

ary signals were ordered. Of these, one hundred and fifty-three, or 86.93 per cent., were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. One hundred and seven cautionary off-shore signals were ordered, of which number, one hundred, or 93.46 per cent., were fully justified both as to direction and velocity; one hundred and five, or 98.13 per cent., were justified as to direction; and one hundred and two, or 95.32 per cent., were justified as to velocity. There were no "northwest" signals ordered at the lake ports during the month. Two hundred and eighty-three signals of all kinds were ordered, of which two hundred and fifty-three, or 89.40 per cent., were fully justified. These do not include signals ordered at display stations where the wind velocities are only estimated. Four signals were ordered late. Of the one hundred and seven cautionary off-shore signals that were ordered, seventy-nine were changed from cautionary signals. In eighty cases, winds of twenty-five miles or more, per hour, were reported for which no signals were ordered.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for February says:

During the month of February a much more extensive system of verifications of railway signals has been established. Thirteen observers along the line of the Cleveland, Mount Vernon and Delaware railway, are now co-operating with the bureau in this matter. The result for the month was, that in temperature, the predictions of the signals displayed, show a percentage of verification of 93 per cent., and in the "state of the weather," the percentage was 84.

The signals above referred to consist of colored symbols displayed from the sides of the baggage cars, representing the daily forecasts, as telegraphed at midnight from the office of the Chief Signal Officer to said bureau.

ATMOSPHERIC ELECTRICITY.

AUORAS.

An auroral display occurred on the night of the 1-2d, which has been reported by the following stations:

Eastport, Maine: a faint aurora was observed from 9 p. m. until the early morning.

Portland, Maine: a faint display was visible from 11.15 p. m. until midnight.

Gardiner, Maine: an aurora was visible from 11 p. m. until 1.45 a. m.

Point Judith, Rhode Island: a faint auroral arch of pale yellowish color was visible from 11 p. m. until 4 a. m.

Boston, Massachusetts: an aurora was suspected from 2.40 a. m. until daylight, the sky being obscured by clouds.

Fort Totten, Dakota: an aurora was visible from 7.30 to 9.10 p. m., consisting of a pale light resembling the morning dawn. The telegraph line between this place and Larimore, Dakota, was so influenced during the display as to render communication impossible.

Other displays were reported as follows:

A faint auroral display was observed at Woodstock, Maryland, at 7.45 p. m. of the 2d.

At Fort Maginnis, Montana, a faint auroral display was observed at 9.10 p. m. of the 14th. A display was also seen on this date at Sandwich, Illinois.

On the night of the 19-20th, an auroral display was observed at Smithville and New River Inlet, North Carolina. This display was reported by these stations only. At Smithville, it appeared at 6.20 p. m., and continued until 7.40 p. m., when the sky became entirely obscured by clouds. The aurora was first observed in the northwestern sky, consisting of a narrow streak of whitish light without any visible movement, and extending upward 12° or 15° from the horizon. This appearance gradually faded when a light appeared in the north, red near the horizon and straw-colored from the centre to its uppermost limit, which was about 25° above the horizon. The display attained its maximum brilliancy and extent at about 7 p. m. and, afterwards, gradually faded away, leaving only a faint glow at 7.30 p. m. At New River Inlet, this dis-

play was reported to have been observed from 6.54 to 7.30 p. m., consisting of occasional flashes of pale yellow light.

A faint display was also seen at Smithville and New River Inlet on the 22d. At Smithville it consisted of a bright, straw-colored light, and was visible from 6.45 until 7.20 p. m. At New River Inlet it was reported to have been of a very faint yellowish color, and was observed from 6.59 until 7.55 p. m. Auroral displays were also observed on the 22d, at Swartz creek, Michigan, and Sandwich, Illinois, the observers at the latter stations not stating the time at which the displays occurred.

On the 23d faint auroral displays were seen at Gardiner, Maine, Fort Brady, Michigan, and Saint Vincent, Minnesota. At the last-named stations it was observed from 8.15 to 9.30 p. m., in the form of an arch extending over about 30° of the horizon, and to an altitude of 10° .

At 12.45 a. m., of the 25th, a faint display was observed at Gardiner, Maine.

The most widely observed display of the month occurred on the 29th. It was observed at stations both on the Atlantic and Pacific coasts, although it was not reported from stations between the upper lake region and eastern Washington Territory. In New England the display was faint, lasting from the early evening hours until midnight.

At Sandusky, Ohio, it was reported as a faint light lasting from 9.30 p. m., until midnight.

In the upper lake region the display was very brilliant. At Escanaba, Michigan, it was observed from 7.50 p. m. until after midnight, attaining its greatest brilliancy between 9.25 and 10.40 p. m., when an arch of yellow light extended from east to west and to within 8° of the zenith. At 10.15 p. m. "merry dancers" and two distinct arches were visible. Towards midnight the display became less brilliant.

At Mackinaw City the display was first observed at 9.10 p. m., when numerous streamers of various colors were seen moving across the northern horizon. At 10.40 p. m. it disappeared. At Alpena, Michigan, it was reported as consisting of brilliant streamers, shooting upward from a dark segment on the horizon, and having an apparent motion from the east. The display continued until 2.30 a. m. of March 1st. At Marquette, Michigan, the display was faint, appearing first at 7.45 p. m., fading away at 8.20, reappearing at 10.10, and finally disappearing at 11.20 p. m.

The observer at Port Angeles, Washington Territory, reports as follows: an aurora was observed at 7.45 p. m., with dark segment resting upon the northern horizon, above which was an arc of yellowish color. The display extended over about 50° of the northern sky and to an altitude of 15° ; at 10.30 p. m. it disappeared. At Pysht, Washington Territory, the aurora was observed from 8 to 11 p. m.

ELECTRICAL PHENOMENA.

Fort Maginnis, Montana.—The telegraph lines were affected by atmospheric electricity on the afternoon of the 19th.

THUNDER-STORMS.

Thunder storms were reported in the various districts on the following dates:

New England.—11th, 14th, 16th, 17th, 20th, 23d.

Middle Atlantic states.—7th, 13th to 16th, 18th, 19th, 20th, 22d, 23d, 28th.

South Atlantic states.—1st, 2d, 12th, 13th, 14th, 16th to 20th, 22d, 23d, 25th, 27th.

Florida peninsula.—12th to 17th, 19th, 22d, 25th.

Eastern Gulf states.—1st, 12th, 13th, 16th, 17th, 19th, 22d.

Western Gulf states.—4th, 5th, 7th, 8th, 11th, 12th, 13th, 17th, 18th, 19th, 22d, 26th, 27th.

Rio Grande valley.—Rio Grande City, 11th.

Tennessee.—1st, 4th, 5th, 12th, 13th, 19th, 22d, 27th.

Ohio valley.—4th, 5th, 6th, 12th, 17th, 18th, 19th.

Lower lake region.—4th, 5th, 19th.

Upper lake region.—12th, 19th.

Upper Mississippi valley.—4th to 7th, 12th, 17th, 19th.

Missouri valley.—3d, 4th, 12th, 18th.

Middle slope.—8th, 10th, 11th, 12th, 29th.

North Pacific coast region.—Astoria, Oregon, 4th, 8th, 9th, 17th, 18th, 19th.

South Pacific coast region.—Yuma, Arizona, 3d.

At Austin, Texas, a severe thunder-storm occurred on the night of the 11-12th, during which the University building was struck by lightning and damaged to a considerable extent.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England.—2d, 3d, 10th, 11th, 15th, 16th, 19th, 21st, 22d, 27th.

Middle Atlantic states.—3d, 4th, 6th, 12th, 13th, 16th, 22d, 27th.

South Atlantic states.—1st, 2d, 6th, 8th, 20th, 23d, 26th to 29th.

Tennessee.—2d, 5th, 11th, 12th, 14th, 15th, 18th, 21st, 22d, 26th.

Ohio valley.—1st, 16th, 21st, 26th.

Lower lake region.—1st, 16th, 19th, 21st, 29th.

Upper lake region.—1st, 3d, 5th, 6th, 8th, 10th, 11th, 20th, 21st, 27th, 28th.

Extreme northwest.—5th, 6th, 12th, 15th, 19th.

Upper Mississippi valley.—10th, 15th, 18th to 23d, 25th, 26th, 27th.

Missouri valley.—3d, 6th, 12th, 13th, 15th, 19th to 22d, 25th, 27th.

Middle slope.—15th, 18th, 20th, 29th.

Middle Pacific coast region.—8th, 9th, 10th, 13th, 17th, 19th, 20th, 22d, 24th.

Solar halos were also observed at the following stations not included in the districts named above:

Fort Grant, Arizona, 14th.

Deadwood, Dakota, 6th.

Boisé City, Idaho, 25th.

Nephi, Utah, 27th.

Salt Lake City, Utah, 10th.

Spokane Falls, Washington Territory, 20th.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England.—3d, 5th, 7th, 8th, 10th, 14th, 15th, 19th.

Middle Atlantic states.—3d, 5th, 6th, 7th, 10th, 13th, 15th, 16th.

South Atlantic states.—2d, 4th to 8th, 12th.

Florida peninsula.—1st, 6th.

Eastern Gulf states.—7th, 8th, 10th.

Western Gulf states.—1st, 2d, 4th, 15th, 24th.

Rio Grande valley.—5th, 6th, 9th, 19th.

Tennessee.—4th, 5th, 15th, 16th, 22d.

Ohio valley.—1st to 4th, 16th, 19th, 23d, 25th.

Lower lake region.—7th, 10th.

Upper lake region.—2d, 5th, 6th, 7th, 9th, 10th.

Extreme northwest.—5th, 6th, 7th, 9th, 10th, 11th, 14th.

Upper Mississippi valley.—2d, 4th, 5th, 9th, 13th, 20th.

Missouri valley.—1st, 2d, 3d, 6th, 9th, 11th, 12th, 22d.

Northern slope.—1st, 5th, 6th, 8th, 9th.

Middle slope.—2d, 4th, 6th, 9th, 15th, 16th, 18th.

Southern slope.—4th, 8th, 10th.

Middle plateau.—5th, 8th, 12th, 13th.

Northern plateau.—5th, 9th, 10th.

Middle Pacific coast region.—2d, 3d, 4th, 6th, 9th, 10th, 13th.

Lunar halos were also observed at the following stations not included in the districts named above:

Prescott, Arizona, 9th.

Olympia, Washington Territory, 16th.

Port Angeles, Washington Territory, 7th.

MIRAGE.

Fort Magiunis, Montana.—During the afternoon of the 15th

many points along the Yellowstone river in the southwest, and not ordinarily visible, were plainly seen. On the 17th, during the afternoon, the whole southern and eastern portions of the country appeared to be elevated above their natural positions.

Mirage was also observed at the following places during the month:

College City, California, 9th, 12th.

Vermillion, Dakota, 9th, 24th.

Alexandria, Dakota, 9th, 24th, 28th.

Saint George's, Delaware, 19th.

Larehland, Illinois, 2d, 14th.

Pretty Prairie, Kansas, 1st, 2d.

Genoa, Nebraska, 9th, 13th, 14th.

Indianola, Texas, 15th, 17th, 25th, 28th.

MISCELLANEOUS PHENOMENA.

The peculiar appearance of the sky at sunrise and sunset, which has been observed for several months past, continued, but with diminished brilliancy, during February. The reports for February are much less numerous than those received during the previous months, and show that the phenomenon is becoming less noticeable, although, in some instances, the displays were reported to have been very brilliant.

The phenomenon was observed in the several states and territories, as follows:

Alabama.—Green Springs, 5th, at sunrise; 21st, at sunset. Auburn, on all clear days of the month.

Arkansas.—Fayetteville, 24th, at sunset.

California.—Hydesville, 3d, 7th, 9th, 13th, 20th, 22d to 27th, at sunrise, and on 2d, 7th, 12th, 12th, 20th, 22d to 28th, at sunset. Point Lobos, 25th, 26th, 27th, at sunset. Cape Mendocino, 23d, 25th, 26th, at sunset.

Colorado.—Golden, 28th, at sunset. On the summit of Pike's Peak on 22d, a dim, red light resembling the sunset glow, appeared in the southwest at 6.30 p. m., and continued for thirty minutes.

Dakota.—Alexandria, 1st, 8th, at sunset, and 9th, 14th, 15th, at sunrise. Vermillion, the sunset after-glow steadily diminished in brilliancy during the month. The observer at Webster reports that the sunsets during February were more noticeable than any previously observed; they were noted on the 1st, 6th to 9th, 19th, 20th, 22d, 24th; those of 6th and 20th, being remarkably brilliant; on the 9th the sky at sunrise was of the same appearance.

Florida.—Archer, 21st at sunrise, and 22d, 23d, and 27th at sunset. Limona, 24th, 29th, sunrise, and 23d at sunset. Newport, 1st, 2d, 4th, 5th, 20th, 21st, 22d, 25th, both before sunrise and after sunset. Jacksonville, 23d, very brilliant both after sunset and before sunrise.

Georgia.—Andersonville, 27th at sunset.

Idaho.—Boisé City, the remarkable redness in the western sky after sunset continued during February.

Illinois.—Cairo, 19th at sunset. Swanwick, bright sunrises and sunsets continued during February.

Indiana.—Vevay, 1st, 2d, 3d, 19th, 29th at sunrise. Sunman, 19th, 21st at sunrise and 20th at sunset.

Iowa.—Muscatine, 2d, 14th, 20th at sunset, and 20th, 21st at sunrise. Cedar Rapids, 14th at sunrise.

Kansas.—Wellington, red sunsets were observed on all clear days of the month, but were not so brilliant as those seen during the previous months. Fort Scott, the red sunsets of February were not so brilliant as those of January.

Maine.—Cornish, 15th, at sunset.

Maryland.—Baltimore, 2d, at sunset.

Massachusetts.—Taunton, 15th, at sunset, very brilliant.

Nebraska.—Clear Creek, 1st, 2d, 7th, 8th, 12th, 13th, 19th, 20th, 22d, at sunset. Red Willow, 27th, 28th, at sunrise.

Nevada.—Carson City, 29th, the red sunsets still continue.

New Hampshire.—Summit of Mount Washington, 10th, 15th, 16th, at sunset, and the 16th at sunrise.

New York.—North Volney, 21st, at sunrise.