there must be a compensating descent from aloft hence the bodies of air which reach the surface have a relatively high rate of fall under super-adiabatic conditions near the surface. As they strike the ground they "splash," at the same time forming a gust.

Very disturbed air movements are caused in this manner, especially when ground roughnesses also induce the production of confused whirling vortices oriented in most irregular fashion and moving with the wind.

The lulls follow the gusts but last longer, since they depend on the broad movement of a layer of air along the surface into which there intrude relatively small, rapidly descending bodies of air from aloft.

Considering the general outlines of the foregoing picture of mechanical turbulence near the surface, it is evident that the sequence of gust and lull forms a pattern involving a succession of ascending and descending bodies of air engaged in a sort of cycle of convection. We may therefore regard each pair as component parts of a large eddy. Its operation depends upon a mechanical and convective interchange of air in masses between the surface stratum and the faster moving layer of air aloft.

The facts about turbulence near the surface have been recapitulated as follows in the publication by the late M. A. Giblett and co-workers, "The Structure of Wind Over Level Country" (Great Britain, Meteorological Office, Air Ministry, Geophysical Memoirs No. 54, 1932):

"Summarizing the results that have been found in the present investigation into the horizontal changes in wind, it may be said that there is a comparatively sharp difference in the type of air motion when the vertical temperature gradient is adiabatic or super-adiabatic and when it is less than adiabatic.

During adiabatic and super-adiabatic conditions the following are the main characteristics.

(I) In wind there are major eddies composed of alternating masses of fast and slow-moving air, while embedded in these air masses there is a large number of small-scale eddies.

(II) These air masses are considerably longer in the direction of the wind than they are broad.

(III) The mean motion of these air masses is equal to the mean motion of the wind.

(IV) The changes of velocity in wind from air mass to air mass are characterized by abrupt increases and comparatively gradual decreases.

(V) Before, during, and for a short period after one of these abrupt increases, small-scale eddying is greater than during the gradual decrease.

These facts have been found in eddies, which are on the scale of 4,000 feet long by 600 feet wide (these measurements are probably below the average). There is another group of major eddies which appears in wind under certain conditions and which ranges up to a dimension in the direction of the wind of the order of 10 or even 20 miles. The wind gusts in these eddies show two important points of similarity with the eddies on the 4,000-feet scale namely:

(1) The changes in velocity in the wind from air mass to air mass are characterized by abrupt increases and comparatively gradual decreases.

(2) Small-scale eddying decreases shortly after an increase of wind velocity. The other features of the group of larger eddies are:

(3) Strong gusts occur just after a maximum of temperature has been reached, and are followed by a decrease of absolute humidity.

(4) Strong gusts are associated with a wind from a more veered direction than lulls.

(5) Rain is associated with falling temperature.

(6) Cloud masses are associated with the strong gusts.

During the occurrence of surface inversions the following are the characteristics of eddies:

(1) There are no pronounced major eddies, (i.e., 4,000-ft. scale).

(2) The eddies are not predominately elongated in the direction of the wind.

(3) The eddies are probably due largely to surface obstacles.

(4) The presence of an obstacle causes, on some occasions, more eddying if there is a surface inversion than if there is not.

(5) In some circumstances the presence of a large inversion may damp out the eddying until there is the phenomenon of a smooth flowing wind. The velocity of such a wind has been observed to be as high as 11 or 12 miles per hour at the height of 150 feet above the surface."

The first group of major eddies referred to in the above quotation occurs when approximately adiabatic lapse rates are prevalent in the lower 1,500-2,000 feet of the atmosphere but generally stable conditions prevail above. The cloud type is often strato-cumulus. As an example, the time interval between the gusts may be of the order of 5 to 7 minutes so that the distances of wind run between consecutive occasions of high speed is of the order of 8,000 feet, when the average wind speed is about 15 miles per hour.

The second group of major eddies referred to in the above quotation is that associated with cumulonimbus clouds or deep convection currents which participate in the convective phase of the mechanism even to altitudes of 15,000-25,000 feet. The high gusts are spaced out at comparatively wide intervals, and the surface winds