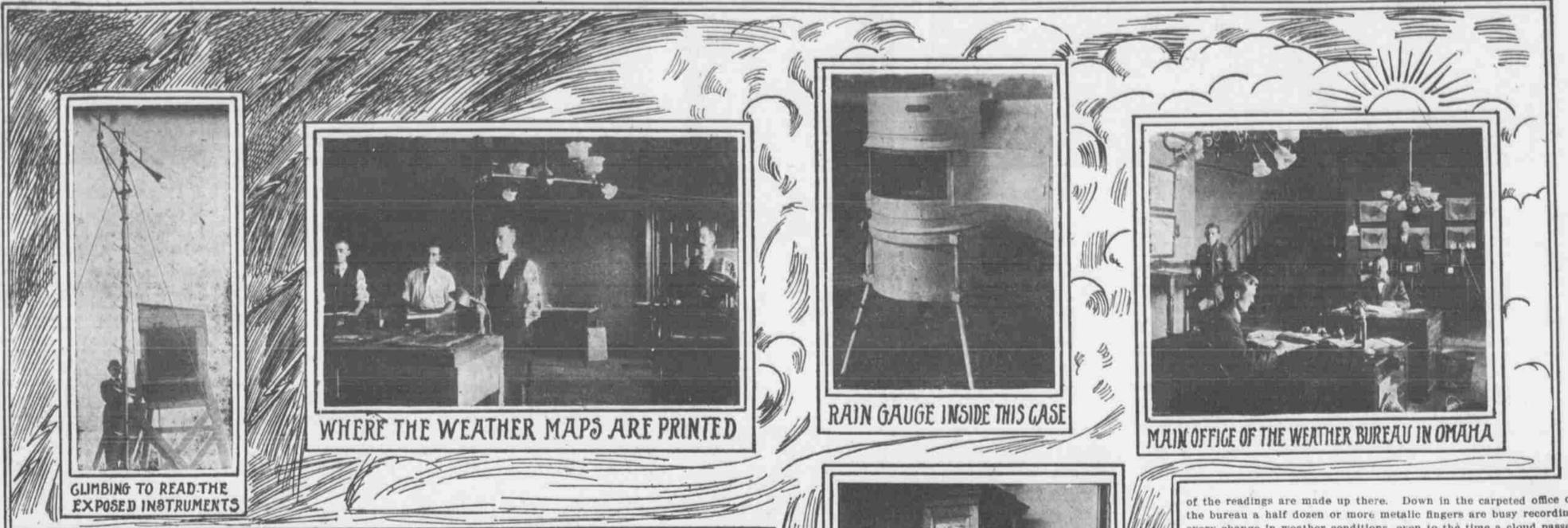


SOURCE OF WEATHER SUPPLY FOR OMAHA AND VICINITY

Workshop of Wizard Welsh and His Corps of Lieutenants, Who Stand On the Watch Tower and Cry Out Meteorological Conditions to the People.



CLIMBING TO READ THE EXPOSED INSTRUMENTS

WHERE THE WEATHER MAPS ARE PRINTED

RAIN GAUGE INSIDE THIS CASE

MAIN OFFICE OF THE WEATHER BUREAU IN OMAHA

FORECASTER WELSH AT HIS DESK

FOR OMAHA, Council Bluffs and Vicinity.

How many people have read this little legend with the subjoined promise of "Fair tonight and Tuesday," or the disconcerting warning, "probably rain or snow; much colder," without stopping to think how much governmental and scientific machinery has been kept ceaselessly in motion in order that the promise or warning might accurately be given or what manner of men the government has selected in order that the human element in the making of the forecasts might be the highest order. Probably no other public official comes so closely and so frequently in contact with the great mass of the people as does the weather forecaster. The farmer scans the paper to see whether to cut his wheat the next day or not. The city man consults him before taking an automobile ride far out into the country. The fruit merchant watches closely for cold wave signals, the mariner for coast storm warnings, the resident of the river valley looks carefully at the stage of the river in early spring when freshets are liable to occur. The grain speculator eagerly devours reports of the weather in the grain belt and just as feverishly scans the prediction for the future. The average man reads the daily forecast either as a matter of general news or for the satisfaction of having an expert opinion on the desirability of taking an umbrella to the office.

Social events halt, business deals go forward or stand still, grain prices go up or down, all on the word of the weather forecaster. Inasmuch as he is such an important part of the social and industrial organization, it is of interest for Omaha people to know something of the personality of the man who for nearly thirty-seven years has been keeping his weather eye out for the benefit of the public and for eighteen years has been in Omaha on the weather frontier, as it were, Colonel L. A. Welsh long ago became an integral part of Omaha, and his husky physique and vigorous step evidence a vitality that promises to keep him here many a year longer. Entering the service when it was but three years old, he has lived to become one of the four or five "oldest" men for continuous connection with the work and is still in the full vigor of life.

It is not mere chance that the chief of the weather bureau has stationed in Omaha one of his oldest veterans. Omaha is something more than a point on the weather map. It is, as has been said, an important station on the weather frontier of the United States. It is the gateway eastward for "lows" and "highs" just as it is the gateway for merchandise and farm machinery.

Glimpse of Map Shows

A glimpse at the map will disclose why this is so. Storms or other weather disturbances move always in the general direction of west to east. As a matter of fact, in the west they come either from the southwest, directly west or northwest. While all of the areas of disturbance do not pass directly over Omaha, there are few of them which do not exert some perceptible influence here on their journey to the east. The southwestern "lows" usually come far enough north to give us a touch of weather, while the northwestern disturbances usually dip down enough to nip us more or less severely. Cities directly west of us usually escape the northwestern and southwestern storms, while those in the southwest or northwest are subject to "lows" from the opposite sections to a less extent than the centrally located city of Omaha.

Hence Omaha is both an important weather center and one for which it is somewhat difficult to make predictions with the same assurance that they can be made in other sections of the country.

Then there is another reason for Omaha's importance on the weather map. The west, the great plains and the mountains, has more or less justly acquired the reputation of being the breeding place of much of the weather which is turned loose in the more easterly states. The "lows" which perambulate across the continent are to a great extent only in their incubating stage until they strike the region this side of the mountains. They are not thoroughly developed until they get well along in the Missouri valley. The eastern prognosticator has the advantage of dealing with a well defined disturbance by the time it reaches his territory.

Colonel Welsh, the veteran who has been on the firing line in Omaha for, these many years, was born in Union county, Ohio. He successfully sidesteps all inquiries as to the date of his entrance into this vale of highs and lows, but the real curious may be able to figure out about the time from the fact that he was habes corpused out of the army during the early part of the civil war, but in 1864 ran away a second time and joined the One Hundred and Thirty-sixth Ohio, having in the meantime passed the last milestone into the mystic country into which the habes corpus had no terrors for young would-be soldiers. Practically his whole life has been spent in one or another department of public service.

Yearn for Official Home

It is a tradition in his family that when he was 5 years old, his father having decided to move to town, the future weather forecaster sat down upon an upturned bucket and wept because he was not going to live in the court house, that being the largest building in sight. As soon as he was old enough he sought the public service and has been in it ever since with the exception of a few years immediately following the war.

At the close of the war the young soldier went back to the school he had deserted to take up arms and for four years gave himself up to study. He joined the great army of country school teachers for three winters and finally went into the produce commission business with his brother-in-law. Then he went to Indianapolis, where he secured a position traveling with a commission firm. His business took him frequently to New York City and it was while there he became interested in the signal service, the weather branch of which had been organized three years before. He took the examination

and reported for instruction at Fort Myer, across the river from Washington.

It was August 1, 1873, that young Welsh first became attached to the weather service of the government. And those early years were full of ups and downs, not only for the service itself, but also for the young pioneers in the work. At that time salaries were meager and members of the service were inclined to go into private enterprises to help eke out a living. To prevent their becoming too much engrossed in the business affairs of any one community a rule was established that no member of the corps should be stationed at one place more than two years. Consequently life was full of changes both of scene and environment for the boys. Service in the signal corps furnished an easy means of seeing the country, but a decidedly poor chance of ever becoming permanently established in a community.

Mr. Welsh's first assignment was to Milwaukee, where he remained two years. Then he was ordered back to Washington for further instruction and preparation in the science of the work and in July, 1875, took charge of the station at Pittsburg. The next few years he put in at various stations, among them Springfield, Mass.; Escanaba, Mich.; Champaign, Ill.; Keokuk, Ia.; Shreveport, La.; St. Louis and Leavenworth. While he was stationed at Leavenworth, in 1888, he was ordered to Kansas City to open up a station there. The same year he came to Omaha. He remained here until 1891, when he went back to Leavenworth, eventually closing up the office and returning to Omaha in 1893. For these sixteen years he has been here, finding time between forecasts to mingle with the active men of the city until, aided by an affable and approachable manner and a strong and striking physique, he has become one of the widest known of Omaha's public citizens.

Four Men With Him

Under Colonel Welsh in the Omaha office are four other men, experts in their respective lines, who assist in making and recording the observations and distributing the results to the public. They are M. V. Robins, observer and first assistant; Arthur Thorsen, assistant observer; C. A. Aikin, printer, and Lytle E. High, messenger.

Mr. Robins has been in Omaha since June, 1902, coming here from Huron, S. D., where he entered the service as messenger. He has also been "on the job" in New Orleans and Kansas City. Mr. Aikin is from Missouri and has been in the service about a year. Mr. Thorsen is from Northwood, Ia., and has been here since June. Mr. High is an Omaha boy and has been with the bureau a little more than a year.

Omaha as a point for weather observations is one of the oldest on the map. The service was organized in 1870 and the records in the Omaha office show observations were made here in November of that year. At first a part of the military service the early years of the life of the new department were of slow progress because of the hampering effect of the stiff military organization. The weather observers were organized into a little army themselves attached to the signal corps and under charge of a military officer. The policy of the department, as has been stated before, was to jump men from one place to another with military precision, and hence there was little permanency of residence and good men were slow to enter. Now, by the way, the policy of the department has changed entirely and an attaché of the weather department is practically sure of a permanent berth as long as his services are satisfactory. Under this broader policy hundreds of men belonging to the service become home owners and permanent members of society in the community in which they are stationed.

The military incubus was thrown off by the department in 1891 under a law passed and approved the year previous. Since then the work has been on a more scientific basis. Mark W. Harrington was the first chief under the new order of things and he remained at the head until 1896, when he was removed by President Cleveland at the request of J. Sterling Morton, then secretary of agriculture. Prof. Willis S. Moore, at that time a local forecaster in Chicago and an expert of wide experience, was placed at the head.

Prof. Moore has raised the standards of the department since his elevation to the chiefship.

Complimented by Chief

"He has conducted the work of the office in a very able manner" is the opinion of Colonel Welsh, "and it has made great advances since he took charge of it. The benefits of the service to the public have increased a hundredfold since the transfer of the department to the Agricultural department and most of the advance has been since Prof. Moore took charge."

The work of the weather bureau is diverse and many-sided in its nature. The daily forecasts, of course, are most often seen by the public and mean most to the average man. The dissemination of warnings as to sudden and severe changes in weather conditions, such as cold waves, storms, hurricanes, heavy rains and snows and frosts, is another feature of the work which brings it in close touch with the readers of the daily newspapers. But few people probably understand the importance to commerce and industry of these activities of the weather force. It is known that hurricane warnings on the Atlantic coast have detained in port over \$30,000,000 worth of traffic. Advance announcements of a single cold wave have been known to save over \$3,500,000 in the protection of property which otherwise would have been exposed.

Frost warnings have become almost invaluable to the fruit industry of California, Florida, Colorado and the north Pacific coast, where fruit raisers have large sums invested in tents, screens and smudge apparatus for the protection of their crops. These are put into use on receipt of news from the department that a cold wave or a frost is due and thus entire crops may be saved. It has been determined

on investigation that the value of the orange bloom, vegetables and strawberries saved by this means in a single night in a limited district in Florida was over \$100,000.

The prediction of floods on rivers is also an important part of the work of the department with which the main body of the public is not as familiar as it is with the weather forecasts.

The department was instrumental in saving \$15,000,000 worth of property by forestalling the rise of the lower Mississippi one year long enough in advance to enable the residents of the lowlands to remove their property.

From three weeks to four days in advance warnings were issued before the big floods of 1903 in the Mississippi valley, and so accurate were the data secured by the department and the deductions made from them that the predictions of the department did not vary more than four-tenths of a foot from the actual conditions recorded. The average difference was about two-tenths of a foot.

Besides these warnings issued from day to day thousands of people make use of the collective data of the department to determine probable crop conditions, the desirability of certain parts of the country for various industries, the probable strains to which big buildings will be subjected owing to expansion and contraction, heat and cold and the wind.

Wireless a New Adjunct

The wireless has lately come to be an important adjunct of the weather bureau, especially to those stations lying on the Atlantic and gulf coasts. Boats far out in the ocean can sometimes give warnings to the coast stations, which are then disseminated to other vessels. More often, however, the situation is reversed and the coast stations by means of the wireless notify vessels of the approach of storms.

There is a lot of complicated instrument reading and nice calculating to be done before the local weather forecaster is ready to announce the probabilities for the next day. In the first place, in addition to the statistics of the local conditions, each office receives reports from many stations located all over the country. The Omaha office, for instance, gets about 100 reports each day telegraphed in by a code which is not used for secrecy, but to cut down telegraph tolls. These reports give the temperature, the wind velocity, the air pressure and the cloud conditions at 7 o'clock, Omaha time, in cities scattered all over the country from the Canadian northwest to Northfield, Vt. Colonel Welsh takes the figures and evolves from them certain lines and curves which he puts on the weather map. This when completed gives him a bird's-eye view, as it were, of the weather at the time the observations were taken. He draws isobars and isotherms, mystic circles and evil-looking arrows pointed in all directions.

As a matter of fact a few minutes' explanation by Colonel Welsh clears up all the cloudiness in the mind of an inquirer and makes these seemingly mystic symbols as familiar as the first three letters of the alphabet.

The isobars or continuous lines pass through those places which have equal air pressure. The isotherms or dotted lines on the map pass through those points having equal temperatures. The circles with the white interiors mean clear weather at the points they designate. Those half white and half black indicate partly cloudy and those entirely black show "cloudy." The arrows point in the direction the wind is blowing at the time of observation.

High and Dry

Here and there on the map appear the words "high" and "low." These designate the points of high and low air pressure, and it should further be explained that the "lows" are to be blamed for the disturbances in the weather such as storms, high winds, rains and snows. After the large map showing all these things is made up a smaller one is reproduced from it and turned over to the printer, who makes up the forms for the familiar map we see on every corner.

The weather recording instruments, as is well known, are located in a covered platform on the roof of the Federal building, but few

of the readings are made up there. Down in the carpeted office of the bureau a half dozen or more metallic fingers are busy recording every change in weather conditions, even to the time a cloud passes over the face of the sun and how long it takes it to pass. These machines work ceaselessly and every twenty-four hours the lined and ruled papers on which they are graphically telling their story are removed from the rolls and fled away for future use.

When a 7 o'clock reading time comes around the first thing that is done is to read the mercurial barometer to determine the pressure or weight of the atmosphere. This barometer is as big and in outward appearance not altogether unlike a grandfather's clock. The exact reading of the barometer itself does not satisfy the weather sharp. The temperature itself slightly affects the condition of the mercury and that initial reading is corrected by a reading of the thermometer. Then, to make assurance doubly sure, this corrected reading is compared with a tracing on an aneroid or barograph which automatically and continuously leaves on a scroll of paper the state of a barometer up on the roof.

Now, this automatic recorder of weather conditions is a strange and wonderful affair, a scientific description of which would only lead to mental confusion outside of a weather bureau office. But one can give an untechnical account of its appearance and what it does.

Called a Triple Register

It is called a triple register, or rain, wind and sunshine recorder. One part of it is a clock connected electrically with wires running from it to the weather recording instruments on the roof on one side; on the other with a cylinder scroll. That clock, by the way, is always kept covered by a dust proof casing. The cylinder scroll is crossed from side to side with light lines and the cylinder revolves at a speed which causes the lines to progress in the revolution the distance of the space between the lines in exactly five minutes of time. Daintily poised over this cylinder are a number of metal fingers holding pens in their tips, and the movement of each pen is determined by the movement of the recording instruments on the roof; the fingers translate, so to speak, into pen lines what those instruments on the roof electrically say to the clock. Now, for instance, the rain gauge on the roof connected with the clock—there are others—is the type known as the tipping bucket.

This is a little metal trough divided crosswise by a thin partition of metal. The trough is evenly balanced, see-sawwise, and the end of the trough pointing upward receives any rainfall. Then when one one-hundredth of an inch of rain has fallen that end of the bucket tips down and the other end tips up to receive the next allotment of rain.

The tipping motion makes or breaks an electrical connection which makes its little remark electrically to the clock, and the clock faithfully confides the state of the rainfall to the little finger over the scroll devoted to such information, and a mark is made on the scroll which, to even the layman, says in the five minutes between 8:15 and 8:20 one one-hundredth, or several one-hundredths, as many as the case may be, inches of rain fell.

The whirling half cups at the very tip of the tower on top of the weather bureau building carry on a continuous conversation with that clock attached to the register. Whirl they fast or whirl they slow, the rate of whirling is denoted every minute of the twenty-four hours by the wire running to the clock, and as the minute hand goes round a little cam goes around with it and upsets something which breaks or makes an electrical connection, imparting the momentum of the half balls to the little finger resting over the scroll tirelessly recording the wind velocity.

Now as to the roof source of gossip concerning sunshine and clouds, take it from the reporter that a comprehensible description of it for the lay mind is outside of the uses of the English language. Still it is pleasing to know what the whimsical little thing looks like.

Minutia of Mechanism

In the first place, there is a cylinder of glass enclosing another cylinder of glass. One end of this enclosed cylinder is blackened, and it has a mercury tube inside of it. This enclosed cylinder has a constricted waist into which enter a couple of tips of wire, as the wires which make incandescent lights enter the bulb.

Now if the sun shines something in the physical nature of the light of the sun causes it to affect the mercury in the tube of the darkened end of the instrument in such a way as to advance the mercury up to the tips of the electrified wires, and thus the curious little instrument imparts to the register by means of the clock the interesting information that the sun shines. If a cloud obscures the sun the undarkened end of the instrument has its turn in the weather gossip and gets into conversation with the clock, which tells the story to that particular little pen finger daintily resting over the scroll, and the equally interesting fact that the weather is cloudy is accurately noted, with the time of day also indicated.

To go back to the roof. Another instrument up there records the rainfall by weight, and weighs so delicately that the readers are thereby informed of each one one-thousandth inch of precipitation. Then as to temperature and humidity, there is a psychrometer, an apparatus on which is mounted two thermometers of the familiar type. They are alike except that the bulb of one is wrapped about with muslin.

These twin thermometers are mounted on an apparatus which permits of their being rapidly revolved, like the arms of a patent egg beater. The uses of the instrument are, by wet and dry reading, as it is called, first to determine the degree of temperature as it affects us mortals and then how it would affect us minus the prevalent humidity. After the ordinary reading the muslin-covered bulb is moistened. Then you turn a crank and the thermometers whirl about. The moistened rag surrounding the bulb is affected as one's perspiring face is by a fan, and then it is read again. The second reading tells you how you would feel if there was no moisture in the air. If there was no moisture we could play golf or dig ditches in a temperature of 100 without danger of heat prostration.