

stopping occasionally and covering the lantern while he looked over his shoulder to gain some idea of the position of Blackbarrow above them, which it was necessary to keep directly behind their backs to preserve a proper course.

"You are sure the rain does not fall upon baby?"

"Quite sure. May I ask how old he is, ma'am?"

"He!" said Thomasin, reproachfully. "Any body can see better than that in a moment. She is nearly two months old. How far is it now to the inn?"

"A little over a quarter of a mile."

"Will you walk a little faster?"

"I was afraid you could not keep up."

"I am very anxious to get there. Ah, there is a light from the window!"

"'Tis not from the window. That's a gig lamp, to the best of my belief."

"Oh!" said Thomasin, in despair. "I wish I had been there sooner. Give me the baby, Diggory—you can go back now."

"I must go all the way," said Venn. "There is a quag between us and that light, and you will walk into it up to your neck unless I take you round."

"But the light is at the inn, and there is no quag in front of that."

"No, the light is below the inn some hundred yards."

"Never mind," said Thomasin, hurriedly. "Go toward the light, and not toward the inn."

"Yes," answered Venn, swerving round in obedience; and, after a pause—"I wish you would tell me what this great trouble is. I think you have proved that I can be trusted."

"There are some things that can not be—can not be told to—" And then her heart rose into her throat, and she could say no more.

## THE MARINERS' "CAUTIONARY SIGNAL."

GENERAL readers have very little knowledge as to the system of cautionary signals displayed at various parts of the Atlantic and lake coasts to warn shippers and skippers of approaching storms.

The "cherub who sits up aloft" is General A. J. Myer, with assistants Captain H. W. Howgate, Lieutenant Robert Craig, Lieutenant H. H. C. Dunwoody, and Lieutenant C. E. Kilbourne. It is just as well to know who are "taking care of the life of poor Jack."

It is not designed to give in this paper a full account of the system or instruments of the office, nor to enter into the scientific, agricultural, or marine aspects of the work, further than to explain in a few words the distribution of the signal stations and the mode of signaling. A total of 145 stations

was maintained in 1876, including those from which reports are deemed necessary and those at which other action is required, to enable warnings to be given of the approach and force of storms and of meteoric changes, for the benefit of commercial and agricultural interests. The average yearly cost of a station, exclusive of the pay and maintenance of the enlisted men on duty at each, is \$424 03. The average force at each station is 1.4 men.

The duties of the men at each station forwarding telegraphic reports are to put in cipher and transmit tri-daily the results of observations, embracing the readings of the barometer, thermometer, the wind velocity and direction, the rain gauge, the relative humidity, the character, quantity, and movement of upper and lower clouds, and the condition of the weather. The same moment of absolute time is adopted at all the stations for these observations, so that they occur at various local times at the stations. Each observation is recorded at its own station. Three other observations are taken at the local times 7 A.M., 2 P.M., and 9 P.M., and recorded at the station. A seventh and special observation is taken at noon each day.

At the cautionary signal stations an observer is constantly on duty to show a signal which may be ordered at any moment.

At stations from which river reports are furnished, an observation of the depth and temperature of the water is made and reported at 3 P.M., local time, each day.

In case of threatening storms or dangerous freshets, any station may be called upon to make hourly reports.

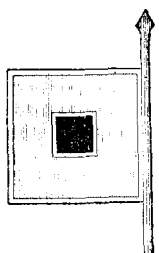
The data thus gathered at a station are consolidated first in weekly and then in monthly reports, and transmitted to the central office in Washington, where they are collated, elaborated, and made of practical value. At this office are also concentrated reports from 626 places at which voluntary observations are taken on this continent, and from 272 places where simultaneous reports are had in foreign countries. From this great mass of data are continually elaborated the results which appear in the different issues and publications of the office, the daily forecasts telegraphed to the press throughout the country, orders for display of cautionary signals on the coast line, the charts, and the weekly and monthly publications.

The work of the office is steadily increasing in accuracy, and the percentage of verifications of forecasts had risen from 76.8 in 1872 to 88.3 in 1876. It is believed that an average of 90 per cent. of accuracy is attainable. During the year 1876, 1577 cautionary signals were ordered, counting each separate display at each port a separate signal, in anticipation of seventy dangerous

storms. Of the total number of signals thus displayed, 77.3 per cent. were afterward reported as justified by the occurrence of winds having a velocity of twenty-five miles per hour. In the cases reported as failures of justification the winds did not attain the prescribed degree of violence. It is difficult to determine beforehand the exact rate which the wind may have at a given point in advance of its then position, and the office has to carefully steer its way between the considerations of loss occasioned by delay of shipping, owing to warnings unnecessarily given, and the far more serious matter of damage inflicted by winds unannounced.

The cautionary signals for shipping are upon the coast, sea-board, or lake, and in view of the mariner. Each is under the charge of a sergeant and assistant, whose duty may be described as pickets of warning on the fringe of the country. The observations from the observing stations having converged upon Washington, and the general and special predications arrived at, the announcements radiate from the central office—the brain—along the wires, or nerves, to the remotest digits upon the signal hal-yards.

When, as is sometimes the case, the signal station is placed in the Life-saving Service station, a farther advantage is gained, as the two work well together, and the Life-saving Service has the benefit of the wires of the sister enterprise.



CAUTIONARY SIGNAL FLAG.

The cautionary signal of the United States Signal Service is a square red flag with a black square in the centre by day; a red light is used by night. The flags are of two sizes—15×15 feet and 8×8 feet, the

black square being one-ninth of the area of the flag. The larger flag is used for important stations, about ten in number, and the smaller flag for the other stations.

The stations on the Atlantic are from Maine to Texas, and on the lakes from Oswego to Duluth. The number of stations on the Atlantic proper is twenty-four, counting Key West; and on the Gulf of Mexico, six, omitting Key West, already enumerated. The lakes have fifteen stations. Warning notices are also sent by telegraph to the Canadian meteorological service when any disturbance occurs which is likely to affect them, and is distributed to the points interested.

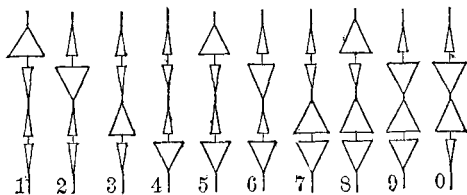
The purport of the signal is this: "A wind having a velocity of twenty-five miles an hour may shortly be expected at this place."

That is all that the flag professes to say;

the probable excess over twenty-five miles an hour, and the direction of the wind, are not given by the flag. The time may shortly arrive when, by an extension of the system, the additional data, such as "severe storm expected," may be embodied in the signal; but at present the notice is just what it is called and professes to be—"cautionary." It is then the duty of the mariner, shipper, or whoever else is interested, to consult the weather report for farther information, and to make frequent examinations of local barometers and other instruments, and study the local signs of the weather.

When the time shall arrive that the Signal Service shall have sufficient confidence in its data to make more detailed display of warning, affording more explicit notice of the expected disturbance, the signals will have a more elaborate reading. The authorities will then determine upon a method and code, and perhaps may find it desirable to use objects which are not subject to change of apparent shape according to the position from which they are viewed. One or two modes have been adopted in Europe, and may be noticed.

Redl's system of cones for telegraphy was particularly designed to construct the individual portions which were associated to form a signal so that they could be read wherever they could be seen; not liable, like a flag, to be blown toward or away from the observer, so as to be illegible to him, nor liable in a calm to hang down the mast, and be therefore useless. Redl's system consists of four cones attached to a mast, and normally in a collapsed state. Either may be spread, umbrella fashion, by pulling on a cord, and the group shows the mode of indication of the numerals from 1 to 0. A cone of three feet base is ordinarily visible in daylight at five miles' distance, and the code may be used by means of black and white flags in the absence of cones.



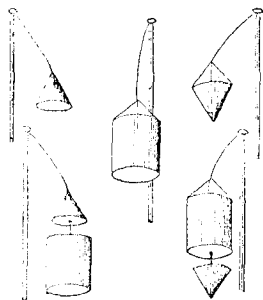
REDL'S CONE SYSTEM.

The number indicated by a series of successive displays is referred to in a code book of some 60,000 possible messages.

Admiral Fitzroy's (English) storm signal consists of a hollow cylinder and cone, either of which, or both simultaneously, may be suspended from a mast or staff so as to be visible to ships in port or in a roadstead. Their positions and grouping denote the

probable direction of the wind in an approaching storm. Thus: cone point upward to the right of the staff—northerly gale; cone point downward to the left of the staff—southerly gale; cylinder above—expect dangerous winds from both quarters successively; upright cone above cylinder—dangerous wind expected from the north; reversed cone below cylinder—dangerous wind expected from the south; and so on.

It took some time to inspire the British sailor with confidence in the storm signals of Admiral Fitzroy, but in 1864 it was found



ADMIRAL FITZROY'S SIGNALS.

in England that 50 per cent. of the storm warnings had proved correct, and in 1865 that 73 per cent. had been verified. In France, during the year 1865, seventy-one warnings were realized, and seventy-six in the following year; 89 per cent. of the storms which occurred were signaled in the first winter, and 94 per cent. during the second. The North German *Seearte* mentions that out of the storm warnings hoisted at Hamburg in a given period 94 per cent. were correct. The forecasts of the weather are derived in Europe more largely than in the United States from local observations, and less relatively from observed movements at distant points. The extent of territory of the United States is peculiarly favorable in allowing the movements of a storm to be traced from point to point, and to be anticipated in regions to which it is trending. The United States mariner has not alone the benefit of observations and deductions from local instruments, but also of predictions from the head-quarters of the government service, derived from the tri-daily reports of all the atmospheric conditions at widely separated points of observation, taken at the same instant of absolute time—observatory time at Washington. As a storm from the Gulf or the Northwest drifts into the area of observation, its course, force, and extent are obtained from collation of the data from various points, and the time of its arrival at any point within its sweep is fore-announced with substantial accuracy.

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## HELEN.

MISS LAURESTON was standing at her study window in brown-study. She was an elderly lady of some forty years, with handsome, severe features, and a figure so straight that it seemed never to have unbent since the days of babyhood. The room, with its sombre tints, was handsome and dignified like its owner, its floor soft with dark Smyrna carpets, and its walls imposing with row upon row of soberly bound volumes. The distant fire-light executed a sort of witches' dance over the dark foreground and the motionless figure at the window. It was Christmas night through the world, and a robin's snow was falling softly outside.

Miss Laureston watched the snow-flakes dropping silently into the circle of faint light, until the gathering darkness changed the glass to a mirror which showed her nothing but a tall ghostly form answering to her own. She looked at this form curiously at first, and then uneasily. Even as it stood between her and the outer world, and set before her eyes the room that lay behind her, so it seemed to stand between her and the onward-coming life, and to set before her thoughts the life that lay behind her.

It was a large, lonely house she lived in, with no friends, no guests, no Christmas cheer. She remembered another house, many miles away, that used to be lighted from top to bottom when Christmas came round. And on dark winter nights the glass used to throw back another figure beside her own—a delicate girlish figure that was sometimes laughing, sometimes crying, sometimes merry, sometimes reproachful, but in all its myriad moods never other than loving and innocent—the figure of her young sister. And in all the world no stranger was less likely to know of its present abiding-place than she herself this Christmas night.

Camilla—Milly—Milly Laureston. The name was in her thoughts oftener to-night than it had been on her lips for twelve long years. One picture came back very brightly: the old homestead, with its quaint sloping roof, from whose highest window one could see the spire of the village church, and hear the noon bell when the day was still. It was on one of those still days that she had taken the little one from the arms that folded it so quietly, and carried it to her own room, knowing that she at ten and Milly at two were both alone in the world.

Alone, except for an old uncle, who, hearing of his sister-in-law's death, came back to settle himself at the homestead, and to give to the two children a care more affectionate than wise during the few remaining years of his life.