

and physicists are reducing observations today to a 750 mm. of mercury basis; and this is close to the 1000 kilobar level.

Mr. Woolard's remark favoring 1366 and 1000 may be likened to advocating the erection of a church spire but omitting the church. It is to be regretted that he has not apparently tried out the scale with a view to serviceability. Comment and criticism along this line will be helpful; for the main purpose is to know whether such a scale will be of service to Meteorology.

BALL LIGHTNING.

An account of ball lightning seen at the U. S. Weather Bureau office, University of Missouri, Columbia, on April 20, 1915, at 2.20 P.M., has recently been brought out of the weather record of that station. Mr. George Reeder writes as follows:

I was sitting at my desk facing the open door and the telephone on the small table. Thunder had occasionally been heard in the south since 1.50 P.M., and light rain began at the station at 2.10 P.M.

Mr. Robert E. Seaton, my first assistant at the time, left his desk, going to the window to look at the sky. The window looks out south. The sky immediately over the station was hidden by a dark-gray cloud, nearly rectangular in shape, from which light rain was falling. Mr. Seaton had barely taken his position at the window (2.20 P. M.) when there was a sharp report, closely comparable with the report of a sporting rifle. There was an immediate answering click at the telephone. I instantly looked up, and saw a palish red, slightly corrugated ball, apparently $1\frac{1}{2}$ to 2 inches in diameter, or about the size of the outer rim of the mouthpiece of the telephone, moving across the space, about 6 feet, between the telephone and the window by which Mr. Seaton was standing.

The fire ball seemed to float as a liquid bubble does, though it seemed solid. It kept a fairly straight line for the window; it rolled over the windowsill, and disappeared, not into the outer air, but flickered out like a bubble. There was no explosion or sound of any kind following the click of the phone; there was no odor nor did it leave any marks on the windowsill. Mr. Seaton * * * received no shock or injury of any kind. The telephone was not in the least damaged nor did it bear any marks to show that the ball actually came out of the mouthpiece. I cannot say positively that the ball came from the mouthpiece but it was but an inch or so from that object when I first saw it. The click of the phone and my looking up was but a fraction of a second apart. I should say that the ball took about two or three seconds to cross the space between the telephone and window. There was no more thunder after that one sharp report.

Inquiry as to whether Mr. Seaton has also seen the ball elicited the following additional information. Mr. Reeder in a letter dated August 12, 1920, says:

I will quote here a part of the short conversation that took place immediately following the occurrence of the phenomenon:

MR. REEDER: "What is the matter, Mr. Seaton?"

MR. SEATON: "I must have been dreaming, but I could swear I saw a ball of fire roll over (or on) this window sill."

Further exchange of views followed. We agreed as to the size, color, and that it seemed somewhat wrinkled. Neither of us saw flash or spark.

With regard to ball lightning in general, the following quotation may be of interest:

Curious luminous balls or masses, of which C. de Jans¹⁰² probably has given the fullest account, have time and again been reported among the phenomena observed during a thunderstorm. Most of them appear to have lasted only a second or two and to have been seen at close range, some even passing through

¹⁰² *Ciel et terre*, Bruxelles, 1910, 31, 499.

a house, but they have also seemed to fall, as would a stone,¹⁰³ like a meteor, from the storm cloud, and along the approximate path of both previous and subsequent lightning flashes. Others appeared to start from a cloud and then quickly return, and so on through an endless variety of places and conditions.

Doubtless many reported cases of ball lightning, probably the great majority, are entirely spurious, being either fixed or wandering brush discharges or else nothing other than optical illusions, due, presumably, to persistence of vision. But here, too, as in the case of rocket lightning, the amount and excellence of observational evidence forbid the assumption that all such phenomena are merely subjective. Possibly in some instances, especially those in which it is seen to fall from the clouds, ball lightning may be only extreme cases of rocket lightning, cases in which the discharge for a time just sustains itself. A closely similar idea has been developed in detail by Toepler.¹⁰⁴ It might either disappear wholly and noiselessly, as often reported, or it could, perhaps, suddenly gain in strength and instantly disappear as sometimes observed, with a sharp, abrupt clap of thunder.

To say that all genuine cases of ball lightning, those that are neither brush discharges nor mere optical illusions, are stalled thunderbolts, certainly may sound very strange. But that, indeed, is just what they are, according to the above speculation, a speculation that recognizes no difference in kind between streak, rocket, and ball lightning; only differences in the amounts of ionization, quantities of available electricity and steepness of potential gradients.—*W. J. Humphreys*.*

¹⁰³ Violle, *Comptes rendus*, Paris, 1901, **132**, 1537.

¹⁰⁴ *Annalen d. Physik*, 1900, **22**, 623.

**Jour. Franklin Inst.*, Aug., 1918, p. 218 (part of "Physics of the Air").

MISCELLANEOUS METEOROLOGICAL NOTES.

[Submitted by A. H. Palmer.]

As a result of damage done by hail during a severe thunder storm on July 2, 1920, the Eastern Iowa Mutual Hail Association has paid \$3,317 insurance to individuals residing in the vicinity of Postville, Iowa.

The city of Oakland, California, maintains a meteorological and astronomical observatory known as Chabot Observatory, and located in the suburbs of that city. It is maintained under the direction of the Board of Education as a part of the school system, and is open to the public during certain hours of the day and evening. At the present time complete meteorological apparatus similar to that of a first class station is being installed. On the east side of San Francisco Bay there are four cities, Oakland, Berkeley, Alameda and Richmond, with a combined population of approximately 350,000 people. In litigation involving weather data, records from Chabot Observatory and those kept by the University of California, in Berkley, are frequently consulted.

As there are approximately 150 aeroplanes in commercial use in California at present, and the number is increasing from month to month, the demand for aerological data continues to grow in proportion.

The South San Joaquin District maintains a large dam known as Woodward Reservoir, and located about 8 miles north of Oakdale, California. In order to determine the loss of stored water through evaporation, the Weather Bureau and the Irrigation District are coöperating in the measurement of evaporation. For the past two years a standard evaporation station has been maintained on the bank of the reservoir, and at the present time a supplementary evaporation pan is being installed on a float in the dam. A similar floating pan is maintained on Lake Tahoe, in the Sierra Nevada Mountains.