As different surfaces of the ground heat very irregularly under strong insolation, in consequence of their diverse absorption and radiation coefficients, colors, characters of surface, specific heats, wetness, and conductivity, the immediately overlying air is correspondingly unevenly heated, the greatest differences being found with the most intense insolation. The movement of the air carries these irregularly heated masses past the thermometer, which records temperature unrest. Figure 4 shows the closeness with which this unrest corresponds to the intensity of insolation. The flattenings of the curve of temperature unrest just after

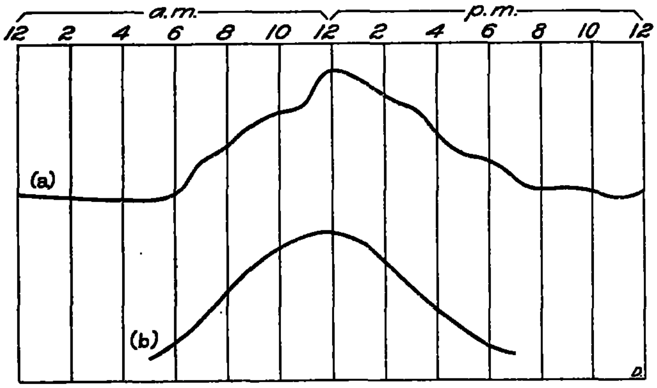

FIG. 4.—Curve of temperature unrest (a) and insolation (b).

10 a. m. and 5 p. m. correspond to the times of beginning and ending of active convection, which, thus, is seen to play a secondary rôle.

Gustiness of the ground wind depends directly on convection, which in turn is a function of the heating of the lower air by the ground. Thus it is not surprising to find the close relationship between gustiness and ground surface temperature shown in Figure 5. The minor irregularities in the gustiness as curve between about 8 a. m. and 2–3 p. m. have their approximate counterparts in the curve of temperature unrest. (Fig. 4.)

At the close of the paper, attention is directed to similarities sometimes found between depressions in the

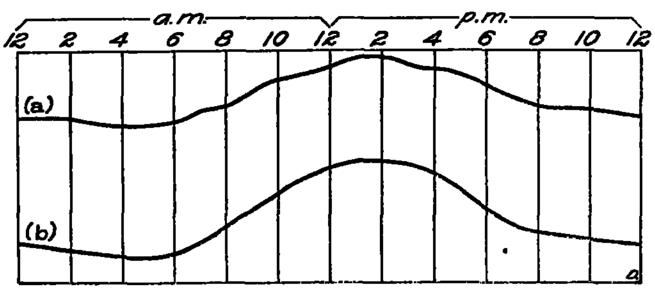

FIG. 5.—Curve of gustiness of the wind (a) and ground surface temperature (b).

rising and falling curves of the actionmeter on the same day. That is, depressions occur with the same angular height of the sun. These the author explains as the result of increased absorption or reflection at the top of an inversion layer. On March 12, 1919, there was an inversion of about 6° C. reaching to 300 m. and one of 1° C. at about 2,400 m.—*C. F. B.*

UPPER-AIR OBSERVATIONS IN NORTH RUSSIA.

[Reprinted from *Nature* (London), Aug. 18, 1923, p. 248.]

A Professional Note, volume 3, No. 32, carried out by Mr. W. H. Pick, has been published on the above by the Meteorological Office, Air Ministry. The observations are based upon pilot-balloon ascents between February 25 and September 13, 1919, at three stations in northwest Russia. The stations are Murmansk, at the head of the Kola Creek, in latitude about 69° N., Archangel on the southwestern coast of the White Sea, in latitude 64° 33′ N., and Lumbushi on the Murman Railway, in latitude about 68° N. The ascents were all carried out with one theodolite only, the balloon being given a vertical lift of, theoretically, 500 feet per minute. The high latitude in which the observations were obtained renders them of value. There were at Murmansk 57 occasions on which the surface winds was in the north east wuadrant, and on 10 of these, that is, 17.5 per cent of the total, the wind backed continuously up to 2,000 feet. On the other hand, there were 164 occasions on which the surface wind was not in the northeast quadrant, and in only 5 of these; that is, 3 per cent of the whole, did the wind back continuously upward. At Murmansk three ascents reached to a height of 40,000 feet, where two of the winds were northwest and one southwest. Two ascents reached to 60,000 feet, where both winds were southwest. Seven ascents reached 20,000 feet, at that height four of the winds were southwest and two northwest. Of the ascents carried out at Archangel only one reached 20,000 feet, where the wind was southerly. Of the ascents at Lumbushi, six attained a height of 20,000 feet, giving two northwesterly winds, three northeasterly, and one southerly.

WHY ARE TYPHOONS IN CHINA SEA MORE FREQUENT THAN WEST INDIAN HURRICANES?

A correspondent of the Weather Bureau raises the above question. The reply by the Chief of Weather Bureau will doubtless be of interest to REVIEW readers and is accordingly reproduced below:

It is a definitely known fact that tropical cyclones have their origin within the region of calms of the Tropics, commonly known as the doldrums, and that cyclones form in this belt of calms only when it lies at an appreciable distance from the Equator. Now if nothing more than still, or relatively still, moist, warm air were essential to the formation of a cylcone of the Tropics then one would expect to find several in operation at the same time when this belt of calms lies say ten or more degrees either north or south of the Equator. But this does not follow, for it is our experience that the major part of a cyclone season may pass without the semblance of a hurricane, and rarely, if ever, do we note more than one cyclone at any one time in the West Indies. The foregoing being accepted as true, we must then seek a contributory cause of the formation of a cyclone outside the still, moist, warm air of the doldrums. Now, if we consider the seeming fact that the loci of tropical cyclonic formations on the North Atlantic are two in number, one the Western Caribbean Sea and the other the region about the Cape Verde Islands, where the belt of calms is at times flanked by oppositely directed systems of winds, one of which is the northeast trade of our hemisphere and the other the similar trade wind of the southern hemisphere, which after having crossed the Equator comes under the right-hand deflective influence of the earth's rotation, and is changed to a southwest wind system, it is reasonable to assume that these passing wind systems have perhaps much to do with the formation of tropical cyclones. Over the North Atlantic, within the Tropics, it is probably true that this contributory cause is rarely in operation, whereas in the East Indies the southwest monsoon blows during much of the cyclone season and on approaching, but passing to the south of the northeast trade wind system of the North Pacific Ocean, there naturally arise many occasions when the conditions are what may be regarded as ideal for the development of cyclones. Hence the greater frequency of the typhoon. Of course the deflective influence of the earth's rotation plays an important part in the changing of the course of these two primary wind systems (each one being turned to the right), and by doing so lowers the barometric pressure over the intervening region and in addition thereto determines the direction of rotation of the winds of the cyclone itself. Now, if these primary wind systems initiate an incipient whirl, then the condensation of water vapor, and the consequent setting free of latent heat, immediately gives the energy that maintains the cyclone during days and at times weeks. Otherwise, it seems likely the life of the cyclone would be very short.