained then enabled two Norwegians, V. Berjknes and his son J. Berjknes, to show that instead of the wind circulation associated with these high- and low-pressure

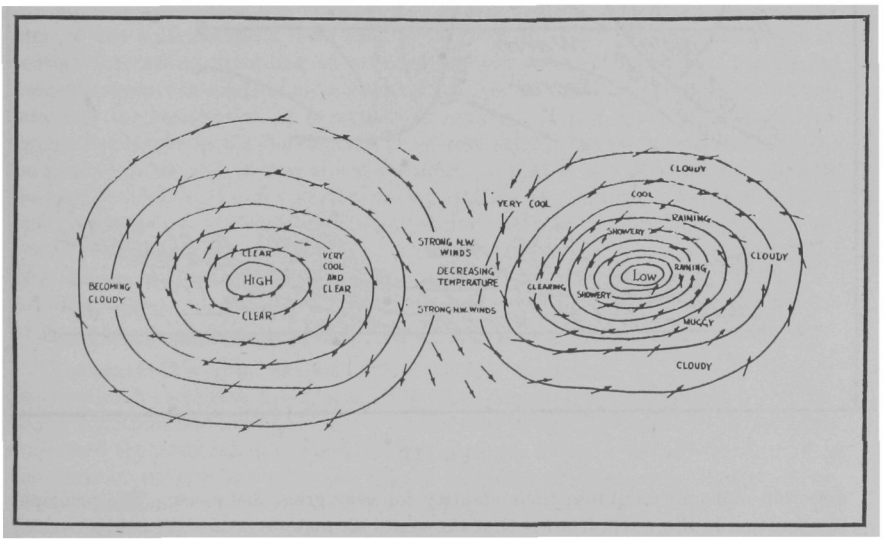

FIG. I.

systems being continuous and passing from one to the other in an uninterrupted flow, as indicated in Fig. I, there was a very marked discontinuity. This discontinuity was so well defined that it indicated that these two pressure systems were in reality two distinct air masses with very different properties, depending on their origin. These masses came to be known as cold air masses or warm air masses depending on whether they had their origin in the Arctic regions or in the tropics. Also, it was discovered that the line of separation of these two air masses was very distinct and is now called a front. If a warm air mass is advancing against a cold air mass, the line of separation is known as a 'warm front'; conversely, a 'cold front' is a line of separation of a cold air mass advancing against a warm air mass.

Figure II gives a horizontal cross-section and a vertical cross-section along the line AB of the horizontal section through what is called an 'ideal cyclone'. It shows the rain areas associated with the system and the vertical section shows the general