fresh particles of air are continually entering the field with new collisions and starting new waves of sound while the older particles and their waves fall away.

By these extremely rapid actions and in an exceptionally perfect elastic fluid a steady relation or steady disposition of the lines or lanes of air flow and blast pressure must really be established and maintained in evenly persistent shapes and contours within the swirl of incandescent air which forms the meteor's head.

As every meteorite shows a thin surface layer of its own material to have been heated, burned, pushed, scraped, or dragged off as by the flow of some blast of hot air, we must add this small mass of meteoritic dust, this heated, incandescent, vaporized, and burning solid, to the incandescent gas that constitutes the meteor trail. This incandescent dust is a new chemical compound of meteoritic matter and atmospheric gases and is left behind as a long, comparatively straight, luminous streak. Observers have watched such streaks for many minutes, and the changes in their apparent shapes do not seem to us to require any assumption of electric or magnetic action for their explanation. A long streak of isolated particles of iron rust does not constitute a magnet, nor could it show any magnetic phenomena under magnetic influence, excepting such as are revealed by individual positively and negatively electrified ions in a perfect vacuum, such as have been revealed to us by the well-known studies of J. J. Thomson. That the streaks do not show such phenomena demonstrates the absence or feebleness of the magnetic and electric fluids in the upper atmosphere of our earth.

It seems to the Editor that the noises that emanate from the meteors are still as difficult of explanation as ever. Professor Herschel's exposition brings vividly before us the waves of sound that are being interchanged between the mass of the meteor and that of the compressed air in its neighborhood, but how can these sound waves reach the ear of an observer through the rarefied atmosphere that exists at a very short distance from the meteor. This atmosphere is so thin or so rare that not only are ordinary sound waves not observable through it, but, according to our present theory of sound, could not even exist therein. Meteors that are 50 miles above the earth's surface and moving nearly horizontally give out sounds that are heard like the discharge of a nearby cannon, although the observer is 150 miles away. This has been notably the case with several that have been investigated in the United States. At these great elevations the gaseous pressure of the atmosphere, that is to say, the elastic pressure which follows the law of Boyle and Mariotte, no longer exists. The individual particles are so far apart that, according to the kinetic theory of gases, the collisions among the particles are infrequent. A meteor rushing among these at the usual meteoric rate of 20 miles per second strikes the individual particles and drives them forward far more frequently than they strike each other; they would, in fact, be entirely submissive to its influence, and, after escaping therefrom, they would find no surrounding atmosphere capable of transmitting sound waves downward to the denser atmosphere near the earth's surface. The sound waves observed in connection with meteors are always described as resembling the booming of an irregular discharge of artillery, rumbling like thunder, coming first from a point on the track of the meteor nearly opposite to the observer, but then from points successively farther back on the preceding parts of the track. It is never heard from points on the subsequent parts of the track. The physical explanation of this phenomenon has been attempted by many, but we know of nothing sufficiently satisfactory to be worth repeating. The rolling of thunder takes place in an analogous manner, but that relates to the lower, denser atmosphere. In our report on the meteor of December 24, 1873, we showed that, if the whole meteor track nearest and opposite the observer be considered as a straight line every point of which became instantaneously the source of sound, then the observer should hear first a crash and subsequently the roaring noises from the more distant preceding and succeeding portions of the line. But why should it always roll backward, and how can any sound at all pass from the thin upper air down to the earth? It does not do to say with Professor Mach and others that every stroke of the meteor against an atom of air is a collision and that a myriad such strokes will make a noise, for this only explains the vibrations within the mass of the meteor and within the volume of compressed air attending it; it does not explain the passage of such sounds to the observer through the "Crookes vacuum" of the upper air.

METEOROLOGICAL LITERATURE IN THE PUBLIC LIBRARIES.

In connection with a lecture on "Storms," delivered by Mr. John R. Weeks, official in charge of the local office of the Weather Bureau at Binghamton, N. Y., a local newspaper, the Press Leader, published a list of the books on meteorology procurable at the Public Library, in order that those who wished to prepare for the lecture, and those with a desire to go further into the subject, might be guided to the proper sources of information.

This practice is commended to other Weather Bureau lecturers as being a means of increasing the interest of the public in the subject of meteorology. It will also stimulate the librarians to provide the necessary books when called for.

The Librarian of the Weather Bureau has compiled and published a list of books for use in studying meteorology, which will no doubt prove valuable to Weather Bureau officials and others who are called upon to select or advise in the selection of authoritative books on meteorology.—*E. R. M.*

STANDARD TIME AT KEY WEST.

On November 16, 1905, the board of aldermen of the city of Key West, Fla., decided to change the standard of time in local use from ninetieth meridian time to seventy-fifth meridian time, the change to be effected by omitting the hour between 11 a. m. and noon on Thursday, November 23, 1905. This action was taken "in order that the time on the city clocks might be the same as that of the naval station, the telegraph office, and the ships calling there."

In order to comply with the provision of Weather Bureau Instructions No. 210, of 1904, dated December 16, 1904, which requires that "all instrumental records and the daily local record shall be kept on local standard time," it has been directed that seventy-fifth meridian time be used as station time at the local office of the Weather Bureau at Key West, Fla., beginning immediately after 12 midnight of December 31, 1905.

Those who have occasion to consult the original records above mentioned should bear in mind that they have been prepared on ninetieth meridian time during the year 1905.

INFLUENCE OF LOCATION ON THE WINDS.

An article on the influence of orography on the winds at Quebec, by Monsignor J. C. K. Laflamme, professor of geology, etc., at Laval University in that city, brings out strongly the fact that the winds recorded at this meteorological station are controlled almost entirely by the configuration of the neighboring ground, and this too, to an extent that would hardly have been expected, notwithstanding the fact that the broad valley of the St. Lawrence has a general trend that coincides with the prevailing general movement of the atmosphere. The memoir is published in tome 10, of the second series of the Memoires de la Société Royale du Canada.

Speaking of the same subject, Prof. R. F. Stupart, Director of the Canadian Meteorological Service, says:

There is an undoubted tendency for the wind at Quebec to blow either up or down the river, e. g., when the barometric gradient would indicate an easterly wind, not uncommonly Quebec reports northeast, or when from the gradient northwest winds are indicated southwest winds are reported.

As regards the velocity, I question whether the highest winds occur near the city of Quebec. I am rather of the opinion that they occur farther down the river. Father Point wind velocities are usually higher than those registered at Quebec. Monsignor Laflamme's description of the geographical situation of Quebec is, I think, admirable. This situation is doubtless the cause of the greater preponderance of northeast and southwest winds than at other points in the river and gulf, but on the other hand I imagine that the various winds in the province generally are not by any means the outcome of mere local conditions in that province. The wind circulation there is connected directly with the general circulation over the continent.

With regard to the conditions which produce the wind circulation over the continent, the Weather Bureau and Canadian meteorological records show that the general track of storms in the colder months is either from the Great Lakes or Atlantic States to the Gulf of St. Lawrence and thence to the North Atlantic; this stream of low areas, with the high areas moving southeastward from the Northwest Territories to the Great Lakes or Middle States, produces the prevailing westerly winds in the Gulf of St. Lawrence.

As the spring advances the general tendency becomes more pronounced for the high areas to develop over the northeastern portion of the continent in the neighborhood of Hudson Bay and move southeastward, while the hovering low becomes more frequent near the Great Lakes and the northeast parts of the United States, and such conditions produce easterly gradients over the whole St. Lawrence Valley; there is not the same marked prevalence of northeast winds at stations on the Gulf of St. Lawrence as in Quebec. Later on again as the summer advances, the continental low spreads eastward across Canada toward Labrador, and southwesterly and westerly winds become prevalent in Quebec.

During the past three years observations have been taken at Cape Fullerton, the northwest point of Hudson Bay, and I find that, with Dawson, Fort Chippewyan, Norway House, York Factory, and Moose Factory, a very interesting weather chart of the northern part of the continent is obtained, and one which will be useful in the study of the cold waves.

A MISTAKE ABOUT ATMOSPHERIC DUST.

The importance of dust in the economy of the atmosphere is not to be underrated, but neither should it be overestimated.

We notice a paragraph going the rounds of the newspapers on the authority of the Sunday School Times, saying:

While the dust contains many of our mortal enemies, it is also one of our very best friends, and the finer it is the more we owe to it. If there were no dust, the sky would not be blue, there would be no raindrops, no snowflakes, no hailstones, no clouds, no gorgeous sunsets, no beautiful sunrises. The instant the sun passes out of sight we should be in darkness; the instant it rises it would be a sharp circle of light in a black sky. * * * Rays of sunlight go straight through all kinds of gases. * * * The light that we call daylight is the light of the sun's rays reflected from the particles of dust in the air about our earth.

These and similar expressions show that the author is not quite up to date in his study of physics. Rays of light do not go straight through the atmosphere, but are bent in curves by atmospheric refraction, and our long twilights are partly due to the curvature of these rays. If dust is present in the air, the light reflected therefrom has various tints of gray or red, depending on the size and nature of the particles of dust, but if no dust is present, light may be reflected from any minute particles of water or ice that happen to be present, and these are not generally called dust. Molecules of water or ice sometimes form minute drops by gathering about particles of dust as nuclei, but they can also form such drops without dust as nuclei, and must frequently do so. However, if neither dust nor water were present in the atmosphere, we should still have our ordinary blue sky light, and some sunset sky colors. The deep blue of the sky is due almost entirely to the selective dispersion of the various waves or rays of light that come from the sun, by the action of the molecules of the constituent gases of the atmosphere. The ability of these molecules to absorb and reflect any given wave length depends upon the relative dimensions of the wave and the molecule. The exact relation has been carefully worked out by Lord Rayleigh, whose formulæ explain not only the blue color of the sky, but also the polarized condition of that light. Dust particles and ordinary water or ice particles are relatively so large that they reflect all rays of light, with a slight possible predominance of the red rays or long waves; consequently the hazy whites and grays of foggy weather and the dirty reds of the Indian summer may be attributed to dust and vapor, which in fact obscure the deep blue sky light.

Aqueous vapor in its finest condition, when it begins to condense without the help of dust nuclei, has the power of selectively reflecting the longer or bright blue as distinguished from the shorter dark blue of the pure upper sky; the resulting bluish haze may often be seen under favorable atmospheric conditions when we look at a distant landscape, and especially in the pure air of oceanic islands. The blue haze off the west coast of Scotland is proverbial. This haze was first studied in the laboratory by Tyndall, when he produced it unexpectedly by allowing dustless moist air to expand inside a vacuum tube.

The beautiful colored sunsets observed in connection with the eruption of Krakatoa, and especially the brilliant colors brought out by Prof. Carl Barus, of Brown University, in his study of cloudy condensation, are not due to dust nor to the selective reflection by fine particles, but are examples of a very different process, i. e., the colors of thin plates, or what Newton called the colors of thin films. The central portion of each little sphere of water transmits a minute beam of sunlight which has been reflected to and fro within the sphere, and its waves have interfered with each other. Some have been reinforced and others have been annulled. The former give the beam that is seen by the observer, and its color depends on the diameter of the sphere or the thickness of the film of water.

In general, therefore, our beautiful atmospheric colors are not altogether due to dust.

ADDENDUM.

Hawaii.—A rather wet November, except in leeward Maui and leeward Oahu. Mean temperatures approximately normal, although night temperatures were low at intervals. Cold, wet weather during middle portion of month retarded cane growth and field operations, especially in windward plantations; condition of cane in Kau, Hawaii, materially improved, however, by showers. Young pineapple plants in good condition all month, and ripening of winter fruit quite general by close of month. Second crop rice damaged by high winds and heavy rain during middle of month in northern Kauai, windward Oahu, and portions of windward Maui. Coffee picking in progress all month; indications of rather light yield in windward Hawaii, but above average in Kona, Hawaii. Most leeward pastures in need of rain all month.—*Alex. McC. Ashley.*

THE WEATHER OF THE MONTH.

By Mr. Wm. B. Stockman, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and V.

The isobars of mean pressure for the month closely approach in contour those of the normal for the month of November, with an area of high pressure over the northwestern and another over the southeastern portion of the country and the area of lowest pressure over the southern Plateau region.

The mean pressure for the month was somewhat above the normal in the central and northern portions of Washington, northeastern Idaho, western Montana, northwestern Wyo-