Cloud Committee. Photographs are taken with the phototheodolite every two hours from daylight to dusk. Already over 500 plates are ready for measurement. I assisted daily in the cloud photography, and also measured some of the plates and calculated the heights and velocities, both by formula and by a very convenient graphic method which is to be used in most of the work. I found this month's work most interesting and profitable. There is a great field for good work in this direction. The method is far more reliable than that of the direct theodolite work, and more convenient. The expense of maintaining a few such stations is not great where the work can be done in connection with stations already established.

An interesting experiment has just been tried at the Potsdam Observatory in the way of an automatic apparatus for cloud photography. The first cloud picture was made about two weeks ago. The method proves to be entirely feasible. The apparatus weighs fully 1,000 pounds. It is built of brass, and is inclosed in a case about 5 feet by 2 feet by 2 feet. The first impression on looking at it is one of bewilderment at the complication of wheels, levers, and chains; but everything is solidly built, and apparently will not easily get out of repair. The apparatus is entirely automatic. You simply "press the button and the machine does all the rest." About twenty photographic plates are put into one end of it to start with. Immediately on closing the electric circuit a large weight begins to descend in both machines (there are of course two similar machines, one at each station and electrically connected). The descent of this weight opens the outside lid of the case, which protects the apparatus against the weather. As soon as this is done the shutter of the objective opens and closes, giving about a half second exposure of the plates. This done, an endless chain is set in motion which carries the exposed plate to the forward end of the case and at the same time brings a fresh plate from the rear and places it in position under the objective ready for the next exposure. This done, the lid closes and a bell rings as a signal that the performance is over. The apparatus is restricted to the taking of one zenith and two horizon exposures at an angle of 90°. The other two horizon exposures could be added, but this would further complicate the apparatus. These two automatic machines are soon to replace the two phototheodolites now in use. No observer will be necessary at the substation, as the man at the principal station decides upon the time and the portion of the sky to be photographed and closes the circuit which automatically sets both machines in motion. The present form of this automatic apparatus is not likely to come into general use, as it is too complicated and expensive. The cost will probably reach $1,000 for each machine. The phototheodolites can probably be purchased for about $200 each, and have a greater range of usefulness.

THE BALLOON ASCENSIONS OF NOVEMBER 14, 1896.

By Dr. R. ASSMANN, of Berlin.

In the November REVIEW, page 415, we have noticed the temperature results of the simultaneous balloon ascensions, as published by Mascart in the Paris *Comptes Rendus*, and by Lancaster in *Ciel et Terre*, and have drawn some conclusions therefrom. We are indebted to Dr. Assmann and Mr. Oliver L. Fassig for an early copy of the *Anzeiger*, Berlin, November 23, from which we copy the following interesting account of the work done on the 14th of November:

After a short sketch of the recent history of the progress of meteorological ballooning, in which he gives full credit to Hermite and Besançon for their work with sounding balloons, and states that the Berlin scientists promptly followed the example of their French colleagues, Assmann says:

In Paris, Berlin, and St. Petersburg, for some time past everything had been ready for a simultaneous ascension, while in Strasburg and Munich preparations were quickly made after the close of the Meteorological Conference in Paris in September. Therefore the proposition emanating from Paris to make a first experiment in this direction during the night of November 13-14 met with general approbation. The identity of methods of observation must, of course, be considered as the most important condition for the attainment of comparable results; therefore, Strasburg and Berlin ordered self-registering apparatus at once from the famous firm of Richard Bros., in Paris, and which were properly tested by Hermite and Besançon.

The experiments were made in the following manner: In Paris the new balloon "Aerophile III," constructed by Besançon out of very light varnished silk and containing 400 cubic meters, ascended at 2 h. 6 m. (?a. m.). At the same time, that is to say, at 2 h. 22 m., the balloon "Strasburg" of 320 cubic meters ascended from Strasburg. At 2 h. 51 m., the 250 cubic meter balloon "Cirrus," also made of varnished silk, ascended from Berlin; but in consequence of its former employment as a military balloon and of the damages it had sustained in six previous ascensions, among them the highest as yet made, 20,000 meters, it was full of breaks and repairs.

In addition to these there was sent up at St. Petersburg a similar registering balloon whose dimensions are not yet known to the writer. As complementary to these balloons, which were destined for the highest altitudes, other ascensions were made by balloons manned by aeronauts and equipped for scientific observations; of these the balloon "Akademie," with Dr. Erk, as observer, ascended at Munich at 6 h. 47 m. (?a. m.); at 2 h. 44 m., and therefore nearly simultaneous with the registering balloon "Cirrus," the military balloon "Bussard," of 1,300 cubic meters capacity, ascended at Berlin with First Lieutenant von Kehler as aeronaut, and Berson, the well-known "German Glaisher," as meteorologist; at 3 h. 15 m. a military balloon ascended at Warsaw, and at 4 a. m. a similar one at St. Petersburg.

Thus, therefore, except at Munich, the ascensions were nearly simultaneous at all places; that is to say at about 2 o'clock, Paris time, simultaneously from Paris to St. Petersburg, seven balloons equipped for scientific purposes were floating in the air, one at Paris, Strasburg, and Warsaw, and two at Berlin and St. Petersburg, respectively. The following accounts of these ascensions and their results have been received.

The registration balloon, ascending at St. Petersburg, attained only an altitude of 1,500 meters when it burst; the military balloon, manned by observers, attained 5,000 meters altitude and a temperature of the air of —27° C., or according to another telegram, only —24° C.; after a voyage of eight hours it descended near Pskoff, southwest of St. Petersburg, at a distance of 260 kilometers. At Warsaw, by order of the Russian Minister of War, a second military balloon ascended which was driven by a north-northwest wind into Galicia, where it descended near Brzozoff, at a distance of 300 kilometers from Warsaw; nothing has yet been learned as to the altitude and temperature attained in this voyage nor the time of its duration. The balloon sent up by the Munich Association for Aeronautics attained its greatest altitude at 3,400 meters, and descended after a voyage of seven and one-quarter hours, in the neighborhood of Lungitz, near Linz in Austria, having traveled 200 kilometers almost directly eastward from the point of ascent; nothing is yet known as to the observed temperatures. The registration balloon "Strasburg," ascending from Strasburg, after a voyage of an hour and a half (during which it attained 8,000 meters altitude and a minimum temperature of —30° C.) descended in the Black Forest, where it was soon afterwards found. (The movement was, therefore, in an easterly direction.) It is peculiar that the registration of the lowest temperature, —30°, C., occurred at the altitude of 6,000 meters, and that higher temperatures were shown at greater altitudes.

At Paris the registration balloon "Aerophile III" ascended in calm but cloudy weather and took a direction toward the north-northeast, but disappeared from view in a few seconds. To the greatest anxiety of all interested nothing was heard of this balloon for many days, so that it was feared that it had fallen into the North Sea. Because of some remarkable phenomena reported from Wulferstedt and Ummendorf, localities lying west of Madgeburg, it was believed that the missing balloon might have some connection therewith, since a journey of about 800 kilometers could not be considered improbable. In fact, our registration balloon "Cirrus" in its first voyage had landed in Bosnia, having described 1,000 kilometers in ten hours. After all instructions had been sent out for seeking the balloon in that region the agreeable news was received that "Aerophile III," after a voyage of five and a half hours had descended near Graide, in Belgium, 235 kilometers northeast of Paris; it had attained an altitude of about 15,000 meters and temperature of —63° C.

The registration balloon "Cirrus," starting from Schoenberg near Berlin (which in its six previous voyages had penetrated higher into the atmosphere than any other piece of apparatus made by human hands, and in its flight towards Bosnia had attained 15,500 meters, toward Minsk, in Russia, 18,300, and toward the Danish island, Lolland, had attained 21,000) now made its last, its funeral voyage. The balloon material (varnished silk) frequently mended, and become defective, could no longer stand the great resistance of the air, due to the rapid ascent, and at 6,000 meters altitude it split, so that after an hour's voyage it sank to the earth. In consideration of the circumstance that the registration apparatus ordered from Paris, had been received only a few hours before the voyage, and could, therefore, not be again compared with the standard, two registers—a barograph and a thermograph, similar to our home apparatus—were, for the sake of certainty, fastened with the Paris instrument in the basket that carried the apparatus, and which was wrapped in a bright metallic paper (blank Nickel-papier); by this addition the weight was increased by many kilograms, but on account of the buoyancy of the pure hydrogen gas used by the Aeronautic Corps of the Army, this would not have prevented the balloon from attaining the height of 16,000 or 17,000 meters if it had not been brought to a premature descent by the above-mentioned break in the material. This precaution proved to be very advantageous, for, by reason of some one of the unavoidable shocks attending the preparation for the ascent the recording pen of the French thermograph must have become loosened from its fastening so that this part of the apparatus did not work. On the other hand, the German thermograph from the workshop of R. Fuess, in Steglitz, which had been carefully tested a few days before, showed in a very interesting way that the temperature rose from —4° C., near the earth's

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.