surface, up to an altitude of several hundred meters, and again reached —4° at the altitude of 3,000 meters. At the highest altitude of 6,000 meters there was registered —25.6, and during the rapid fall of the balloon, the so-called inversion of temperature was again shown in the lower strata. The balloon, which at first moved rather rapidly toward the northwest, must have met rather high up a feeble current of air blowing from the north, which again carried it toward the south and allowed it to fall gently on the highest trees of the Grünwald. The fact that it descended during the nighttime, that is to say about 3h. 50m. a. m., was the reason why it remained for one and a quarter days undiscovered. It was first seen on Sunday morning by Herr Jochens as he was walking out, who perceiving that it would be impossible to get the balloon down without technical assistance, took the trouble to personally notify the officers of the balloon corps. With much labor and not without serious danger to life, a captain of that corps was able on Monday to bring the balloon in fragments down from its airy location, in fact a portion of the material, together with the network, was left in the tree. But the meteorological apparatus was brought to the earth uninjured, so that the reward of 50 marks, promised for the rescue of the balloon, could properly be paid to the energetic balloon corps.

The military balloon "Bussard," of 1,300 cubic meters capacity, and which by the assistance of the commander of the balloon corps, who had so often helped us in our scientific ascensions of the past years, was filled with 1,000 cubic meters of hydrogen and ascended a few minutes before the "Cirrus," also moved, at first, rapidly toward the northwest but after it had attained its position of equilibrium at an altitude of about 1,500 meters, it gradually swerved towards the north-northwest, which direction it maintained during the remainder of the rather slow voyage. Here, also, the increase of temperature with ascent in the lower strata, as registered by "Cirrus," was observed with perfect clearness; the temperature rose from —4° to + 1° C. and only regained the first value at an altitude of 3,000 meters. During the nighttime the balloon remained at an altitude of less than 2,000 meters, but after sunrise it began to ascend steadily. As the aeronauts saw that they were approaching the coast of the Baltic they decided that in case the coast should be reached before noon and a wind should blow stronger from the south, they would attempt to pass over the Baltic and land either in Denmark or its neighborhood. Unfortunately the wind at their altitude did not increase to the necessary extent, as it usually does, so that at 2h. 21m. p. m., therefore, after a voyage of eleven and a half hours they sorrowfully descended at Volkshagen, south of Ribnitz in Mecklenburg, 206 kilometers north-northwest of Berlin. In the descent, since the surface wind blew with unexpected force, the balloon dragged for a little but no serious injury occurred thereby; the temperature —24.4° was observed at an altitude of 5,650 meters.

If now we review the results so far as known of these associated international experiments, we have the following: Of the four simultaneous ascents of unmanned registration balloons, the French attained the greatest height, about 15,000 meters, and the lowest temperature, —63° C.; next to this comes the Strasburg balloon with about 8,000 meters altitude and —30° C. temperature. Both of these were perfectly new balloons and considerably larger than ours, which ascended to 6,000 meters and recorded a temperature of —25.6°. The Russian balloon, probably also an old military balloon, attained only 1,500 meters. Of the four manned balloons, that of our own balloon corps, ascended the highest, viz, to about 5,700 meters and found a temperature of —24.4° C. The Russian balloon, which ascended in St. Petersburg, attained about 5,000 meters, where —27° or —24° was observed; the Munich balloon attained 3,400 meters; as to the two balloons that ascended at Warsaw, the maximum height is not known. Of further interest is the direction taken by each balloon and the corresponding mean wind velocities. The St. Petersburg balloon was carried by a north-northeast wind at an average velocity of 9 meters per second. The Warsaw balloon had a north-northwest wind. The Berlin military balloon had an exactly opposite south-southwest wind with a velocity of 5 meters per seconds. The Munich balloon had a direct west wind of 8 meters per second; similarly the Strasburg balloon had a west wind, but the Paris balloon had a southwest wind of 12 meters per second.

TEMPERATURES OF NOVEMBER AND DECEMBER, 1896.

By Prof. H. A. HAZEN (dated January 25, 1897).

There was a remarkable reversal of temperature conditions in the United States in December as compared with November. As shown in the November WEATHER REVIEW, page 414, the coldest November in twenty-seven years was experienced in Montana, while the warmest of seventy-five years was noted in Philadelphia. During December, Havre, Helena, and Miles City each showed a temperature 12° above normal. This has been exceeded but once at Havre (Assinniboine), it has been equaled but once at Miles City, and at Helena temperature was the highest since observations of the weather service began. On the Atlantic Coast the great heat of November gave way to temperatures far below the normal: New York, —3.7°; Augusta, —4.1°.

It is interesting to inquire whether the cold area of the west was gradually transferred to the east or whether we must look for some other explanation of these anomalous conditions. The weekly temperatures have been charted for the whole country, and these charts do not show any progression of a cold area from west to east. On turning to the tracks of low and high areas in the two months we find a remarkable similarity in their general tendency, with the single exception that there was quite a long period of high pressure in the middle Plateau Region and two highs very slowly moved from the middle Pacific in December which had no counterpart in November. If we turn to the two charts of mean pressure in the two months, we find the following very significant changes: The high pressure, 30.35, to the north of Montana in November moved to the middle Plateau Region (30.32 at Idaho Falls and 30.31 at Salt Lake City). The high pressure off the Carolina coast in November moved to east Tennessee and west Carolina. This distribution of pressure in the West caused southerly and southwesterly winds in Montana, with corresponding high temperature in that region.

The high area over the Atlantic in November carried warm southerly and ocean winds, but in December the center of the subpermanent high pressure was wholly over the land, and the clear skies permitted intense radiation of heat from the earth's surface. It should be noted that the temperature in the middle Plateau was 1.7° above normal at Salt Lake City and 4.6° at Idaho Falls. In the latter case it seems probable that the radiation effect was much diminished by the proximity of a series of storms traveling from the moist and warm Pacific Coast to the north of Montana. It is not possible to account fully for all the temperatures noted, and we must look to moisture and other conditions at several thousand feet above the earth for a more complete elucidation of such anomalies.

NOTES BY THE EDITOR.

SIR ISAAC NEWTON AND HIS KITES.

Mr. Oliver L. Fassig, formerly Librarian in the Weather Bureau, who has taken a year's leave of absence without pay in order to study meteorology and physics in Germany, calls our attention to the fact that perhaps the remark by Professor Marvin in the April REVIEW, page 115, "Sir Isaac Newton is said to have taught the boys how to fly their kites," does not do full justice to that eminent man.

Our knowledge of Sir Isaac's experiments with kites is based upon two paragraphs in Brewster's Life of Sir Isaac Newton, *published in Edinburgh in 1855.* On page 11 of Vol. I, Brewster, apparently on the authority of Dr. Stukely's manuscript, which is still preserved among the "Portsmouth manuscripts," says:

> With this view he introduced the flying of paper kites, and he is said to have investigated their best forms and proportions, as well as the number and position of the points to which the string should be attached. He constructed also lanterns of crimpled paper, in which he placed a candle, to light him to school in the dark winter mornings; and in dark nights he tied them to the tails of his kites in order to terrify the country people, who took them for comets.

This is related to have occurred while Sir Isaac was living at Woolsthorpe and attending the public school at Grantham, probably in the year 1655, when he was about thirteen years old. A second paragraph occurs on page 16 of the same volume, which reads as follows:

It is about this time (1657) also that he seems to have paid some attention to the subject of the resistance of fluids, to which his experiments with water wheels would naturally lead him. Mr. Conduitt (Sir Isaac's nephew) apparently on the authority of Mrs. Vincent (an intimate friend of Sir Isaac in his youth) informs us that even when he was occupied with his paper kites he was endeavoring to find out the proper form of a body which would experience the least resistance when moving in a fluid.

This item is apparently copied by Sir David Brewster from the manuscripts collected by Mr. Conduitt before 1729, as material for his own memoir of the great philosopher. The precise wording of the Stukely and Conduitt manuscripts is, I suppose, not followed by Brewster in the paragraphs above quoted.

The above paragraphs are apparently those on which Poggendorff bases the statement made by him on page 659 of his *Geschichte der Physik*, "Even playthings, such for example as the kite, served him not so much as a direct means of recreation, as an opportunity for reflection as to how these could be best constructed in order that the wind should act most powerfully upon them."

The Editor has, unfortunately, not at hand any of the other numerous publications relative to the life of Sir Isaac Newton; but considering the thoroughness of his insight into the play of forces in all manner of cases, we can not doubt but that Sir Isaac arrived at a satisfactory theory of the mechanics of the problem. Nevertheless it still remains true, as Professor Marvin has stated in this connection, that a search for the literature bearing upon the mechanics of the kite in action has proved nearly fruitless, and his own published memoir on the construction of a kite, and another that will soon be published, on the theory of the kite, constitute the first important publications on this subject, and will prepare the way for future progress in the use of this important piece of meteorological apparatus.

The Editor understands that Professor Marvin considers the combinations of balloon and kite and various complicated forms objectionable on the score of efficiency, although they may, sometimes, be necessary in order to overcome special difficulties. The readers of the MONTHLY WEATHER REVIEW will, we are certain, be pleased to hear from any who have made experiments with various forms of kites.

EARLY MEASUREMENTS OF THE VELOCITY OF THE WIND.

We are indebted to Mr. Oliver L. Fassig for an interesting item of history as to early measurements of the velocity and force of the wind. In the September REVIEW, on page 335, we have stated that the simplest measurement of the velocity of the wind is made by observing the speed of light bodies, such as feathers or soap bubbles, carried along by it. Questions of inertia or of the resistance of any heavy object to the force of the wind do not enter into the calculation of these results if the light object remains in the air long enough to attain the same velocity as the wind itself; therefore this method is much more direct and not encumbered with the theoretical difficulties that attend the method described on page 335, as invented in his early youth, by Sir Isaac Newton.

The observation of the velocity of very light floating bodies was made with much care by Derham of England in his determination of the velocity of sound; but earlier than this, and, in fact, the earliest record that the Editor is aware of, is the following, quoted from Poggendorff's *Geschichte der Physik*, p. 123:

The writings of Geronimo Cardeno (born at Pavia, 1501, and died at Rome, 1576) fill not less than ten folio volumes. From a physical point of view the most remarkable of these is his *Opus Novum*, Basil, 1570, although, in general, it contains but little that is new. He speaks therein of the necessity of taking account of the resistance of the medium if one would determine the velocity of movement of a projectile. He furthermore endeavors to apply the beating of the pulse as a means of measuring time. In this way he measured the velocity of the wind, and found that the strongest storm wind blew at the rate of only fifty paces for one pulsation. * * * He also determined the densities of certain bodies, partly by the phenomenon of friction and partly by their resistance to projectiles, and found, for instance, that the air is fifty times lighter than water, a result which he himself, however, considered as inaccurate.

On page 743 Poggendorff says:

The oldest datum as to the velocity of the wind is that which Marriott gives in his treatise on the Movement of Water and Other Fluids (published after his death at Paris, 1686). Therein he states the velocity of the strongest winds at 32 feet per second. But since this velocity is much too small, and he does not state how he found it, therefore it is possible that this figure results from an estimate merely.

Passing over the history of the invention of several forms of anemometers, Poggendorff says:

There are few subjects in physics to whose measurement so many and various instruments have been devised as the strength of the wind. Most of these, however, have been no sooner invented than they were again quickly forgotten. The number of useful measurements of the velocity of the wind is very small and has no relation to the number of anemometers invented. As the oldest of these measurements we must recognize those of the Englishman, Derham. They were made in the year 1705 and published in the Philosophical Transactions in 1708. From the velocity with which the wind carries light objects, such as down, he concluded that a storm wind had a velocity of 50 to 60 English miles per hour, which is evidently too small. Rochow observed 120 English miles, or 24 German miles, as the velocity of a hurricane. (See the Philosophical Transactions, abridged, Vol. V, p. 392.) To this Derham, also, must credit be given in that he first, in the above-mentioned Philosophical Transactions, demonstrated the influence of the wind on the velocity of sound, an influence that the Academy del Cimento denied, and whose demonstration certainly demanded better means of observation than the academy possessed, since the velocity of sound is very great relative to that of the wind.

DERHAM'S OBSERVATIONS ON THE VELOCITY OF THE WIND.

In the London Philosophical Transactions for 1708, Vol. XXVI, occurs the celebrated memoir by Rev. W. Derham on the Motion of Sound. This memoir was written and published in Latin, as being the common language of the philosophers of that day, but about 1875 the late Dr. J. C. Welling, of Washington, had occasion to make a translation of this memoir and allowed the present Editor to have a copy made for preservation in the Library of the Weather Bureau. The determination of the true velocity of sound required Dr. Derham to determine the influence, if any, of the velocity of the wind, about which there was some doubt at that time, in the minds of philosophers. As his determinations of the velocity of the wind have a special interest for meteorologists, and as Derham's whole memoir is an elegant example of experimental work, the Editor takes pleasure in laying before the readers of the REVIEW, the following quotation from the latter part of Dr. Welling's translation, which is fuller than the authorized Hutton's Abridgment:

After, in this way, I had perceived what influence the winds have, both for accelerating and retarding the course of sounds, curiosity led me to inquire into the velocity of the winds themselves. And though the inquiry may be foreign to my subject it will not be wholly ungrateful, as I hope, to curious minds, if I publish in this connection certain observations on this point.

Concerning the velocity of winds.—In order to ascertain how large a space winds may traverse in any given time, I have used, in prosecuting my experiments, certain bodies of the somewhat lighter sort, such as thistle down, light feathers, etc., which seemed better to serve my purpose than the instrument which is described for us in the Philosophical Transactions, No. 24; or even that other more available one, recalling the figure of a mill with wings attached, invented, unless I mistake, by our most acute friend, the late Dr. Hook.

From very many experiments which I have made, with the aid of the lighter sort of bodies, when the winds were blowing with differ-