and the rate indicated by the Signal Corps formula if the constant of 72 is adopted and the additions are made to the first five minutes:

Minute.	Mr. Batty's observed rate (m. p. m.).	Signal Corps rate (m. p. m.).
1	181	181.9
2	163	166.9
3	164	166.9
4	159	159.3
5	157	159.3
Mean from 5 to 10 minutes	153.2	151.6

The agreement in this table is remarkably close, and strongly confirms the accuracy of the newly determined constant, as well as the necessity of introducing additive corrections during the first five minutes.

A REPORT ON TWO PILOT-BALLOON ASCENTS MADE AT SHOEBURYNESS.[1]

By N. K. JOHNSON.

(Review reprinted from *The Meteorological Magazine*, London, Dec., 1920., p. 247.)

In the two ascents to which this note is devoted, the pilot balloons were followed with two theodolites and also with a range finder. It so happened that in each case the balloon developed a defect after reaching 25,000 or 30,000 feet; the first dropped rather quickly, the second very slowly. The usual assumption of the single-theodolite method, that the rate of ascent was uniform, would have led to entirely false results, the wind being credited with speed of 100 feet per second at 60,000 feet.

The principal moral of the paper is that when information as to air currents at considerable heights is derived from the one-theodolite method it must be used with the greatest caution; it also brings out how much is to be learned concerning the structure of the atmosphere by the more elaborate two-theodolite method.

VISIBILITY OF PILOT BALLOONS.

By NELSON K. JOHNSON.

[Abstracted from the Meteorological Magazine, December, 1920. Vol. 55, pp. 249-251.]

In order to determine the most suitable color for pilot balloons under various atmospheric conditions, four ascents were made at Shoeburyness, two differently-colored balloons, tied together with about 20 feet of thread, being used in each ascent. In each of the first three cases a red and a white balloon were used, blue having already been found unsatisfactory except against a dense white background. In the fourth ascent a plain white balloon and another white one coated with aluminum paint were used. This treatment was not effective, because the paint dried a drab gray without any metallic luster. The suggestion is made, however, that if pilot balloons can be coated in the same manner as are kite balloons, both their opacity and their reflecting power would be increased. In the three ascents with red and white balloons it was found that the white ones are best in sunshine because of their greater reflecting power, and the red in cloudy weather because of their greater opacity.

The author summarizes his results as follows:

"(1) Against a background of continuous, dense white cloud either red or blue should be used.

"(2) If the sky contains slight cirrus or haze, red is the correct color to employ.

"(3) On occasions on which the sky is cloudless and of a deep blue color, a white balloon should be selected."—*W. R. G.*

[1] *Professional Notes, No. 13.* Brit. Meteorological Office publication.

VERTICAL CURRENT DETECTED BY COMPARING CLOUD MOTION WITH APPARENT SPEED OF PILOT BALLOON.

By JOSEPH LESHAN.

[Weather Bureau, Washington, D. C., Dec. 22, 1920.]

SYNOPSIS.

The pilot balloon ascension made at Washington, D. C., on the afternoon of November 23, 1920, showed a rapid rise in velocity up to the 800-meter level, and an almost equally rapid decline thereafter to the 1,800-meter level, when the balloon entered a roll of strato-cumulus cloud. The appearance of the clouds and a nephoscope observation made at that time seem to show that the balloon gained about 100 meters during the last minute of ascension over the assumed rate of ascent, and that the velocity during the last minute should be corrected from 6.2 to 13.3 meters per second.

A comparison of the altitude-velocity curve for this ascension (the heavy line in the figure) with other altitude-velocity curves for ascensions in the vicinity taken within eight hours, shows that all but one of the

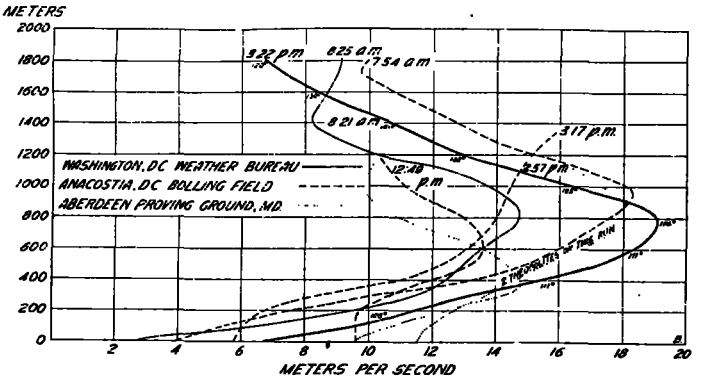

FIG. 1.—Altitude-velocity graphs for pilot balloon observations, Nov. 23, 1920. Wind directions at Washington are indicated at every 200 meters (0°=S., 90°=W.).

curves have approximately the same general characteristics except that none of them reaches as high a velocity at its maximum, nor does any of them reach as low a velocity at its minimum.

The reason for the peculiar features of the curve in question might be explained by the supposition that the balloon was in a downward current of air up to about the 800-meter level, and in an upward current during the latter part of the flight. Such currents in a single theodolite system of observation would give higher and lower computed velocities respectively.

The appearance of the lowest strato-cumulus cloud-layer at the time of observation would tend to bear out this supposition, as the clouds were in bands lying approximately northeast-southwest, and were probably formed on the crests of an air wave moving approximately from the northwest. It can be easily seen that with the balloon in the downward current of the wave the angle would be depressed and give a greater computed velocity, and conversely with the balloon in the ascending portion of the wave.

Nephoscope readings at the time of the observation indicated that the cloud which the balloon entered was moving at the rate of 7 meters per second for every thousand meters of elevation. While it is not certain that