Loa, Kilauea, and Hualaloi, (which are, we believe, the only three active craters in the island of Hawaii, and, for that matter, in the whole of the Sandwich Islands), but the date 1851 is given in the Encyclopedia Britannica in addition to those given in Mr. Lyons' two articles, and there are discrepancies enough between the exact dates of eruptions and the sun spots to make one wonder how there can be any causal connection between the two. In some cases the eruptions appear to precede the sunspots, in other cases they follow. In one case the eruptions between 1851 and 1859 seem to have favored the maximum sun spots quite as much as the minimum.—ED.

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26′ N., 85° 47′ W. The observations at 7:17 a. m., local time, are simultaneous with Greenwich 1 p. m. The altitude of this barometer is now said to be 4 feet above ground; the thermometer 6 feet above ground; the rain gage 7 feet above ground. The ground is 210 feet above sea level. Until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0–12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded.

This station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of the station. Dr. Flint's records occasionally mention the presence of clouds on the summit of this mountain.

Dr. Flint's reports to the Weather Bureau now embrace two distinct features, namely, the simultaneous morning observations and the daily climatological summary, as given in the two following tables for each month.

Simultaneous observations at 1 p. m. Greenwich (or 7:17 a. m. local) time, July, 1899.

Date.	Temperature.		Wind.		Upper clouds.			Lower Clouds.		
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.
	°	°								
1	79	72	ne.	5	cs.	2	sw.	k.	2	ne.
2	78	74	ne.	6	.....	.....	.....	kn.	10	ne.
3	76	73	ne.	5	.....	.....	.....	ak.,k.	1,9	ne.
4	77	75	ne.	6	.....	.....	.....	k.	8	ne.
5	78	71	ne.	7	ck.	10	se.	.....	.....	.....
6	80	73	ne.	5	ck.	10	sw.	k.	Few	ne.
7	80	73	ne.	6	ck.	8	sw.	ak.	2	ne.
8	80	73	ne.	7	.....	.....	.....	ak.	4	ne.
9	80	73	ne.	5	.....	.....	.....	k.	10	ne.
0	80	73	ne.	5	cs.,ck.	9	sw.	k.	1	ne.
1	80	73	ne.	5	ck.	10	sw.	k.	Few	ne.
12	76	73	n.	0	.....	.....	.....	ak.	10	n.
13	78	74	ne.	3	.....	.....	.....	ak.,k.	9	ne.
14	77.5	73	ne.	0	.....	.....	.....	f.k.	10	ne.
15	78	75	ne.	3	.....	.....	.....	k.	10	ne.
16	79	75	ne.	5	.....	.....	.....	f.k.	10	ne.
17	81	77	ne.	6	ck.	5	sw.	f.k.	1	ne.
18	81	74	ne.	6	.....	.....	.....	f.k.	9	ne.
19	76	73	ne.	6	.....	.....	.....	kn.	10	ne.
20	79	75	ne.	3	.....	.....	.....	f.k.	9	ne.
21	75	73	n.	0	.....	.....	.....	kn.	10	n.
22	77	73	ne.	5	ck.	8	sw.	f.k.	1	ne.
23	78.5	73	n.	5	ck.,c.	10	sw.	k.	Few	ne.
24	77	73	ne.	3	.....	.....	.....	f.k.	10	ne.
25	78	75	ne.	2	.....	.....	.....	f.k.	10	ne.
26	77	74	se.	3	.....	.....	.....	k.	10	se.
27	75.5	73	ne.	0	.....	.....	.....	ak.,k.	9	ne.
28	77	74	ne.	3	.....	.....	.....	ak.,f.k.	8	ne.
29	79	75	ne.	4	.....	.....	.....	ks.,k.	1	ne.
30	79	75	ne.	5	ck.	6	sw.	k.*	Few	ne.
31	77.5	74	se.	3	.....	.....	.....	k.	8	se.
Means	78.2	.....	.....	.....	.....	....	.....	.....	.....	.....
Departure	+1.3	.....	.....	.....	.....	.....	.....	.....	.....	.....

*On Ometepe.

Climatological observations for twenty-four hours ending at 7:17 a. m. local (or 1 p. m. Greenwich) time, July, 1899.

Date.	Temperature.		Wind.		Average cloudiness.	Total rainfall.
	Maximum.	Minimum.	Prevailing direction.	Maximum force.		
	°	°				*Inches.*
1	84	76	ne.	4	8	*0.00
2	84.2	78	ne.	6	7	0.00
3	84	77	ne.,se.	6	10	0.93
4	84.5	75	ne.	5	9	0.08
5	86.5	78	ne.	6	6	0.00
6	89	77	ne.	7	10	0.00
7	86.5	78	ne.	6	9	0.00
8	89	78.5	ne.	6	4	0.00
9	87	79	ne.	7	6	0.04
10	89	79	ne.	5	7	0.00
11	88	78.5	ne.	5	8	T.
12	87	79	ne.	5	9	0.11
13	83	75	ne.	4	9	T.
14	87	77	ne.	4	8	0.16
15	87	76.5	ne.	4	9	0.20
16	84	77	ne.,se.	4	10	0.70
17	84.2	77	ne.	5	9	0.00
18	88.6	77	ne.	6	2	0.00
19	86	79	ne.	7	7	T.
20	87	75	ne.	6	5	0.20
21	87	78	ne.	4	9	2.09
22	83	75	n.,ne.	5	10	2.32
23	84.5	76	ne.	6	5	0.00
24	86	77	ne.	7	9	0.40
25	88	77	ne.	6	10	0.83
26	83	77	ne.	5	8	1.80
27	77.2	75	ne.,se.	5	10	0.71
28	83	75	ne.,se.	3	7	0.00
29	85	76	ne.	5	4	0.00
30	88	77	ne.	5	5	0.10
31	87	78	ne., e.	5	7	0.02
Sums	.....	.....	.....	.....	.....	10.69
Departure	.....	.....	.....	.....	.....	+3.93

*The rainfall at 3 p. m., June 30, was reported on that date. Strictly speaking, therefore, the rainfall for June is 7.53 and that for July is 10.85, and the 0.08 measured at 1 p. m. of July 31 belongs to the record for August.

Since early in June farmers have asked me for forecasts of rain, but to all I have replied, "No rain until the northeast trades cease." On the 15th the wind veered to southeast, with sprinkles at 9 a. m., but then back to northeast. Little hope for the first corn crop. Great complaints of dryness from Costa Rica. On the 31st, although the July rains are 3.93 above normal, yet there is still complaint of dryness.

THE TORNADO AT NEW RICHMOND, WIS.

By Prof. O. G. LIBBY, Madison, Wis.

The Editor has received from Prof. O. G. Libby, instructor in history at the University, Madison, Wis., quite a full special report on the tornado of June 12, 1899, that destroyed the City of New Richmond, Wis., from which he makes the following extracts:

I observed the ruins and other phenomena for two weeks after the tornado occurred, while aiding the sufferers. Mr. Emil Gerde, of Star Prairie, Wis., stated that he saw the storm approach and watched its first destructive action. He states that the cloud had three parts, a central cone larger than the others and showing a square ragged base, with the body twisted like a rope. On either side of this was a smaller cone that swung free in and out, to and fro, licking up a building, leaping and swaying as the cloud advanced. Sometimes a considerable distance separated them, and then again they would be close together. The western cone was larger than the eastern. The cones were of a yellowish tint, like flames, especially the central one. Intense darkness preceded the storm, the noise was like that of an immense wheel turned by machinery, in which there was considerable slack, so that the sound was uneven. The sun shone out after the storm. The reports from Polk County indicate three paths of destruction, the central one being the worst of all. I crossed the central path twice in driving near Clear Lake, where the bushes were stripped of bark and old logs lying partly in the ground, had been moved for some distance. Even on a sloping hill covered with small bushes, everything was bruised and pounded flat, as though logs had been rolled or dragged over the surface.

Among the numerous details given by Mr. Libby, we select

only the following items whose numbers correspond to locations on fig. 3:

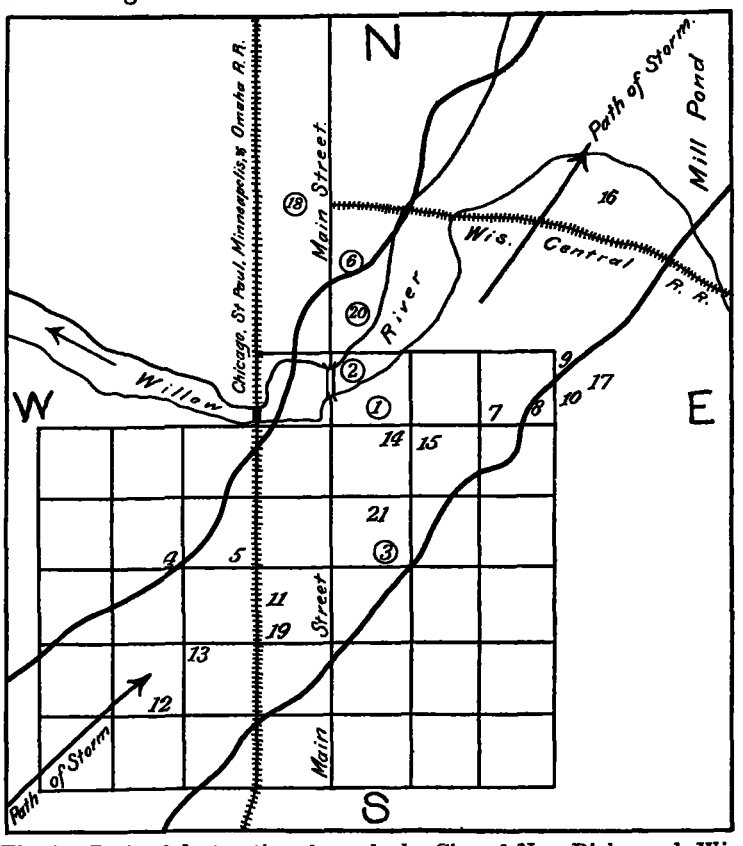

Fig. 3.—Path of destruction through the City of New Richmond, Wis.

1. Here an iron bar 4 feet long, 4 inches wide, and ½ inch thick, was driven into a lombardy poplar and solidly embedded at about 3 feet above the ground. The bar pointed toward the northwest and was said to have come from a blacksmith's shop in that direction, on the other side of the Willow River.

3. Dr. Epley's house and office; the eastern end of the office was blown away, but the house was standing and in a fair state of preservation; this is one of the marks of the work of the eastern cone.

4. Dr. Krapps' house and office; the house was turned from the west around to the south on its foundations.

5. A complete circle of boards driven deep into the earth, the circle was 90 feet in diameter and was best marked in the northwest quadrant. Furrows showed where other boards had struck the earth and were carried on. At the same place was found the body of a boy who had been carried from Hawkins' house, No. 19.

6. A sill beam 20 feet by 10 inches, from a destroyed planing mill, 2 rods to the southeast is here thrust into the ground, so that only 5 feet protruded, pointing toward the southeast.

7 and 8. Buildings standing but the roofs gone.

13. Judge Hough's house a wreck, but walls still standing. To the west and southwest of this there was complete destruction.

14. A dwelling house, some of whose contents were carried southward.

15. The power house, whose beams were carried northward, and the library whose books were carried northward.

16. Glover's lumber yards practically untouched.

18. The point from which Emil Gerde saw the tornado cloud approaching.

The loss of life was very large in the cellars where people fled for shelter. The wind was so fierce that everything was swept clean, then the débris from other buildings poured into the cellars with fatal results.

THE USE OF THE STORAGE BATTERY FOR THE ELECTRICAL RECORDING INSTRUMENTS.

By ELISHA C. VOSE, Observer Weather Bureau (dated July 17, 1899).

The use of the storage battery, now in successful operation at the Chicago station, for the purpose of furnishing the electric current for the self-registering instruments, had been under consideration by Professor Cox for some time.

It was at first thought that the current might be taken directly from the electric light wires or the main wire, and reduced from a voltage of 110 to 4 or 6 volts by rheostat. Experiments were made along this line, the tele-thermograph being connected, but it was found that heat was being generated in the magnets; the current was at once shut off and the cause sought for, which was found to be a ground. The only way that this could be eliminated was by running a separate wire directly from the dynamo, which should not be used for other purposes. The old main feed wire which was put in to furnish the current for the experiments with the search light of the ill-fated battleship *Maine*[1] was used for this purpose. Professor Moore, while in charge of this office, had placed this light on the top of the Auditorium Tower for testing flash lights as a means of giving notice of the approach of cold waves and other warnings. But it was not practical to run a separate wire on account of the cost, and then there were other reasons why the direct current would not be feasible, even on the direct main feed wire: 1. If at any time it should be necessary to shut down the dynamo for repairs, or otherwise, the power for all the instruments would be affected, and the record would be lost for a longer or shorter period. 2. If in any way the main wire should become grounded with the building or with other wires, as was very liable to happen, it might cause the very delicate magnets to be burned out, thus destroying the effectiveness of the instruments. 3. The direct current has too high a potential, even if greatly reduced by the rheostat, to be adapted to furnish the current for such delicate mechanism as these meteorological instruments contain. For these reasons it was apparently necessary to abandon further experiments with the direct current.

Attention was then turned to the storage battery as furnishing a steady current of high intensity and low potential, such as would be especially adapted for furnishing the electromotive force for delicate instruments.

The Auditorium Association, through Mr. A. W. Sawyer, the secretary, very kindly consented to furnish the storage battery in order to give this important forecast center and station an up-to-date electrical equipment, if after a test of thirty days, it was found to do the work in a satisfactory manner.

Eight cells were purchased and these were divided into four batteries of two cells each; two of these batteries are always charging, while the other two are furnishing the current. Each of these batteries has an electro-motive force of 4 volts and a current of 12 amperes, and will run for forty hours. The current is taken directly from the electric light wires, and each battery is charged for twenty-four hours through one 8-candle power light of 110 volts, thus giving a low potential; this is also for the purpose of inserting resistance in the circuit with the storage cells from such a high voltage circuit. In order to provide against a short circuit in the electric light wires, another connection was prepared with the main wire, so that this could be used at any time in case of emergency. The batteries are connected with what is termed a "four-point switch," so that when the switch is thrown, one battery is "set in" while the other is "set out," that is, one battery furnishes the current while the other is charging. In order that there may be as little confusion as possible about the time of changing the batteries, the observer who changes the sheet at noon each day throws the switch at the same time, so that he is as little likely to forget to change the battery as to neglect to change the sheet. It will be noticed that the cells are 40 ampere-hour cells, and that they are in operation only twenty-four hours. Thus, it is so provided that in case the observer should fail to attend to the batteries at noon each day, still there would be no loss of the records on that account, as the batteries would easily furnish

[1] MONTHLY WEATHER REVIEW, Vol. XXVI, p. 58.

Plate I. Explosive Effects of the New Richmond Tornado.


12. NEW RICHMOND TORNADO.
REV. TUTTLE'S HOME. PARSON, METHODIST CHURCH.
MAAS BRO. PHOTO. ST PAUL "COPYRIGHT APPLIED." 1899.


22. NEW RICHMOND. DESTRUCTION OF DR. EPLEY'S HOME
TORNADO. HAAS BRO. PHOTO. ST PAUL COPYRIGHT APPLIED. 1899.