

red rust. Alfalfa, vetch, and clover yields were generally above the average, and pasturage continued good. Potatoes and gardens made splendid progress, but hops did poorly, owing to the yards being badly infested with lice. The yield of strawberries and cherries was below average.—*Edward A. Beulis.*

Pennsylvania.—At the close of the month considerable hay and some wheat and rye were secured. Oats were heading rapidly and a good crop was promised. Practically all crops were well advanced. Corn, tobacco, vegetables, and pastures were in prosperous condition and garden truck and small fruits were plentiful. Apples were of excellent quality, but scarce and dropping badly. Buckwheat seeding and cultivation were progressing satisfactorily and the transplanting of tobacco plants was practically completed.—*T. F. Townsend.*

Porto Rico.—Weather favorable for growth until the last week, when it became too dry. Cane grinding nearly finished; crop generally excellent, although below normal in a few wet districts. Cane planting continued; young canes did well. Coffee maturing and a small amount picked; the berries fell badly in a few districts on account of dry weather. Corn, beans, and other small crops were harvested and planted. Mangoes and pineapples were abundant; a few alligator pears marketed. The cotton crop was badly damaged by worms in some places.—*E. C. Thompson.*

South Carolina.—Temperatures were favorable. Deficiency in precipitation gave opportunity to clean field crops of grass and weeds and give them much needed cultivation, but the long, dry spell and previous lack of cultivation had injured early corn irretrievably. Cotton improved steadily; blooms were noted during the last decade. Wheat and oat harvest was finished. The weather was unfavorable for the best development of tobacco. Early peaches were plentiful and of good quality. Minor crops needed more moisture.—*J. W. Bauer.*

South Dakota.—Month cooler than usual, with much cloudiness. Excessive rainfall over much of the State, injuring crops on lowlands. Spring wheat, oats, barley, spelt, winter and spring rye, potatoes, and flax did well, except on lowlands, though red rust appeared in considerable wheat and in some oats in the third decade. Corn was backward and cool weather and frequent rains retarded growth and cultivation. Grass was in excellent condition. By the 25th barley, spring rye, and early oats were heading and early spring wheat was beginning to head. Local damage from hail.—*S. W. Glenn.*

Tennessee.—The first ten days of the month were very favorable for farm work, which was pushed vigorously, but the cool nights were unfavorable to cotton and young corn. Rainy weather from the 12th to 30th greatly hindered cultivation and harvesting, and much grain and hay were badly damaged. The yield of oats and hay was very good, but of wheat only fair. At the end of June all crops were growing rapidly, cotton and tobacco being overgrown in many fields, and all were very much in need of cultivation. Apples and peaches were scarce and inferior.—*H. C. Bate.*

Texas.—Temperatures generally averaged above normal, but were slightly below in the southwestern district. The weather was gener-

ally favorable for crops and farm work early in the month, but showery weather later delayed work and caused some damage to grain in shock. Cotton improved decidedly early in month, but later weather was less favorable, and caused increased activity of boll weevils. Some cotton picked in extreme south by end of month. Corn improved rapidly during latter part of month. Other crops fair to good.—*M. E. Blystone.*

Utah.—The temperature was about normal. Precipitation was deficient and none was reported over portions of the southern counties. Irrigated crops were in good condition, but arid land crops deteriorated considerably. Fall and early sown spring wheat were being harvested, also the second crop of alfalfa. Insects were reported in some sections. Beets were in fine condition and gardens were doing well. Ranges deteriorated, but stock was still thriving.—*R. J. Hyatt.*

Virginia.—Cool weather prevailed over the State, with variable and poorly distributed amounts of precipitation, until the 14th. These conditions were unfavorable for crop progress, especially spring plantings. After the 15th warmer weather, with ample rainfall, prevailed and there was a general improvement in the condition of vegetation. Harvest of wheat and oats began in the month and haymaking also was undertaken, but this and other field work was interrupted considerably by frequent rains.—*Edward A. Evans.*

Washington.—The western division had nearly normal conditions, but in the eastern division there was an unusual amount of rain, the greatest amount on record in some of the central counties. The result was very beneficial for nearly all crops, especially for pastures, meadows, potatoes, oats, barley, and wheat. Winter wheat grew very rank and some was lodged by wind and rain.—*G. N. Salisbury.*

West Virginia.—Conditions were generally favorable for growth, but cultivation was retarded during the first and fourth weeks by wet weather. The third week was clear and hot and especially favorable for the rapid growth of corn. At the close of the month clover and wheat harvest was in progress, oats, gardens, millet, and sweet and Irish potatoes were doing well, and meadows and pastures were improving.—*E. C. Vose.*

Wisconsin.—The month was notable for severe local storms, excessive rainfall, and deficiency of sunshine and temperature. The storm that passed over the State on the 3d to 6th resulted in almost unprecedented rains in the central and northwestern counties, flooding lowlands and causing much damage to crops along the streams. Bridges were washed away in many places and traffic delayed. Growing crops made satisfactory progress during the month, except on lowlands, where excessive moisture interfered with growth.—*W. M. Wilson.*

Wyoming.—The heavy rainfall over the northern and eastern counties rendered irrigation unnecessary over many sections, and the streams of the State gave plenty of water for irrigation where necessary. Gardens were backward, but grain made good progress. The harvest of the first crop of alfalfa was in progress at the close of the month, and a good crop was being secured. Native meadows made good growth. Ranges continued to improve, and all stock were in excellent condition.—*W. S. Palmer.*

SPECIAL ARTICLES.

TORNADO OF JUNE 5, 1905, AT BINGHAMTON, N. Y.

By W. E. DONALDSON, Observer.

This elaborate paper contains many details of local interest and is fully illustrated by charts and photographs, for which, however, space could not be afforded here. The following paragraphs will indicate the scope of the paper, and suffice for the meteorologist.—*Ed.*

A small, local, very violent storm passed over Binghamton, N. Y., about 10:30 p. m., of June 5, 1905. The weather during the day was moderately warm, with a maximum temperature of 79°. A thunderstorm with feeble thunder and lightning and light rain occurred during the afternoon. The isobars for 8 p. m., June 5 are shown in fig. 1.

Heavy rain accompanied by frequent and extremely vivid lightning and strong gusts of wind commenced about 9:22 p. m., and continued until 10:30 p. m., when a confused rumbling roar was heard for a short time, after which comparative silence ensued. The roar is presumed to have been caused by a violent whirlwind, moving at a rate of 45 or 50 miles per hour.

The storm first struck Binghamton at the Westcott place at the extreme southwestern limit of the city within a few hundred feet of the left bank of the Susquehanna River. Here the whirlwind demolished three barns, damaged several houses and barns, and uprooted a number of large trees.

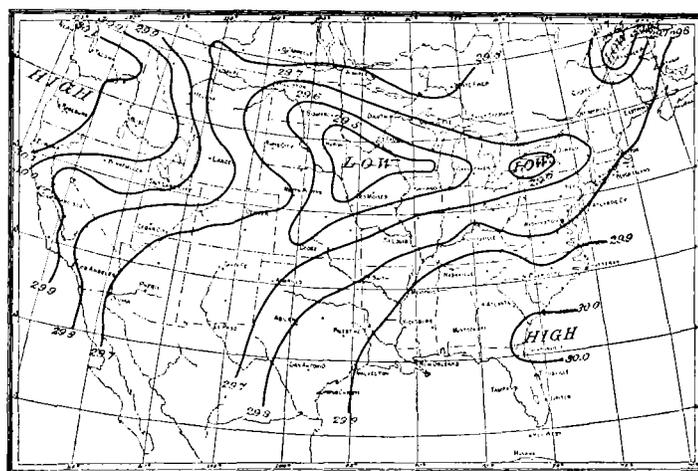


FIG. 1.—Isobars for 8 p. m., June 5, 1905.

Crossing the river the whirlwind struck a field of rye near the track of the Binghamton Driving Park. From this point it followed a path extending over the low flood plain on the right bank of the river and probably a portion of the river within a few hundred feet of the right bank, the width of the track over the flood plain being from 170 to 400 feet. Here the storm uprooted and broke off many trees ranging

from two inches to two feet in diameter. From the driving park to Chapin street the whirlwind passed over a section practically uninhabited.

From Chapin street to Front street the whirlwind covered only a narrow strip on the right bank of the river. Several houses near the river bank were slightly damaged, and many trees were broken off.

At Front street the whirlwind crossed the river again and passed over the Withington place a hundred feet south of the left bank, uprooting and breaking off a number of large trees ranging from six inches to two and one-half feet in diameter.

After passing the Withington place the tornado left the narrow flood plain on the left river bank, ascended a gentle slope, and suddenly began to do serious damage; four houses and one barn were more or less demolished, three houses were unroofed, four were badly shifted on their foundations and a number were slightly damaged, and many trees uprooted.

From Mill street to Telegraph street the whirlwind ascended a rather steep slope, uprooting many trees and doing the damage described in the preceding paragraph. A few hundred feet from Kress street it passed over the only hill in its track within the limits of Binghamton, the summit of the hill being 150 feet above the street and 300 yards distant. Not the slightest damage was done to the small trees covering the west side and summit of this hill, but about halfway down the eastern side of the hill the storm passed over a vacant house, known as the Eaton place; this house was completely wrecked and the débris carried to a considerable distance toward the northeast.

From the Westcott place to the Withington place the whirlwind followed the river, passing over a water surface and a nearly uninhabited land surface. After passing the Withington place the storm passed over a comparatively thickly settled territory. With the few exceptions, noted above, the damage done by the whirlwind over a path from 170 to 600 feet wide and about one and one-third miles in length, from the Withington place to the Eaton place, where it passed beyond the city limits, consisted of shade trees uprooted, houses slightly disturbed on their foundations, chimneys blown down, and walls and roofs damaged by flying débris. More than half of the houses that were in the path of the storm escaped without the slightest damage and less than 15 per cent of the trees in the path were damaged.

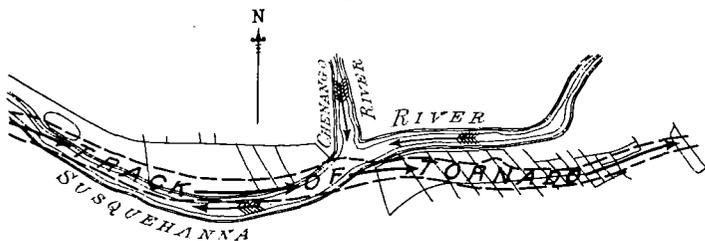


Fig. 2.—Track of tornado in Binghamton, N. Y.

Although intense darkness prevented direct observation of a funnel-shaped cloud, the characteristics developed indicate that the storm was tornadic. It passed over a path 170 to 600 feet in width and about two and seven-tenths miles long (see fig. 2). Its destructive force was spent in the middle of its narrow path and diminished laterally so rapidly as to leave houses and trees uninjured at a distance of 60 feet to the right and left of houses that were shattered. At the Eaton place the storm passed over a hill, leaving undisturbed the trees that covered the summit, descended 80 feet and completely wrecked a house that would have been completely protected by the hill had the storm been a straight blow. The general direction in which trees and débris lay in the center line of greatest destruction further confirms the opinion that this storm was a tornado.

Notwithstanding its destructive violence not a person was seriously injured by the storm. The total damage to property in Binghamton is estimated at \$15,000.

A NOVEL TYPE OF RECORD SHEET ADAPTED TO SEISMOGRAPHS, AERIAL METEOROGRAPHS, ETC.

By CHARLES F. MARVIN, Professor of Meteorology, U. S. Weather Bureau.

Many difficulties are encountered in securing records from the automatic instruments sent up on kites and balloons. This is especially the case with sounding balloons which often reach very great elevations and enter strata, the temperature of which is many degrees below zero. Temperatures more than 100° Fahrenheit below zero have been observed. Inks are almost certain to fail by freezing or thickening, and, in addition, are likely to be much affected by conditions of extreme moisture or rain, as, for example, when the instrument is carried through clouds or exposed to rainfall. After the balloon and instruments return to the earth, many days, even weeks, elapse sometimes before they are discovered, during which time the precious record is constantly liable to obliteration and destruction.

In one of the best methods of registration thus far employed the surface of the record sheet is covered with a coating of soot deposited by a smoky flame. Thin aluminum foil, or similar metal sheets, are far more durable and moisture proof than paper and are generally employed. Such recording surfaces offer exceedingly slight resistance to the stylus of the recording pen, and are unaffected by cold, moisture, etc., but a serious difficulty is presented in the facility with which the records may be obliterated and the smoked surface destroyed by accident or inadvertence in handling before the records are finally secured and varnished so as to render them permanent.

A novel modification of this method of registration has been recently devised by Mr. R. Nimführ, the assistant in the Central Institution for Meteorology and Geodynamics, of Austria. A short account of this was presented by Dr. J. M. Pernter at a meeting of the Mathematical Section of the Imperial Academy of Science in May, 1905, and the following is a translation of his paper:

A NEW METHOD OF FIXING THE RECORDS FROM SOUNDING BALLOONS, AND A NEW DEVICE TO AUTOMATICALLY DISENGAGE THE RECORDING PENS AFTER LANDING.

Heretofore smoked glazed paper or aluminum foil has commonly been employed for meteorograph records of sounding balloons. The soot coating is fixed or rendered permanent at the end of the journey by dipping the record cylinder in a solution of shellac.¹ This mechanical fixing of records of the registration apparatus is nevertheless accompanied with many disagreeable consequences. In the first place the original curves by the mere act of measuring are scratched and obliterated in the most undesirable manner. Again, it not infrequently happens that by an accidental touch of the cylinder before fixing, the record is effaced and can not possibly be reproduced.

I have now succeeded in finding a new method for fixing the records that is not open to the defects mentioned, and in addition has several advantages over the usual methods of fixing the soot coating.

I place upon the record cylinder common photographic printing paper (celluloid paper) and smoke the same in feeble daylight in the usual way. When the apparatus returns to the central station after the ascension, the cylinder is removed, exposed to light, and the coating of soot removed by means of a cloth; the paper is now removed and washed and handled

¹ A very superior varnish for fixing record sheets of this character has been extensively employed at the Weather Bureau for varnishing records from the Bosch-Omori seismograph. This consists of a solution of about 15 grams of celluloid in 100 cubic centimeters of acetone which is subsequently diluted with about 400 cubic centimeters of amyl acetate. Alcohol may be used as the solvent as well as acetone. From 24 to 48 hours, with frequent shaking, are required to thoroughly digest the celluloid and reduce it to a homogeneous, viscous liquid. Large record sheets of paper may easily be varnished on the face only or both front and back as desired. For this purpose the varnish is placed in a small shallow tray. The sheet is held at each end in a deep J-formed loop and the surface touched carefully to and drawn over the varnish and laid out flat to dry, or better, dried by gentle heat from a steam radiator or small gas heater.—C. F. M.