AIR MASS ANALYSIS

A graphical means of identifying air masses

by

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Signatures of Authors

Professor in Charge of Research ....

May 15, 1930.

Professor A. L. Merrill
Secretary of the Faculty
Massachusetts Institute of Technology
Cambridge, Massachusetts.

Dear Sir:

Submitted herewith, in partial fulfillment of the requirement for the degree of Master of Science, is a thesis: Air Mass Analysis,- a graphical means of identifying air masses.

Very truly yours,

ACKNOWLEDGEMENT

The authors take this opportunity to express their appreciation to the United States Weather Bureau and to Lieutenant D.R.Eldridge, U.S.Navy, for the loan of certain data which made this investigation possible, and to Prof. C.-G. Rossby for his guidance in the preparation of this paper.

During recent years marked progress has been made in the science of meteorology. Important investigations have been carried out and sound theories have been advanced. One of the most practical results of this progress has been the developement of a comprehensive method of analyzing the various air masses[1] which are indicated on the synoptic map. Such an analysis serves to give the forecaster a more definite basis for the formulation of his forecast than if he arrived at his decision solely from a knowledge of how similar conditions had developed in the past. Any air mass analysis precludes identification of the air masses involved, and that is the problem with which we are concerned in this paper. We shall attempt to demonstrate a more positive identification than that which may be indicated on the synoptic map.

The weather at any place will depend largely on the characteristics of the air mass(or air masses) which happen to be over that place at the time in question. An air mass acquires certain characteristics by virtue of having remained over a certain region of the earth for definite length of time. For example, air that remained over the snow and ice covered polar continental regions would become cold, dry and very stable. Likewise, air that had remained in other regions would acquire other

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[1]An "air mass" is defined here as an extensive body of air which is horizontally homogeneous.

definite characteristics. The latest theories[2] state that the various disturbances which we are able to observe, originate for the most part, along a boundary between two air masses of different characteristics. In other words, these various disturbances which constitute our daily weather are caused by the interaction between two different air masses. Furthermore, the occurrence and maintainance of this interaction will depend largely on the contrast between the characteristics of the adjacent air masses.
It is therefore apparent that if we are able to recognize the source (or region from which an air mass acquires its characteristics) of an air mass, or if in some way we are able to identify the characteristics themselves, then we will have a valuable clue as to the type of weather we may expect at the stations which are likely to come under its influence. Such identification of the characteristics can best be made by observation of the properties of the air mass concerned. Furthermore since these properties are changed as the air mass moves away from its source,- some to a greater degree than others,- the main part of our problem will be the selection of those which are most conservative. A thorough discussion of the conservativeness of various properties is given in " Die dreidimensional verknupfende Wetteranalyse", by T.Bergeron.

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[2]Bjerknes and Solberg,-"Life history of cyclones and the polar front theory"

In examining the properties of an air mass for the purpose of determining their relative value for identification purposes, it is only natural that we first consider those which are measured directly, namely,- pressure, temperature and relative humidity. A glance at the equation of state, $p = \rho \frac{R}{m} T$, reveals immediately the inter-dependence of pressure, temperature and density. A change in any one of the three must be accompanied by a change in at least one of the others. Pressure changes may be caused by a change in elevation or by the motion of the air mass itself. These pressure changes will be accompanied by changes in either temperature or density or both. Furthermore, since for a given moisture content, the relative humidity varies with the temperature, this property may also be affected. Then too, the absolute humidity varies with changes in either temperature or pressure. Consequently, these properties may be classed as non-conservative ones and are of only limited value in the identification of an air mass.

Next, let us consider the vertical temperature lapse rate, condensation forms and visibility conditions. In the lower layers of the atmosphere the lapse rate is almost constantly changing. At higher altitudes it is more conservative, but even there it is not suitable for positive identification. This is evident if we remember that the temperatures from which the lapse rate is computed may only be associated with the definite air particle which happened to be at that particular elevation at the time of observation. We have no assurance that the particles will remain at their respective elevations or retain these observed values of temperature for any length of time. Since the condensation forms depend on the lapse rate and the moisture content, we may regard them as being conservative to the same extent as these two properties. It should be mentioned, however, that in some regions the condensation forms give an excellent indication of the source of an air mass. This is illustrated in a striking manner on the western coast of Norway. Polar maritime air, having been heated from below in crossing the North Atlantic, is almost invariably characterized by convective type clouds, while on the other hand, the tropical maritime air which reaches this coast has been cooled from below and is characterized by strata-form clouds.

The visibility in any air mass will, of course, depend on the condensation forms and the solid impurities. Obviously, it can be no more conservative than the condensation forms. It should be mentioned here, that the phenomenon of opalesence is quite often conservative for tropical air that originates in desert regions. It is most noticeable in the tropical air which passes northward over Europe from the Sahara.

We shall now consider the potential temperature. If by means of Poisson's equation, we take the observed temperature and pressure and calculate the temperature which will correspond to some previously accepted standard pressure, say 1000 millibars, then we have obtained the potential temperature. Since we know that all changes in the properties of an air particle which occur with constant entropy are adiabatic, and since Poisson's equation was derived on the assumption of constant entropy, we are able to show that all changes occuring with constant potential temperature are adiabatic. Taking Poisson's equation:

$$\frac{T}{\Theta} = \left(\frac{p}{P}\right)^{R/mc_p}$$

By logarithmic differentiation:

$$\frac{mc_p}{R}\left(\frac{dT}{T} - \frac{d\Theta}{\Theta}\right) = \frac{dp}{p}$$

and: $$c_p\frac{d\Theta}{\Theta} = c_p\frac{dT}{T} - \frac{R}{m}\frac{dp}{p}$$

but from the equation of state, $p = \rho\frac{R}{m}T$, and the first law of thermodynamics, $dQ = c_v dT + p dv$, we obtain:

$$dS = \frac{dQ}{T} = c_p\frac{dT}{T} - \frac{R}{m}\frac{dp}{p}$$

therefore: $$dS = c_p\frac{d\Theta}{\Theta}$$

and $$S = c_p \log\Theta + \text{constant.}$$

Where T = observed temperature, P = 1000 millibars, p = observed pressure; Θ = potential temperature; R = universal gas constant: m = molecular weight; c_v = specific heat at constant volume; c_p = specific heat at constant pressure; S = entropy.

From the above, it is evident that as long as we regard the process which an air particle undergoes as an adiabatic one, the potential temperature of the particle will remain constant. In other words, the potential temperature may be regarded as an invariant for adiabatic changes. A great many of the changes which occur in the free atmosphere are approximately adiabatic and therefore potential temperature has a certain definite value for identification purposes.

Consideration should now be given to the specific humidity. This property is defined as the mass of water vapor per unit mass of moist air and from the definition itself we see that it will vary only with the addition or subtraction of moisture from the element in question. Breifly then we may say that the specific humidity will remain constant in the absence of precipitation, turbulence[3] and at such a distance from the surface that it will not be affected by evaporation. Thus, we may regard this property as rather conservative and further state that it will become more so with increased altitude.

The formula for computing the specific humidity from the observed values of pressure, temperature and relative humidity is derived as follows:

By definition:

$$q = \frac{\gamma}{\rho_l + \gamma}$$

since: $\gamma = \frac{e\ m_w}{RT}$

$$\rho_l = \frac{p_l m_l}{RT}$$

therefore: $q = \frac{e m_w}{p_l m_l + e\ m_w}$

$$= \frac{e\ m_w}{(p - e) m_l + e\ m_w}$$

divide by m_l and insert $m_w/m_l = 5/8$

then $q = \frac{5e}{8p - 3e} = 0.623\ e/p = 0.623\ \frac{e_m}{p} \cdot f$

q = specific humidity
γ = density water vapor
ρ = " moist air
e_m = max. vapor pressure
e = vapor pressure
p = total pressure
p_l = pressure dry air
m_l = molecular weight dry air
m_w = molecular weight water
f = relative humidity

[3]Turbulence may transport moisture from layer to layer.

For the purpose of discussion in this paper we have multiplied the above formula by 1000 and have used grams of water vapor per kilogram of moist air, which we have called "Q".

At this point it might be well to consider both specific humidity plotted against elevation and potential temperature treated in the same manner as means of identifying an air mass. In the same way as was pointed out regarding the vertical temperature lapse rate, both of these are constructed from the observed properties at various elevations, each point corresponding to one particular air particle which happened to be at that particular elevation at the time of the observation. Here again we have no assurance that this arrangement of the particles will remain the same for any length of time. As an illustration of this point, figure 1 shows potential temperature-altitude curves plotted from kite observations at Ellendale, N.D., Broken Arrow, Okla., and Royal Center, Indiana on the days indicated. Figure 2 shows the specific humidity-altitude curves on the days indicated. During the period of these observations a polar continental air mass extended over the three stations. A brief examination of the figures will serve to indicate that they are not well adapted for positive air mass identification.

So far we have endeavored to show that the two most conservative properties of an air particle are specific humidity and potential temperature. Furthermore we have pointed out that the altitude-specific humidity or,-potential temperature curves are of very limited value in the identification of an extensive air mass, mainly because they are but little improvement on the vertical temperature lapse rate which is more readily obtained. Obviously the next logical step is to investigate some convenient combination of the two above mentioned properties.

The main purpose of this paper is to discuss the practical possibility of combining the values of potential temperature and specific humidity, obtained from upper air observations above a station, so as to obtain a graphical means of identifying the air mass above that station. The original idea for such a combination was first suggested by Prof. C.-G. Rossby and an investigation similar to this one was carried out by Lieutenant H.M.Wescoat, U.S.N. in 1929. The situations which we have investigated are entirely different from those used by Lieut. Wescoat. If we have arrived at the same conclusions then at least we have contributed toward proving the original idea to be practical.

In drawing this invariant curve, we have plotted specific humidities as absissae and potential temperatures as ordinates. In this manner we have eliminated the altitude and have thus avoided the difficulties encountered when trying to use any of the lapse rates as an identification curve. This curve will have no physical meaning, but because of the fact that its shape can depend only on the potential temperature and the specific humidity, it will retain its original shape to the same degree that these two properties retain their original values.

Curves plotted in this manner can have a variety of shapes. For example, if we take our observations in an air mass that has an adiabatic lapse rate, (constant potential temperature), and a water vapor distribution which decreases with altitude, then the curve will take the form of a straight line parallel to the X-axis. Its length will depend on the maximum and minimum values of the specific humidity. On the other hand, if the air mass under observation has a perfectly homogeneous water vapor distribution, (constant specific humidity), and a lapse rate other than the adiabatic, the curve will again be a straight line but this time parallel to the Y-axis. Obviously then, if we find both an adiabatic lapse rate and a homogeneous water vapor distribution in an air mass, the curve will be reduced to a single point. In several of the curves which we have drawn we find points which were computed for altitudes several hundred meters apart, grouped close together. Also other curves show points quite some distance apart which were computed for altitudes quite close together. It follows then that this curve will bring out clearly, small, apparently insignificant inversion layers, while homogeneous (thoroughly mixed) strata will be indicated by a crowding of the points. Thus the extension of the curve measures the homogeneity of the air mass.

As an illustration of two of the extreme shapes which these curves may assume, let us examine the typical curve for polar air over the snow and ice covered regions of the continent, and that for tropical air in the region of the Gulf of Mexico. The air masses from these two regions probably play the most important role in the weather phenomena of the North American continent. In the winter, the air which has remained over the north central part of the continent becomes cold, dry and very stable. As one might expect, our invariant curve when drawn for this air will approach the vertical. There is very little water vapor present at any level, so consequently there can be only a slight decrease of specific humidity with altitude. Furthermore the stability of the lapse rate gives a rapidly increasing potential temperature. Figure 5b shows a typical curve drawn for a polar continental air mass near its source. It is constructed from data obtained from kite flights at the Weather Bureau station at Ellendale, N.D. on February 6, 1929.

With the tropical air from the Gulf of Mexico, the situation is reversed as far as the shape of the curve is concerned. Here it will approach the horizontal. Since the region is a maritime one with prevailing high temperatures, especially in the lower levels, we may expect the water vapor distribution to be more concentrated in the lower levels. Furthermore, the region is weakly cyclonic most of the time with the lapse rate slightly less than the dry adiabatic. This gives only a slight increase of potential temperature with increasing altitude. Figure 27 shows a typical curve for this type of air, drawn from kite flight observations at Due West, S.C. on February 26, 1929.

If we regard the curves for polar continental and tropical Gulf air as the two extreme shapes, then we can class the typical curves for the other types of air with which we are concerned as intermediate shapes or modifications of the first two. When one air mass is superimposed on another, as is the case with a typical warm front, the invariant curve will resemble two curves joined at a more or less abrupt angle. Illustrations of the various typical curves, their combinations and modifications will be discussed later in conjunction with the corresponding synoptic maps.

Since we realize that the time element is always an important one to the forecaster, we shall mention here an idea that occurred to us when confronted with the problem of working up a great number of these curves in a limited time. Having picked the values of pressure, temperature, and relative humidity for selected points from the barograph trace, we may immediately take the corresponding values of potential temperature from the adiabatic chart[4]. The problem of computing the corresponding specific humidities was a little more difficult. We have constructed a simple nomogram, figure 3, and with this device we can obtain sufficiently accurate values of "Q",(within certain limits), for our curves. As regards its use, the nomogram is almost self explanatory. A temperature-maximum vapor pressure curve is superimposed in order to avoid the use of any tables.

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[4] Otto Neuhoff,-Adiabatische Zustandanderungen Feuchter Luft und deren Rechnerische und Graphische Bestimmung. Abh.d.Preuss. Met. Inst. vol.1 no.6 (Neuhoff diagram)

If we enter the horizontal scale with the observed value of the temperature, then from this superimposed curve we immediately obtain the corresponding maximum vapor pressure on the inner vertical scale at the left. A straight-edge placed between this point and a point (on the pressure scale) which corresponds to the observed value of the pressure, will cross the index line (i.e. the line which extends from the upper right corner to the lower left corner) at some point. This point is marked and the straight-edge is then placed so as to pass through it and a point which represents the observed value of the relative humidity on the outer scale at the right. In this position, the straight-edge will cross the outer left hand scale at the corresponding value of the specific humidity. The nomogram which we illustrate here is not sufficiently accurate for low temperatures but it serves to indicate the general idea. For greater accuracy, similar nomograms may be constructed on a much larger scale but covering smaller ranges in the observed properties. In computing the specific humidities for the curves which we will discuss in this paper, we have used the slide rule and checked the values wherever possible with the nomogram. A comparison of the two methods reveals small discrepancies for the most accurate part of the nomogram. Greater accuracy than that obtainable with the slide rule is not necessary with the scale which we have used for plotting the values. Furthermore the values of the potential temperature taken from the adiabatic chart are sufficiently accurate for the potential temperature scale which we have used. Greater accuracy in computing either of these quantities will not affect the shape of the curves.

Finally, before beginning the discussion of the curves which we have constructed, it should be mentioned that this invariant may also be plotted on the T-ø gram[5]. In such case, the coordinates will be water content and entropy and the coordinate axes will not be orthogonal. The curve, however, will be none the less invariant than when plotted as we have done on Cartesian coordinates. The construction of the curve when plotted on the T-ø gram is very simple. Points will be located at the intersection of a horizontal line (constant entropy) through a point representing the observed value of the pressure and temperature, and the sloping line (parallel to the water content lines) which represents the corresponding water content. A line connecting the points found in this manner represents the invariant curve. We have not investigated the possible shapes of the curve when plotted in this manner, but merely take this opportunity to mention that such is possible and to suggest further investigation along this line. Figure 4 shows an invariant curve for a tropical air mass constructed in this manner.

In order to illustrate and examine the practical value of the invariant curve, we have chosen the period from February 5, to February 28, 1929. We have constructed curves for all stations having upper air data available during this period.

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[5] Sir Napier Shaw,- and H. Fahmy,- The energy of saturated air in a natural environment. Quar. Jour. Roy. Met. Soc. Vol. 51;p 205-228.

These stations are: Ellendale, N.D., Royal Center, Ind., Broken Arrow, Okla., Groesbeck, Texas, Due West, S.C., and Anacostia, D.C. The first five are Weather Bureau kite stations, while Anacostia is a United States Naval air station. We shall discuss these curves in conjunction with the corresponding synoptic maps which were constructed and analyzed by Dr. H.C.Willett, (assistant professor of meteorology at Massachusetts Institute of Technology), during the period under discussion. We have accepted his location of fronts and indicated surface analysis as correct.

In comparing these curves, it must be remembered that a change in the lower part of a curve does not necessarily indicate a different air mass. Specific humidity and potential temperature are least conservative in the lower layers of the atmosphere, because of the fact that the effects of diurnal heating and cooling, evaporation, radiation, and turbulence are most marked in these regions. Consequently, we must neglect, in many cases, that part of a curve which represents the lower several hundred meters of an air mass.

The first situation which we shall discuss is one which clearly illustrates the typical shape of the invariant curve for a polar continental air mass. It deals with the movement of an extensive anticyclone, and shows conclusively how the curve retains its original shape. Our discussion will be rather brief and will consist mainly of a comparison of the various invariant curves.

The synoptic map for the morning of the fifth,(fig.30), shows a high pressure area extending southward into the Dakotas and Montana. From the position of the cold front and the values of the surface temperatures, it is evident that this was an outbreak of polar continental air. Succeeding maps show a rapid spreading of this air mass to the South and East. Figure 29, indicates the morning positions of the cold front for the fifth and the following days as long as it was in evidence at the surface.

From the above mentioned figure, we see that the cold front had passed Ellendale by the morning of the fifth. The lower portion of the corresponding invariant curve,(fig. 5a), is almost vertical, and with low values of the specific humidity, thus clearly indicating polar continental air at these levels. The point of this curve which was computed for the maximum elevation of the observation shows a somewhat higher specific humidity and causes the curve to swing to the right at its upper extremity. This elevation corresponds to the cloud level (strata-form clouds) and another air mass seems to be indicated aloft. Evidently the colder and more dense polar continental air has under-run the air mass which was previously over this station. The invariant curve for the following day,(fig. 5b), is vertical throughout, thus indicating that the cold air has now entirely displaced the other air mass. This curve is a striking example of the typical shape we may expect for polar continental air. There is no data available for a curve for the seventh, but those for the eighth, ninth, and tenth are almost identical to that for the sixth,(refer to figures 5&6). On the eleventh,(fig. 6b), the curve seems somewhat distorted. This is probably due to the fact that the observation did not reach a very high elevation, and most of the curve represents a region below a subsidence inversion. Turbulence in this region has caused a marked crowding of the points, by causing the lapse rate to approach the adiabatic. If the observation had reached higher altitudes the upper part of the curve would probably have compared favorably to the curves for the preceding days. On the twelfth, (fig.6c), the subsidence inversion has almost reached the surface and now the lower part of the curve has become straightened. On the thirteenth,(fig.6d), the middle part of the invariant curve is extended slightly to the right and on the corresponding synoptic map we note an occluded front to the West of Ellendale. This "bulge" in the invariant curve is caused by the pushing in, aloft, of another air mass of slightly greater moisture content.

If we now glance at figure 29, we see that the cold front passed Royal Center sometime between the morning of the eighth and the morning of the ninth. The invariant curve for the morning of the ninth, (fig. 8a), is nearly vertical as was to be expected. The values of the specific humidity are slightly greater than those for observations in the same air mass at Ellendale but this is due mainly to the fact that this portion of the air mass has traveled further from its source and has had the opportunity to absorb moisture. There was no data available for a curve for the tenth but if we examine that for the eleventh, (fig. 8b), we see immediately that the cold air has now come in more strongly and the specific humidities for the upper part of this curve are much lower. That part of the curve representing the surface layers is swung to the right due to certain of the various effects mentioned above. No observation was made on the twelfth and the curve for the thirteenth, (fig. 8c), seems to indicate an entirely different air mass. This is verified by the more complete curve for the fourteenth, (fig. 8d).

In its southward movement, the cold front had apparently passed Broken Arrow by the morning of the seventh, (fig.29). However, there was not sufficient upper air data to construct an invariant curve until the morning of the ninth, (figure 10a). This curve shows, without a doubt, the presence of polar continental air and the similarity between it and the typical curve for this type of air is well marked. The curve for the following morning, (fig.10b), still shows the presence of the same air mass. Here the points are more crowded together and the lower part of the curve has been swung to the right, the probable cause of which is the same as that affecting the curve for Ellendale for the eleventh. The main difference is that here the lower layers of the air mass have absorbed more moisture. Lack of data prevented the construction of a curve for the eleventh and that for the twelfth, (fig. 10), shows an air mass of different characteristics over this station.

Again referring to figure 29, we see that the cold front has passed Groesbeck by the morning of the eighth. The data for both the eighth and ninth does not reach a very high elevation and furnishes but few points to construct invariant curves. Nevertheless, these two curves, (figures 14&15), are very similar and show a thin layer of polar air at the surface with another air mass above. The progress of the cold air may be observed by noting the lower specific humidity and potential temperature of the curve for the ninth. The upper part of the curve for the tenth also has a tendency to swing to the right, (indicating a different air mass above), but here we note a much deeper mass of polar continental air . The curve for the eleventh indicates that this upper air mass has been entirely displaced. Here again the lower part of the curve swings to the right due to the same effects mentioned above. The curve for the twelfth, (fig. 16), is distorted in its upper part. This seems to indicate the pushing in, above, of another air mass of slightly higher moisture content. This indication is further brought out by the indicated occluded front on the corresponding synoptic map, figure 37.

On figure 29 , the cold front is indicated as having passed Due West by the morning of the tenth. No observations were made until the morning of the eleventh, (fig.24a), for which time the invariant curve is very similar to the one at Groesbeck for the same morning. The same discussion may be applied. The curve for the following day is incomplete, due to lack of data, but even from the small part available we can see that it represents an air mass of a different character. We find, from a study of the synoptic maps, that this air mass is still a part of the original anticyclone, but now the circulation carries a portion of it over the Atlantic. Thus, the air now over this station has begun to assume certain maritime characteristics.

The cold front had also passed Anacostia by the morning of the tenth, (fig. 29). The first observation which was made after this time was on the morning of the twelfth. The invariant curve for this time , (fig.22a), is typical for a polar continental air mass. The curve for the following day is very similar except for a marked increase of specific humidity. This is probably due to the same effect noticeable at Due West, i.e. the air from the Atlantic is now reaching this station.

Now we shall consider a situation which clearly illustrates the identification of tropical air from the Gulf of Mexico. This is best represented by the series of synoptic maps from the twenty-fourth through the twenty-seventh. A low pressure area developed over Texas and moved northward, thereby establishing an extensive current of warm air in the south-eastern section of the country. The original center moved rapid-ly northward and proceeded to occlusion. The cold front moved eastward and reached the Atlantic coast by the morning of the twenty-seventh, at which time another center had appeared in the Gulf. Refer to figures 45-48 inclusive.

In order to show clearly the typical shape of the invariant curve for this type of air, we must select a station which is well within the warm sector at some particular time. From the synoptic map for the morning of the twenty-sixth, we see that Due West was clearly within the warm sector. The corres-ponding invariant curve is shown in figure 27. This curve has already been discussed and identified as being typical for tropical air from the Gulf of Mexico; consequently we are justified in using it for comparison purposes.

The invariant curve for Groesbeck for the morning of the twenty-fourth apparently indicates an abrupt discontinuity in air masses at an elevation of 607 meters. If we compare the upper part of this curve with the corresponding part of the typical curve, we immediately identify the upper air mass as tropical Gulf air. The air mass belowm the discontinuity extends to the surface and is indicated on the synoptic map as polar "transitional". Obviously, it may be identified as a part of the extensive anticyclone which covers the eastern section of the country and which was originally of polar continental origin. Its high moisture content is probably due to passage over the Gulf.

The invariant curve for Broken Arrow for this time, (fig. 20), is almost identical with the one for Groesbeck and the same discussion may be applied.

On the morning of the twenty-fifth, the warm and cold fronts are well defined on the synoptic map, (fig. 46). Both Groesbeck and Broken Arrow appear to be in the warm sector. The invariant curve for Groesbeck,(fig. 21), compares favorably with the corresponding part of the typical curve and thus clearly indicates tropical Gulf air. There is no data available to construct a curve for this time for Broken Arrow.

The invariant curve for Due West for the twenty-fifth is very similar to those for Broken Arrow and Groesbeck for the twenty-fourth and thus indicates over-running tropical Gulf air; the same discussion applies as above.

By the morning of the twenty-sixth the cold front had moved rapidly eastward as shown on the synoptic map,(fig. 47). Broken Arrow and Groesbeck are no longer in the warm sector. The invariant curve for Due West has already been discussed and selected as the typical curve for this type of air. There was no data available from Anacostia for this time, but if there had been, it is likely that the curve would have been similar to those previously discussed which indicated overrunning tropical Gulf air.

The only remaining upper air data available which is applicable to this situation is that from Due West for the morning of the twenty-eighth. From the synoptic map it is apparent that at this time Due West is still in the warm sector and this is confirmed by the corresponding invariant curve, (fig. 28), which compares favorably with the typical curve for this type of air.

There is one other type of air mass, evident during the period which we have investigated, which may be fairly well identified by a typical invariant curve, i.e. a polar maritime air mass which has moved across the Rocky mountains from the Pacific. On the western slope of the mountains, this type of air is of course very moist and probably unstable in the lower layers due to its having been heated from below in passing across the Pacific. However, it loses considerable moisture in crossing the mountains and by the time it reaches the stations with which we are concerned it is not very similar to true maritime air.

This type of air mass is best represented by the eastward movement of the anticyclone from the Pacific which first reached the western stations of our group on the thirteenth. It was bordered on its eastern side by a low pressure area and on the northern side by another anticyclone from polar continental regions. The eastern and northern boundaries are represented on the synoptic maps by cold fronts.

The typical shape of the invariant curve for this "polar Pacific air" is well illustrated by the curve drawn for the observation at Groesbeck on the sixteenth, (fig. 19). Roughly, this type of curve should extend upward, from right to left, at an angle of about forty-five degrees to the horizontal. If the observations extend to sufficiently high elevations, the upper part of this curve will be identical to the typical curve for polar continental air. This type of air was true polar continental air before it crossed the Pacific. On the other hand, if this air had not moved across the mountains and lost considerable moisture, its lower part would resemble the typical curve for tropical Gulf air. The main difference would be that this air would be characterized by a lower specific humidity and potential temperature than tropical Gulf air. As it is, this type of air has a maximum specific humidity of about four grams of water vapor per kilogram of moist air and a minimum potential temperature of about zero degrees Centigrade. We shall take the curve drawn for Groesbeck for the sixteenth as being typical and compare certain other curves with it.

From the synoptic maps, we see that this polar Pacific air mass had reached Broken Arrow by the thirteenth and the invariant curve for this morning, (fig.11a), agrees fairly well with the typical curve. There was no observation made on the fourteenth and that for the fifteenth is incomplete. However, those for the sixteenth and seventeenth, (fig.11-), are very good examples of the shape of the curve for this type of air and show marked agreement with the typical curve. The invariant curve for the eighteenth, (fig. 12b), indicates quite a change in the previous conditions. A discontinuity in air masses is shown, and the upper part of the curve agrees with the corresponding part of the typical curve for tropical Gulf air. Furthermore, we note from an examination of the synoptic map that the polar Pacific air mass at the surface is being displaced by polar continental air. This fact is also made evident on the invariant curve by a drop in both the specific humidity and potential temperature for the surface layers.

The polar Pacific air mass had also reached Groesbeck by the morning of the thirteenth. The invariant curve for this time, (fig.17a), is typical for this type of air. On the fourteenth, however, the invariant curve, (fig. 17b), assumes a different but still significant shape. Overrunning tropical Gulf air causes a distinct "bulge" in the center of the curve.

This observation extends to a considerable elevation and clearly shows the effect of such a situation on the shape of an invariant curve. By the morning of the fifteenth, this tropical Gulf air had been pushed back and the curve, (fig. 18), shows a tendency to regain its typical shape. The curve for the following day has been discussed above and selected as the typical shape for this type of air. There was no observation on the seventeenth and on the eighteenth the conditions were entirely changed. Here again we have overrunning tropical Gulf air, but the thin layer of polar Pacific air at the surface has been so modified that this part of the curve is no longer significant.

From a study of the observations at Ellendale, we find that the polar Pacific air did not reach the surface during this period. The invariant curves for this station for the thirteenth and the fifteenth, (figs. 6d&7), seem to indicate the presence of this air mass aloft, but it is evidently always pushed back by a fresh current of polar continental air before it is able to reach the surface. We also find that whenever the invariant curve takes the shape indicated in these figures, an occluded front is indicated on the corresponding synoptic map a short distance to the West of Ellendale. These occluded fronts usually become indistinguishable before they have moved much further eastward.

The synoptic maps show that Royal Center had also come under the influence of this polar Pacific air mass by the morning of the thirteenth. The invariant curve for this time, (fig. 8c), is incomplete due to lack of data, but that part available indicates that the air mass in the lower layers of the atmosphere is probably of polar Pacific origin. The specific humidity is too high for it to be of polar continental origin. The grouping of the points shows that this surface layer had a very homogeneous water vapor distribution. The curves for the fourteenth and fifteenth, (figs. 8&9), extend to higher elevations, and the corresponding parts agree well with the curve for the thirteenth. Those for the sixteenth and seventeenth, (fig. 9b,c), show better agreement with the typical curve for this type of air. On the following day, polar continental air had begun to displace the polar Pacific air mass.

The only invariant curves available for Due West and Anacostia which are typical for this type of air are those drawn for the morning of the eighteenth, (figs.23&25). Both are readily identified as representing this type of air but there are certain marked differences which should be pointed out. The curve for Due West shows a distinct grouping of the points for the layer which extended from the surface to an elevation of approximately 1000 meters. This is probably caused by turbulent mixing and it is interesting to note that the upper limit of this surface layer is characterized by a marked inversion. The upper part of this curve shows a good agreement with the corresponding part of the typical curve for this type of air. The curve for Anacostia for the same time shows much less concentration of water vapor in the lower levels. It is more regular and agrees well with the typical curve.

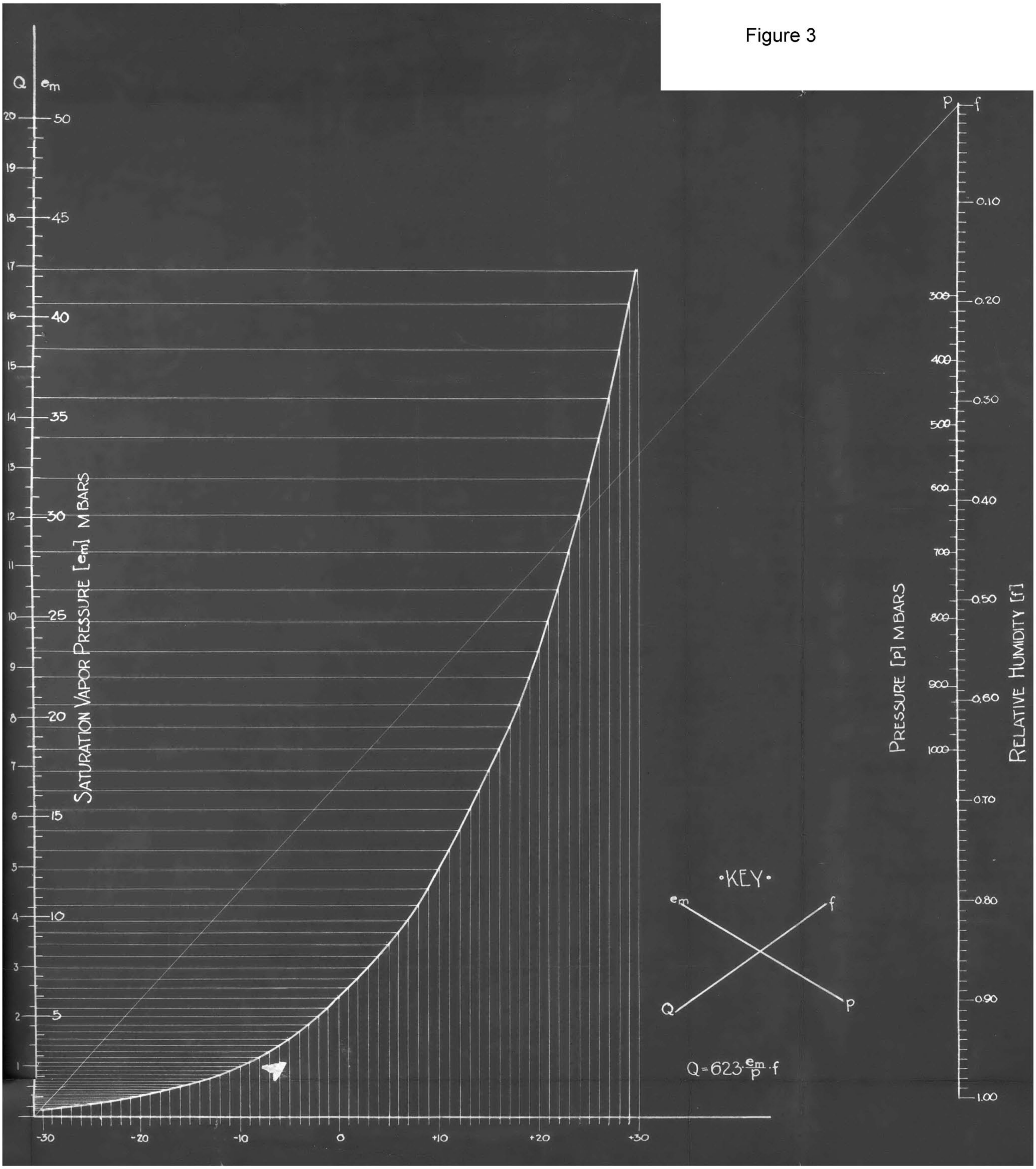
The foregoing discussions are rather brief and by no means exhaustive. We have considered three air masses of different characteristics and attempted to show that an invariant curve, constructed as shown, has and maintains a certain definite shape for each of these air masses. In many instances, our investigations were hampered by a lack of data, but even so, we are able to draw certain conclusions which justify the investigation and show the original idea to be of practical value. These conclusions are:

1. That this invariant curve represents the state of the atmosphere above a station in such a manner that the following information is immediately apparent: (a) The water vapor distribution; (b) the homogeneity of the various layers; (c) the stability of the various layers.

2. That this invariant curve has a characteristic shape for an air mass at its source.

3. That this invariant curve shows a marked tendency to retain its original shape after the air mass has moved away from its source.(Not true for turbulent layers near surface.)

Figure 3


Q
e_m
Saturation Vapor Pressure [e_m] M Bars
Pressure [p] M Bars
Relative Humidity [f]
p
f
•KEY•
e_m
f
Q
p
$Q = 623 \cdot \frac{e_m}{p} \cdot f$
-30
-20
-10
0
+10
+20
+30

Form No. 1125–Aer.

TEPHIGRAM CHART

t Φ INDICATOR DIAGRAM: 1 SQ. CM. = 372 JOULES PER KG.

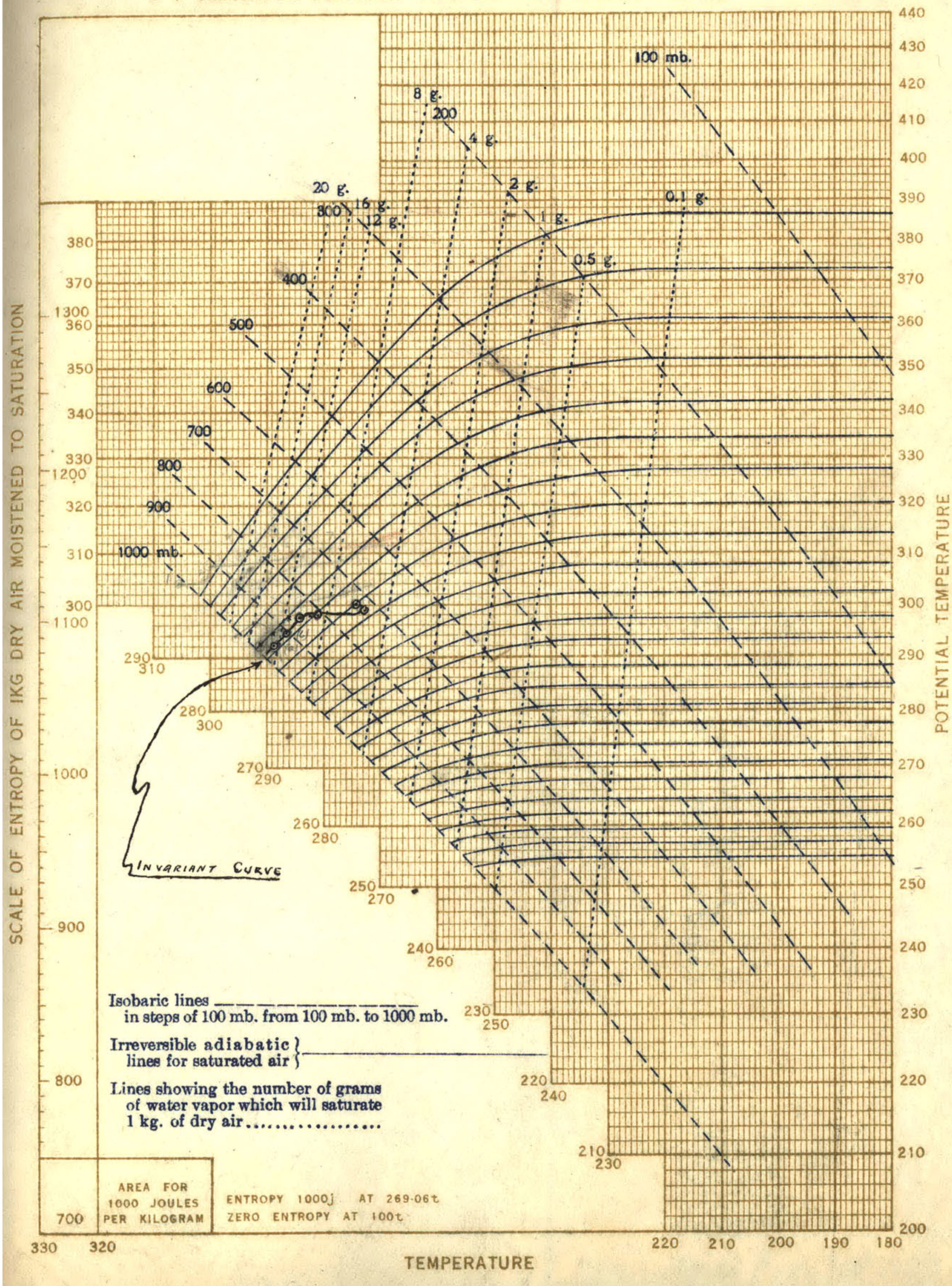
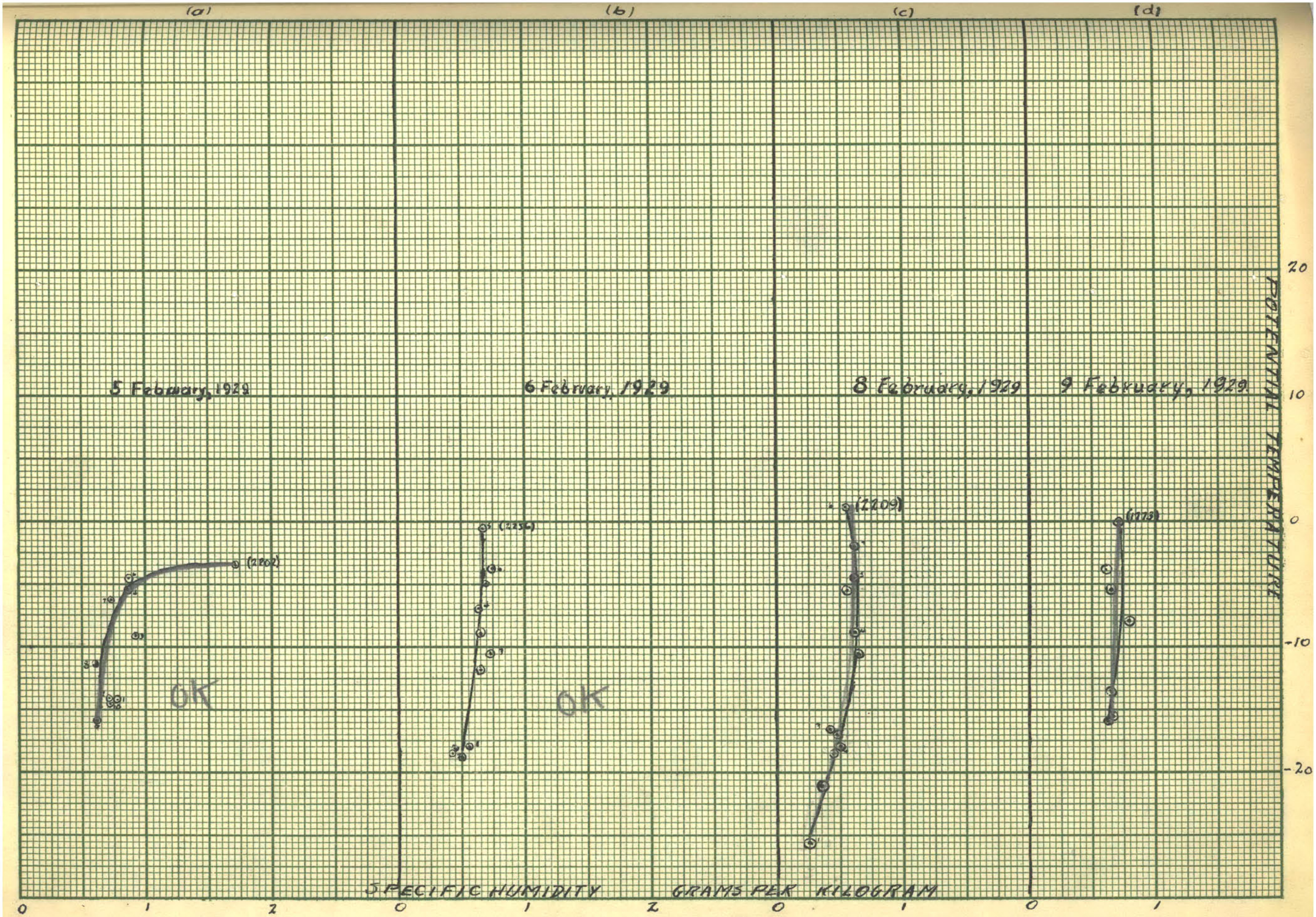
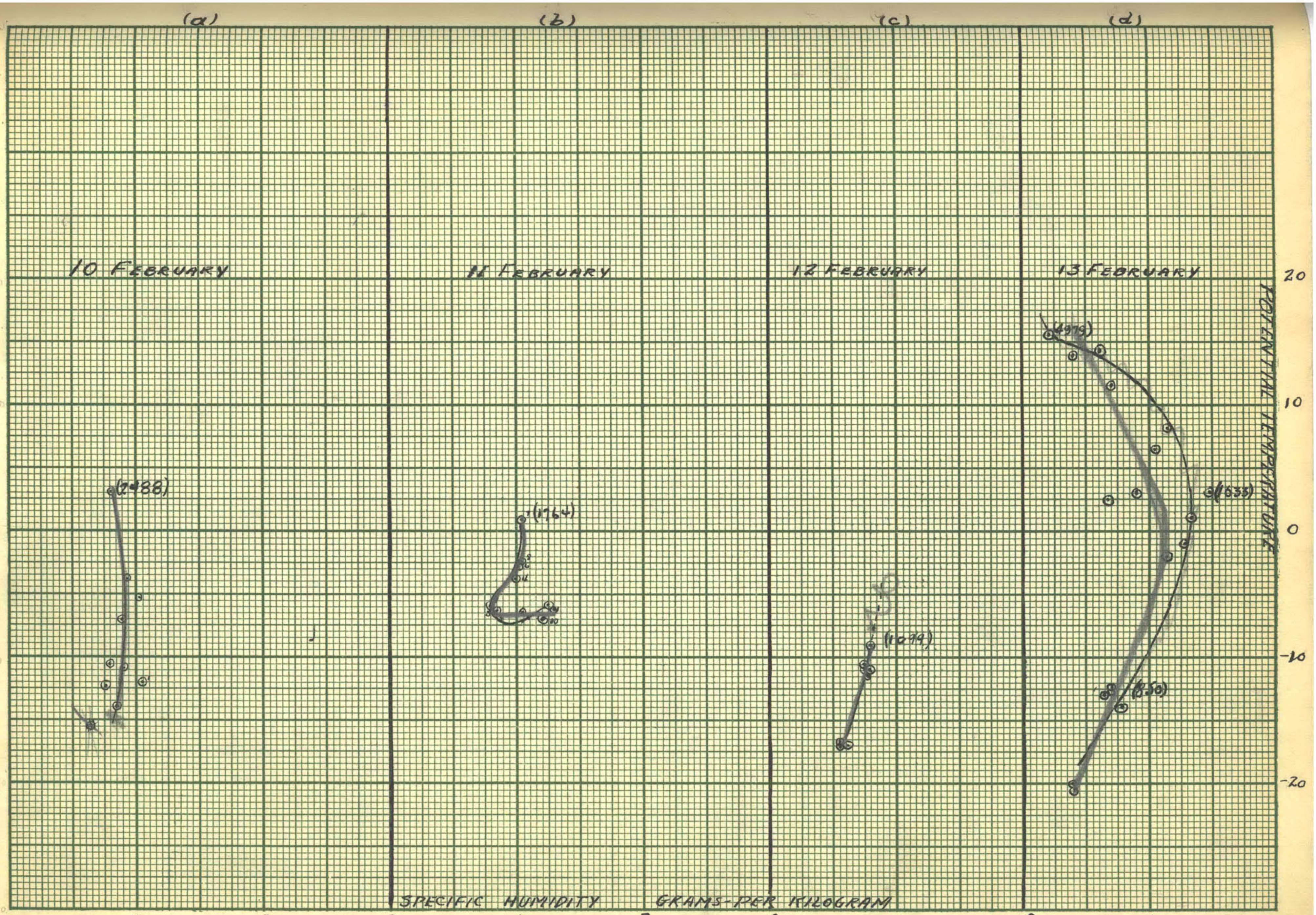


FIG. - 4.



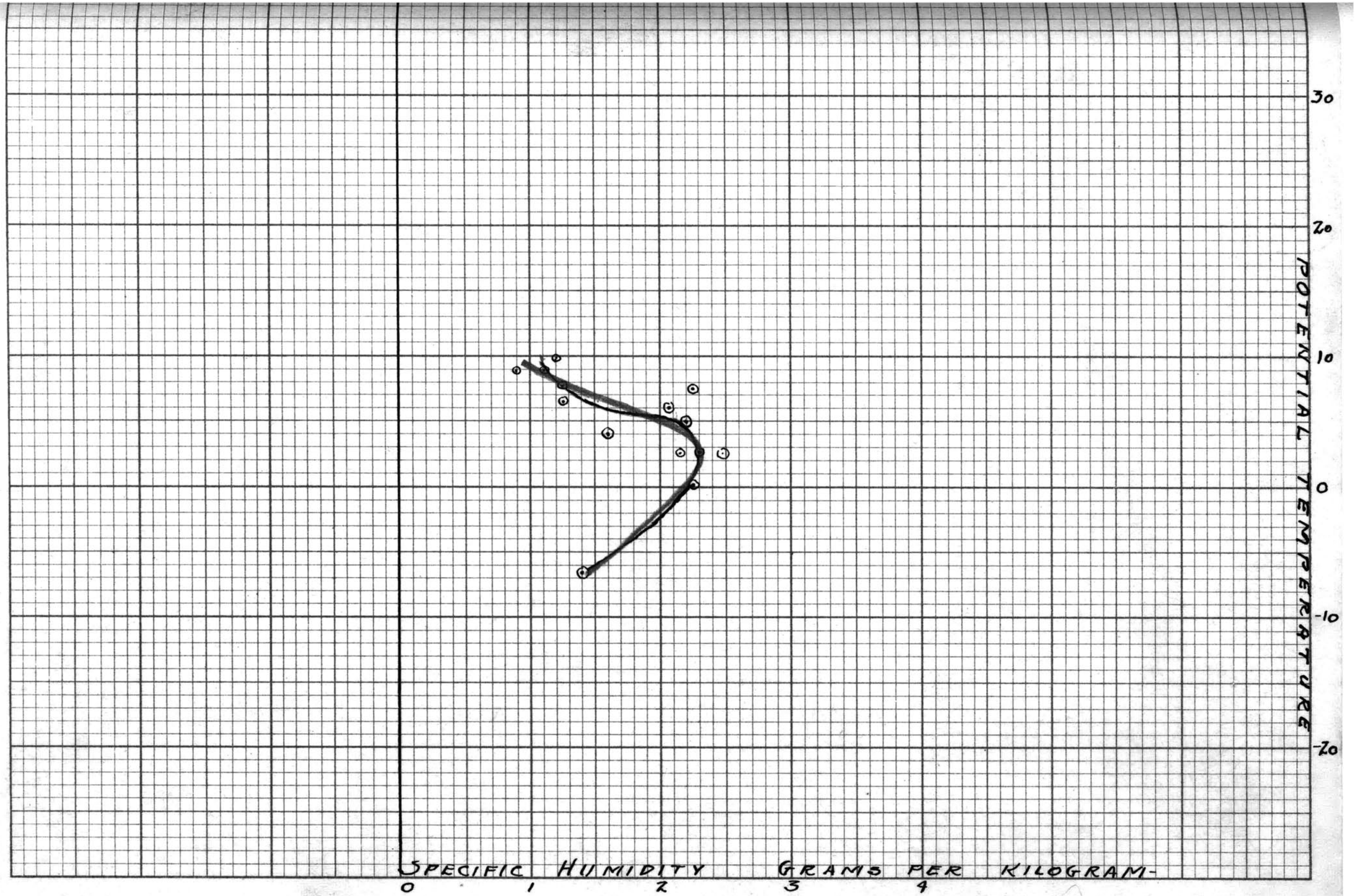
ELLENDALE, N. D. ~ 5-9 FEBRUARY, 1929.

FIGURE - 5



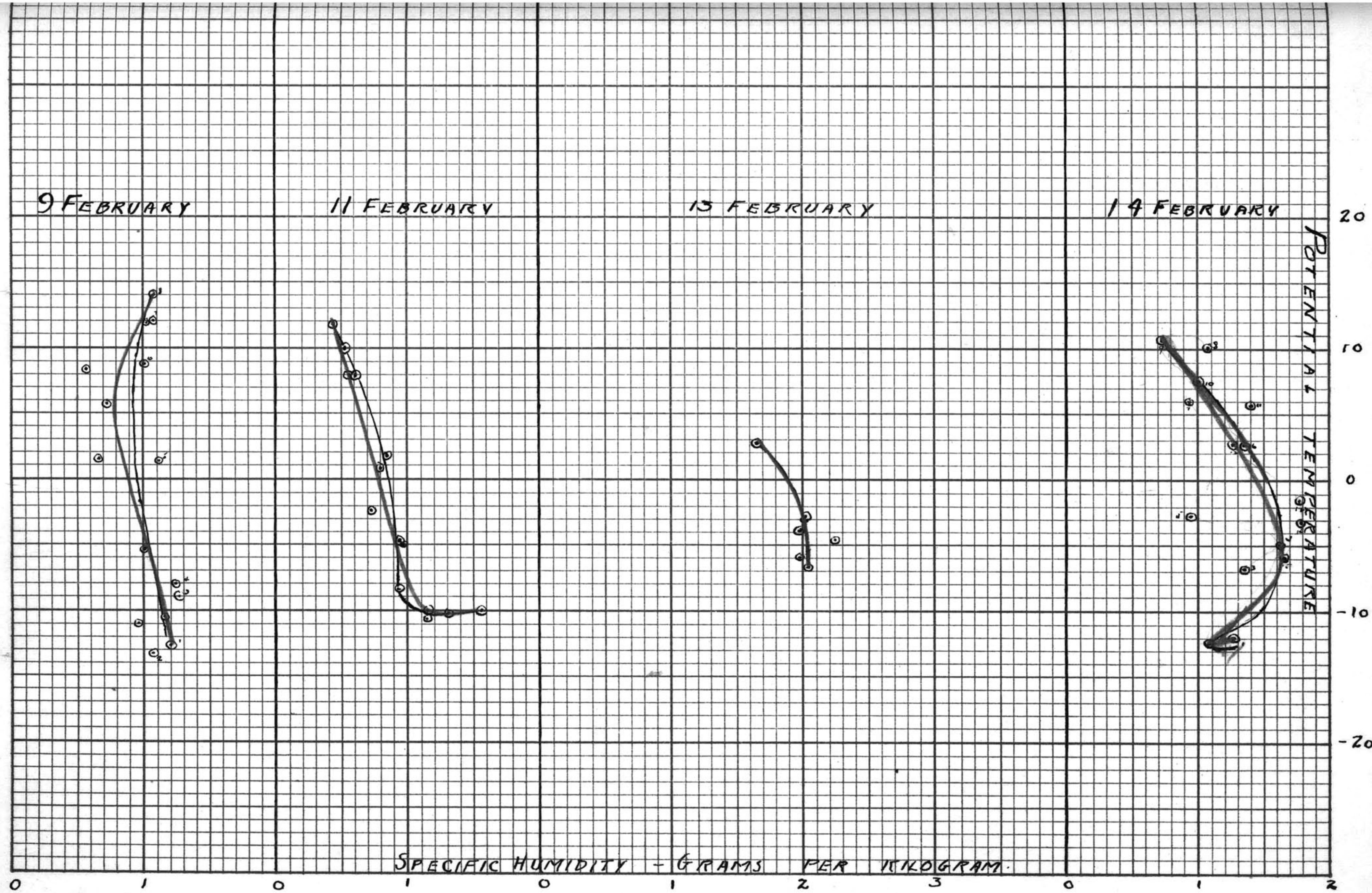
Ellendale, N. D. ~ 10 - 13 February, 1929.

Figure - 6



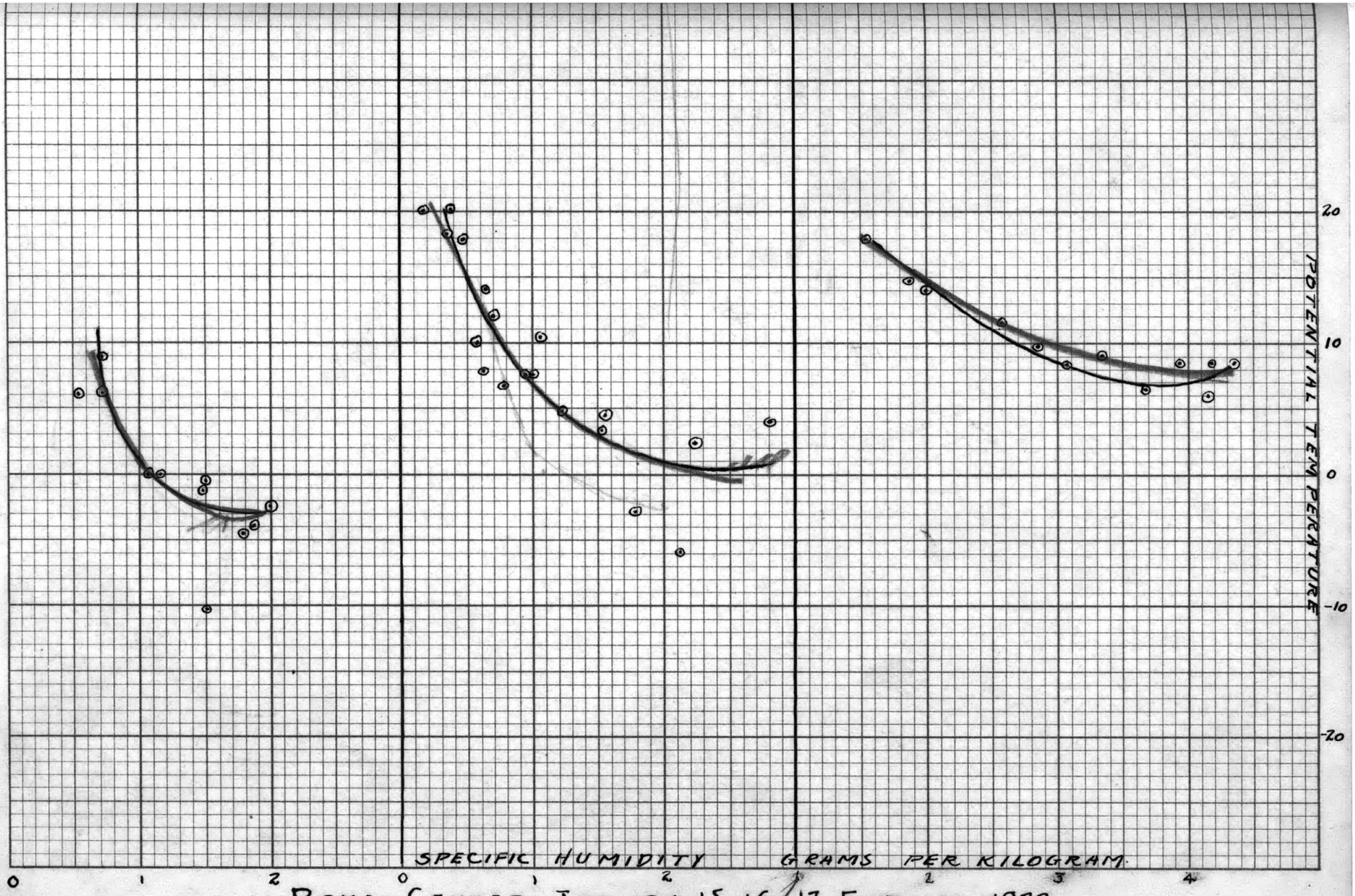
ELLENDALE, N. D. ~ 15 FEBRUARY 1929.

FIGURE - 7



ROYAL CENTER, IND. ~ 9, 11, 13, 14 FEBRUARY 1929.

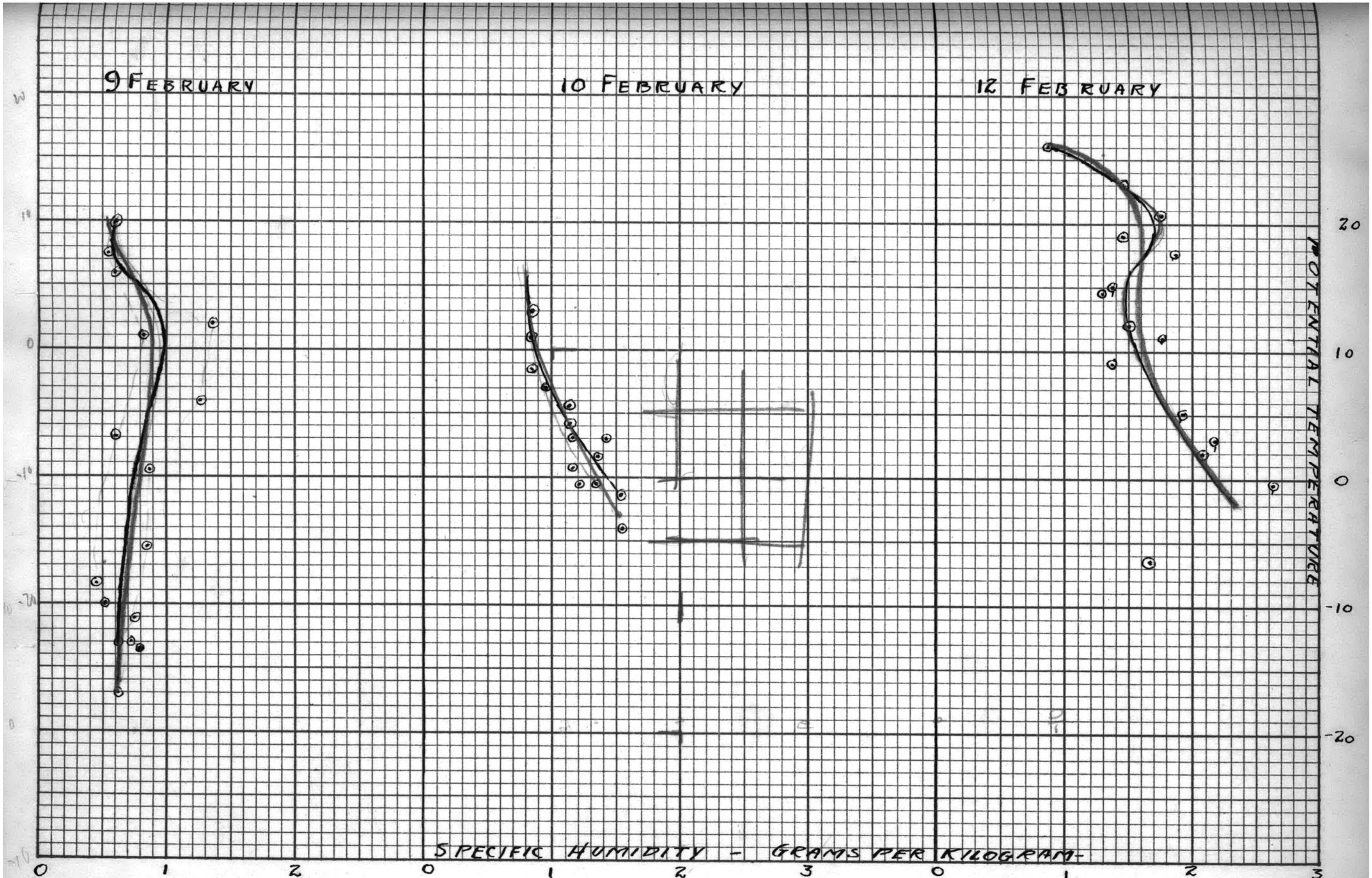
FIGURE - 8



ROYAL CENTER, IND. ~ 15, 16, 17 FEBRUARY, 1929

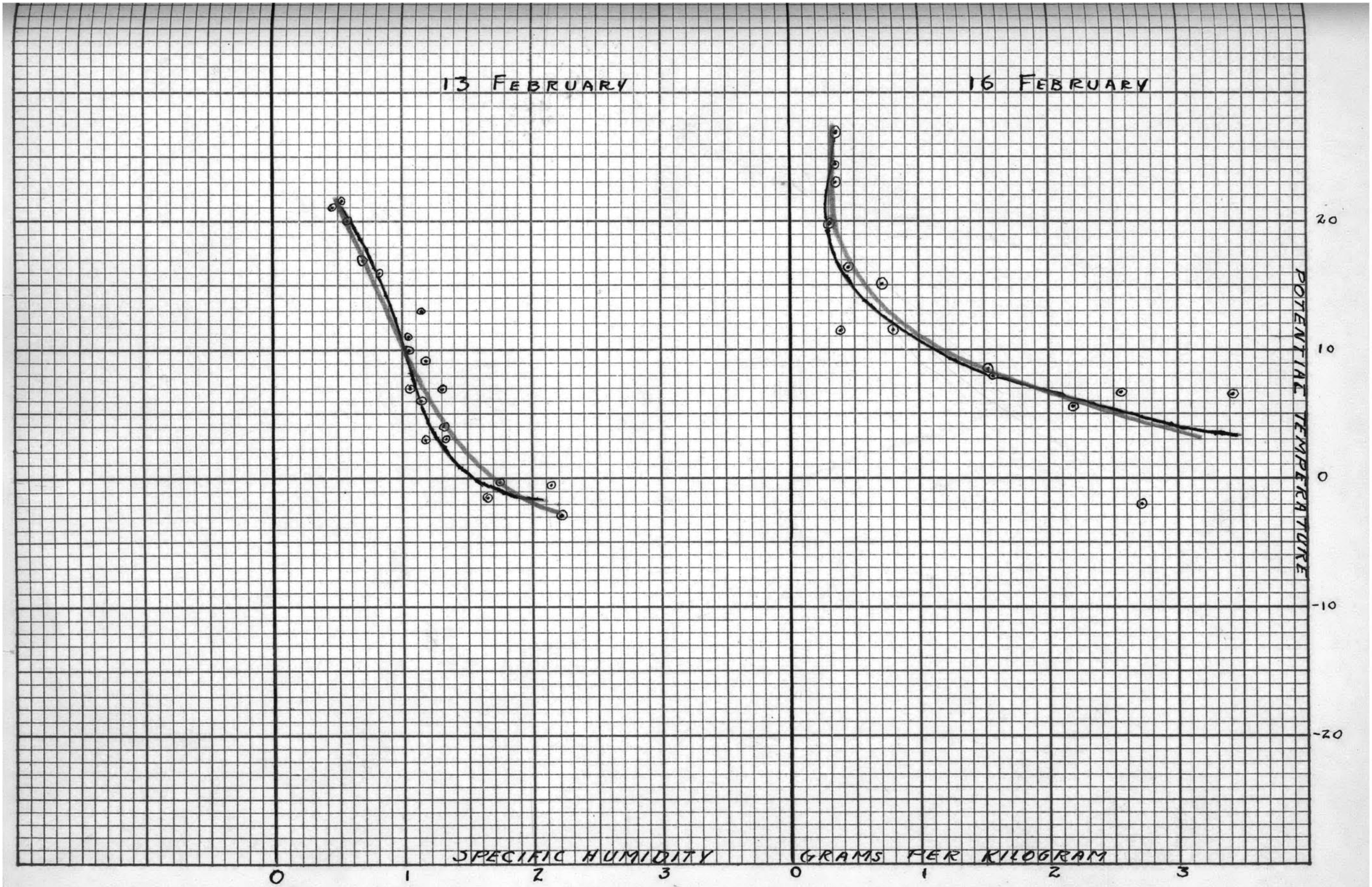
FIGURE - 9

Observe



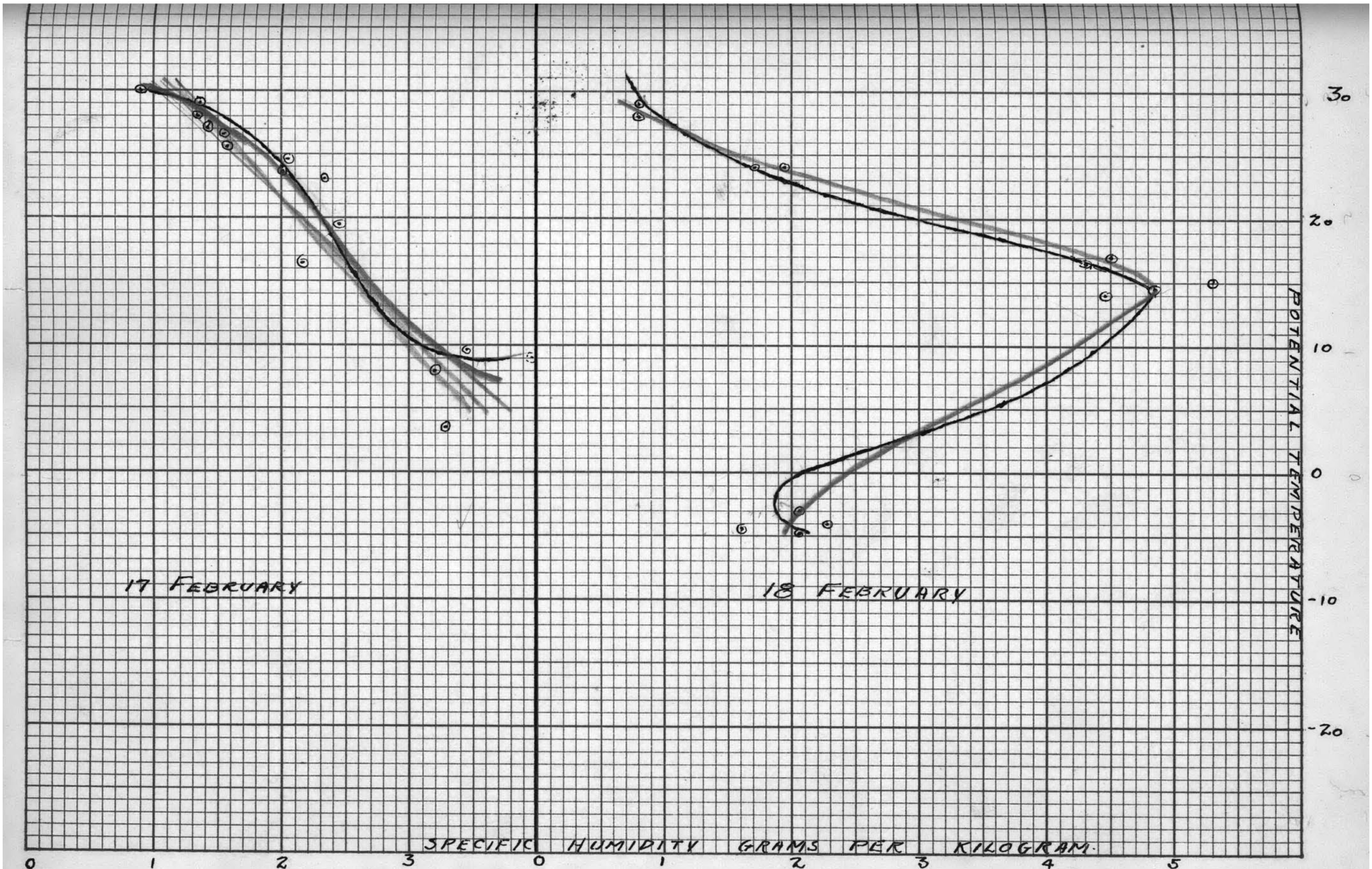
BROKEN ARROW, OKLA. ~ 9-12 FEBRUARY, 1929.

FIGURE -10



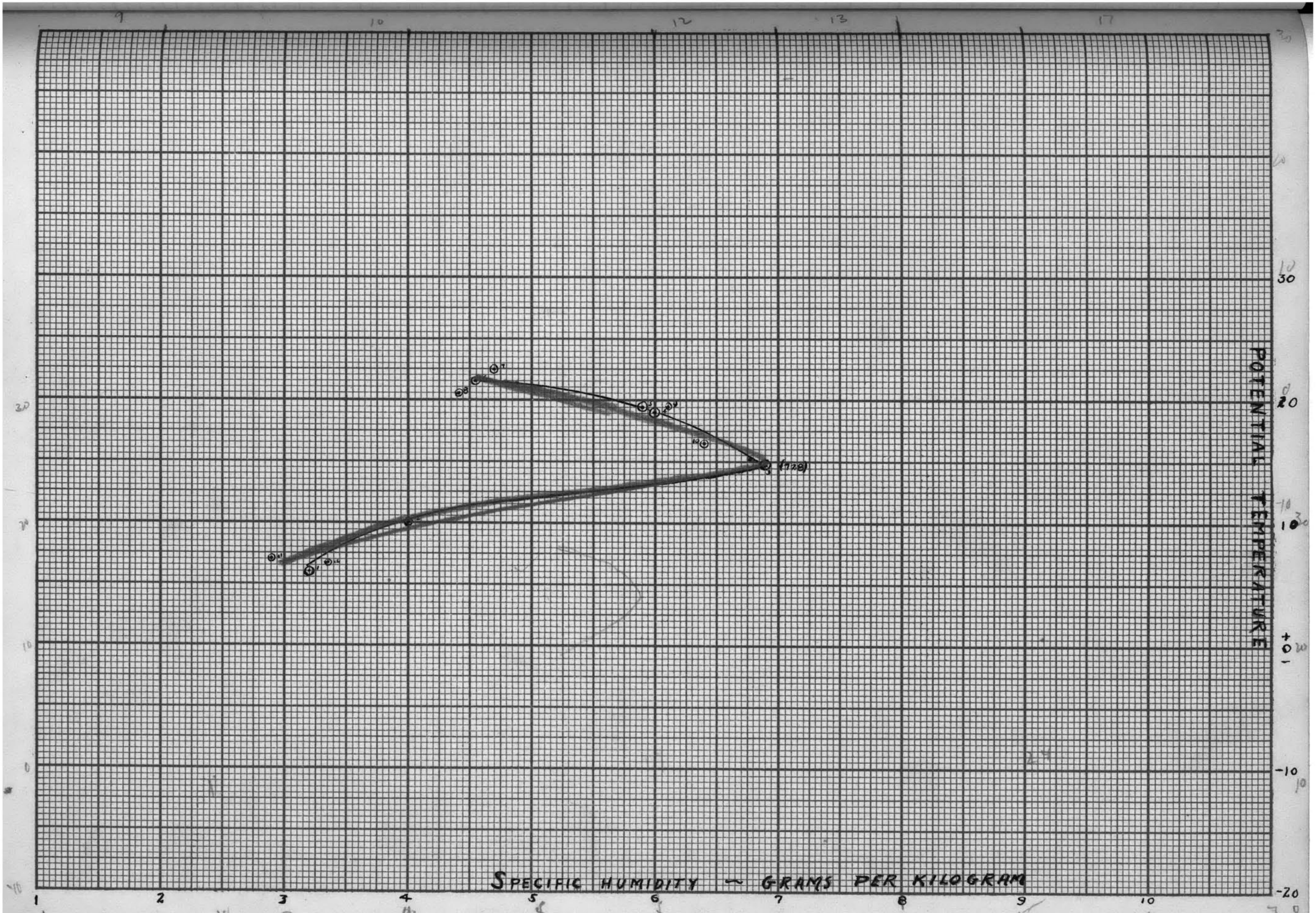
BROKEN ARROW, OKLA. ~ 13, 16 FEBRUARY, 1929.

FIGURE - 11



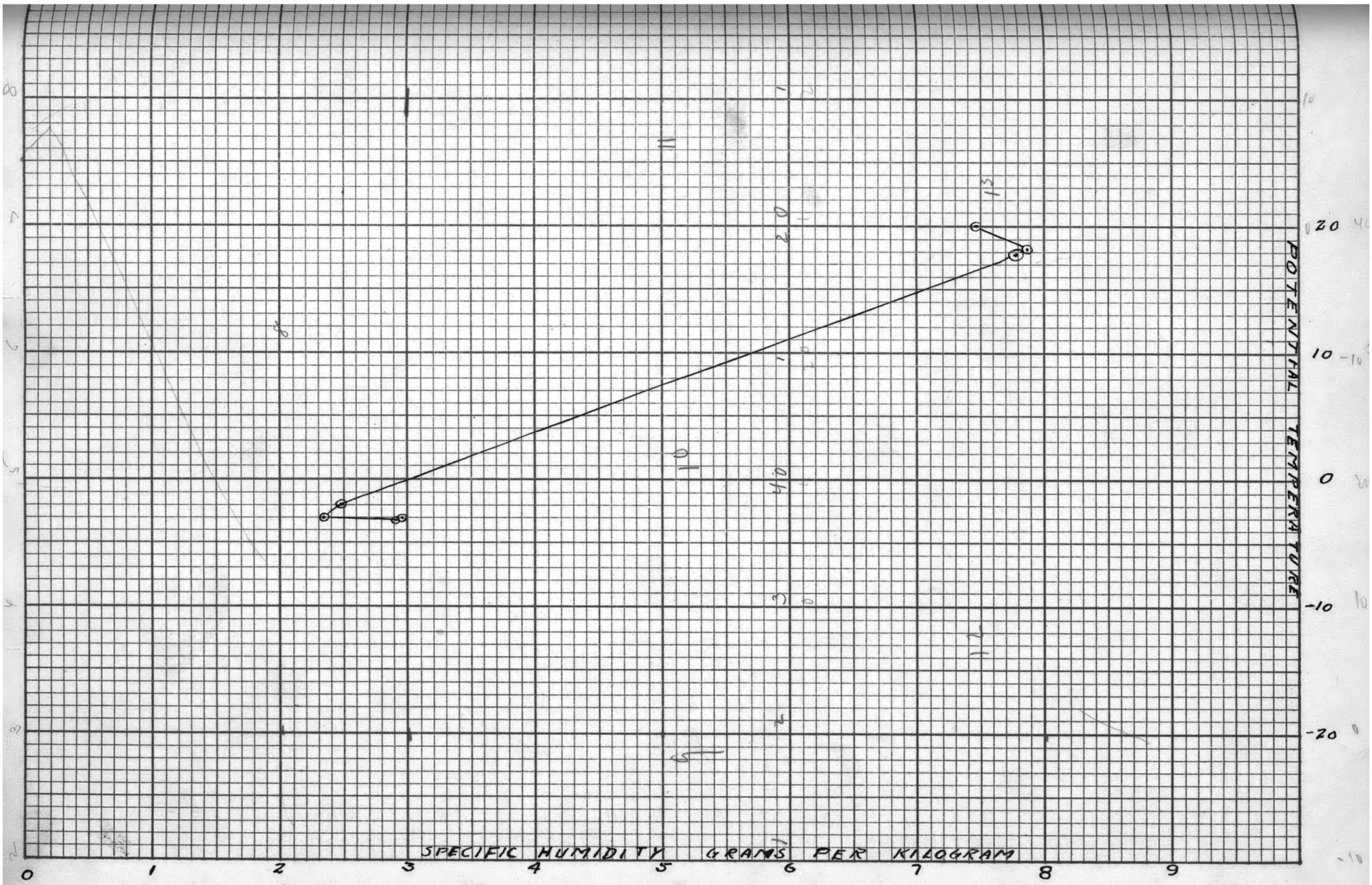
BROKEN ARROW, OKLA. ~ 17, 18 FEBRUARY 1929

FIGURE - 12



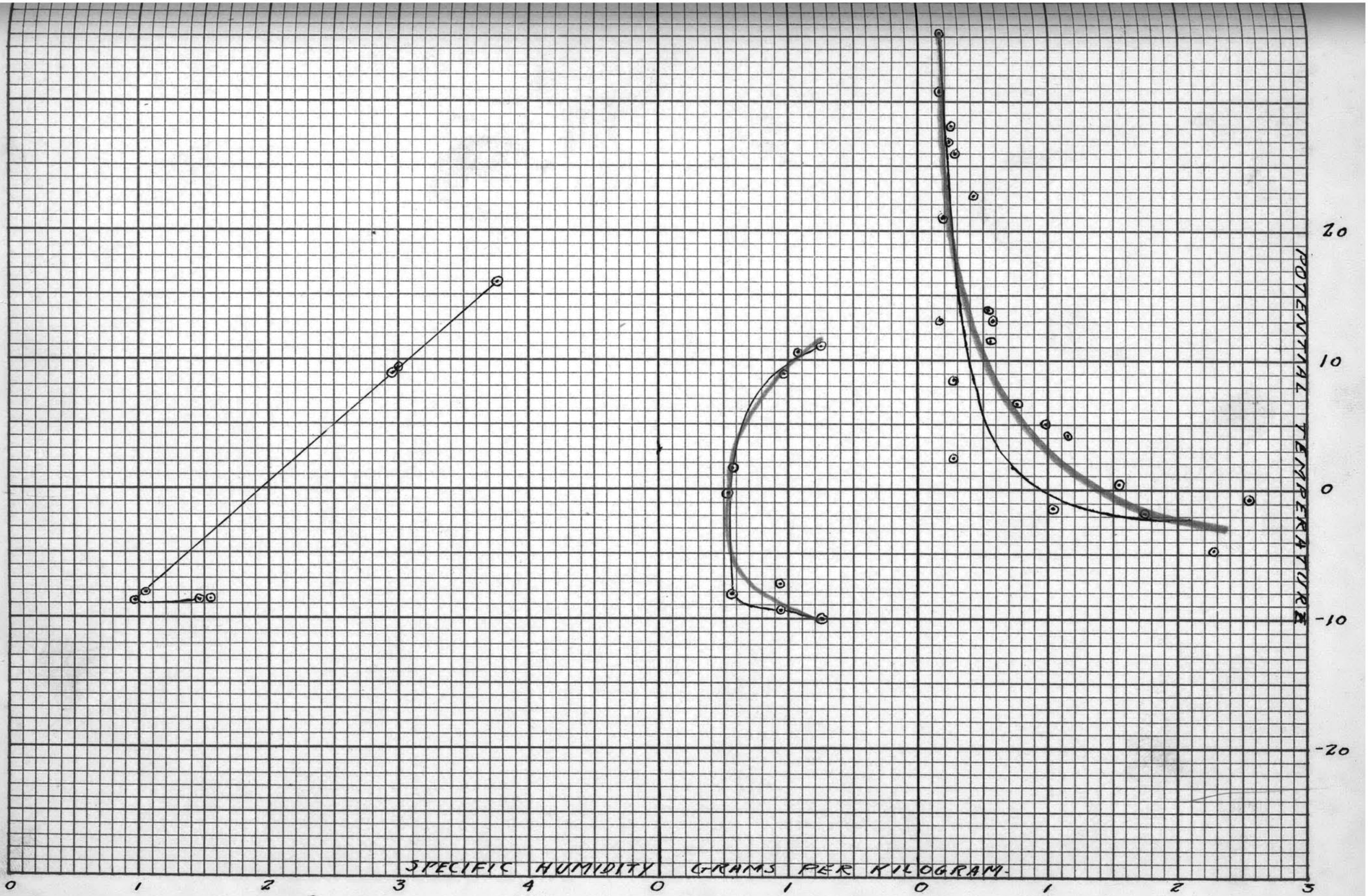
BROKEN ARROW, OKLA. ~ 24 FEBRUARY, 1929.

FIGURE - 13



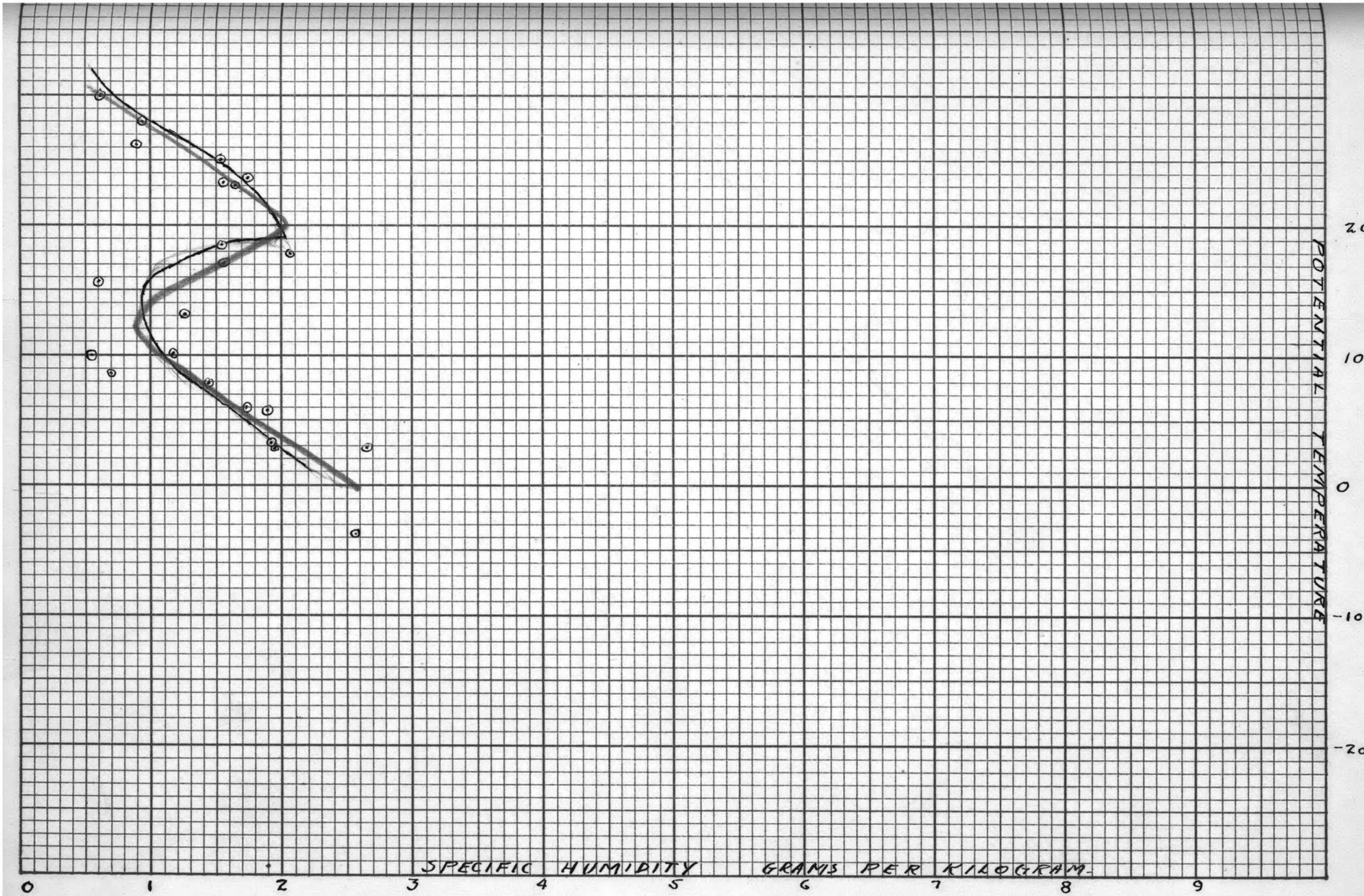
GROESBECK, TEXAS ~ 8 FEBRUARY, 1929.

FIGURE -14



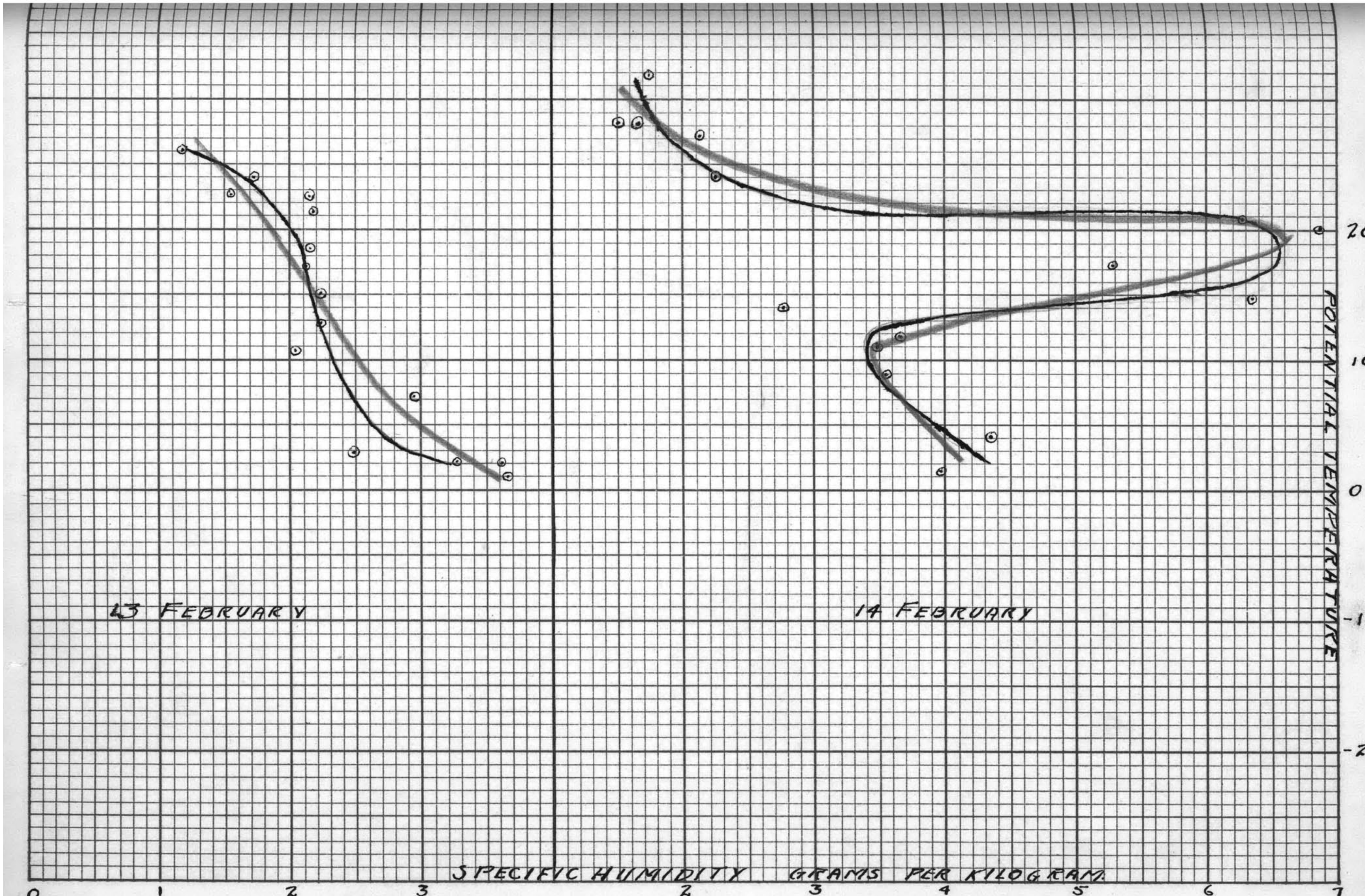
GROESBECK, TEXAS ~ 9, 10, 11 FEBRUARY, 1929

FIGURE - 15



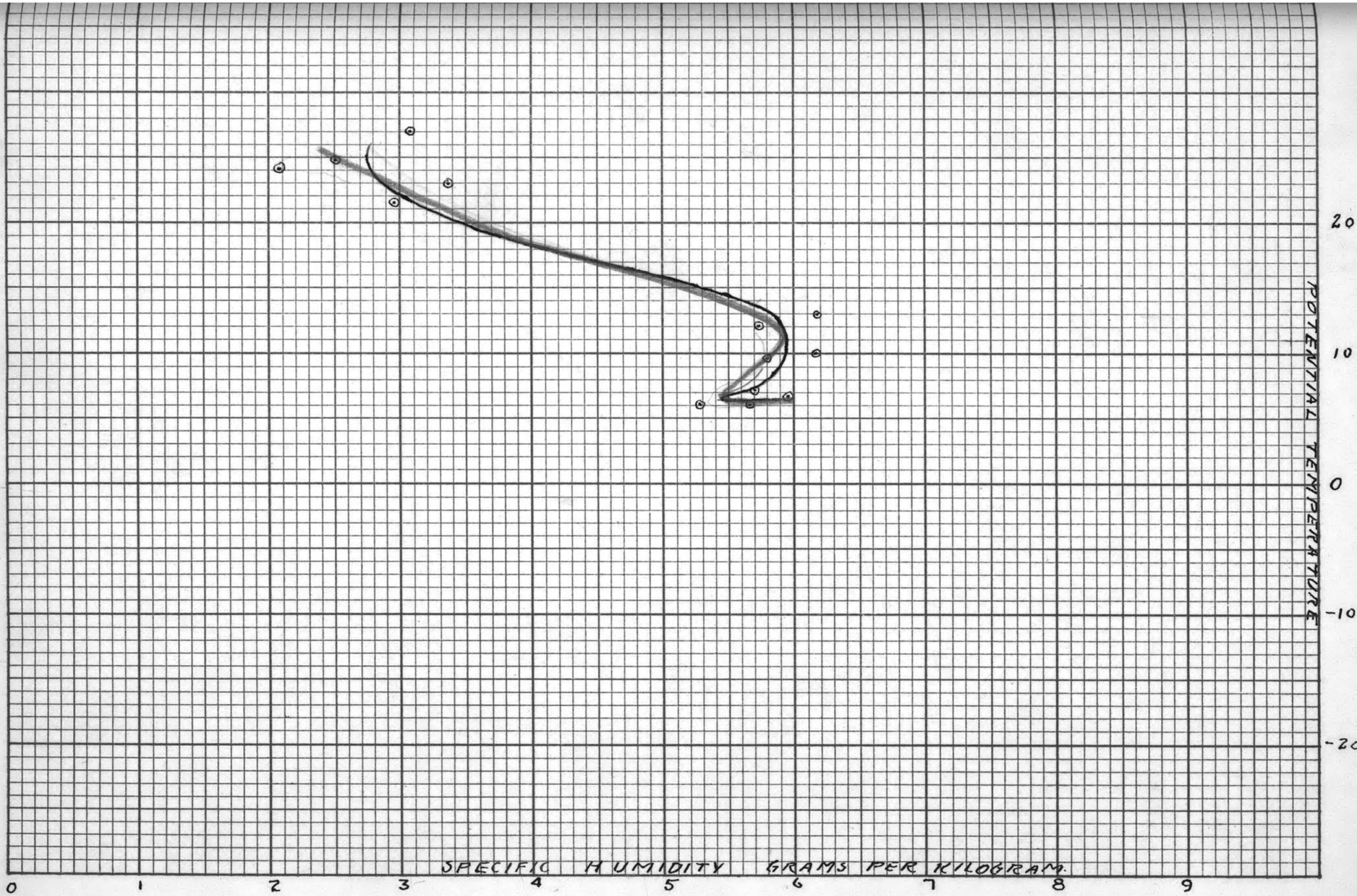
GROESBECK, TEXAS ~ 12 FEBRUARY, 1929.

FIGURE -16



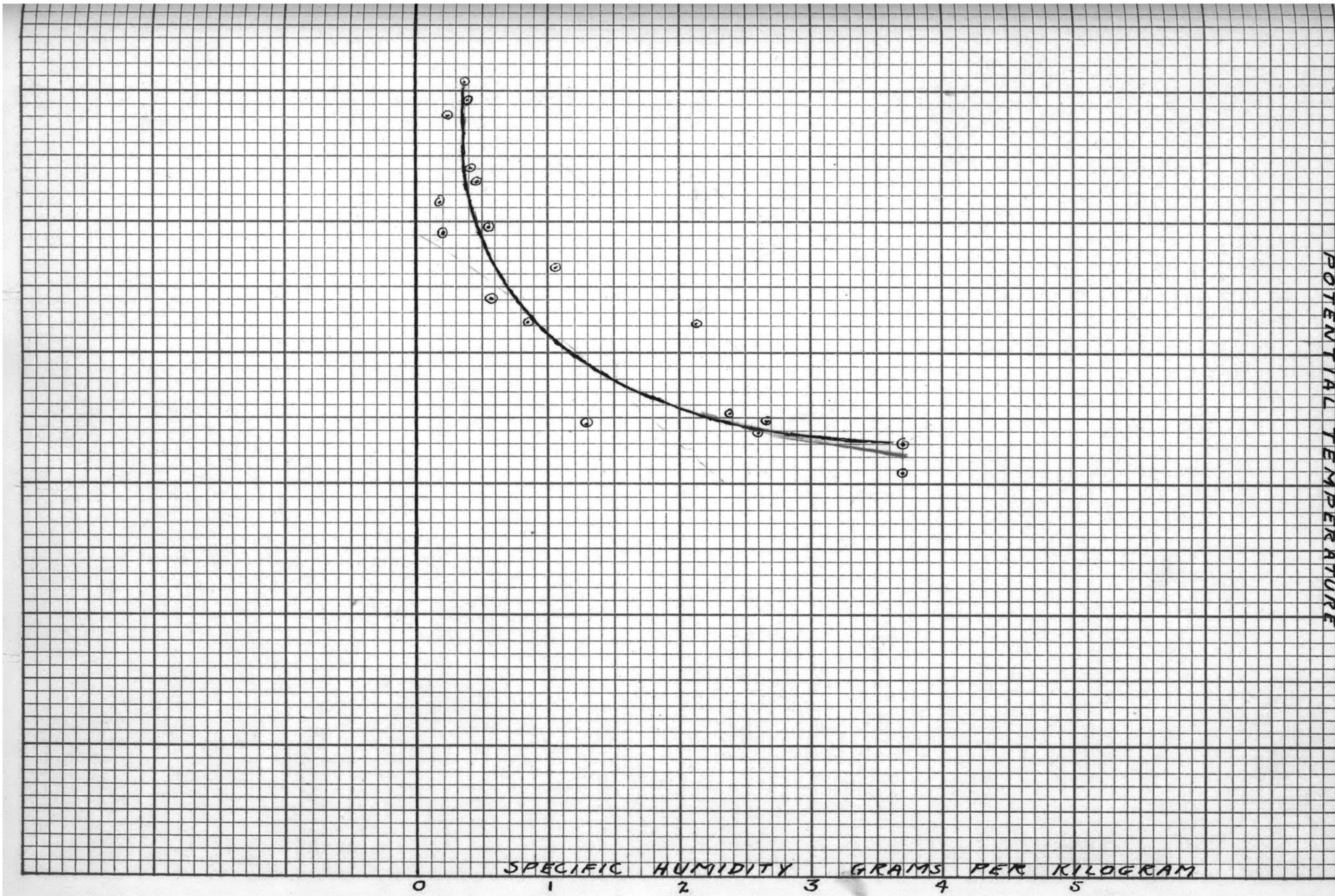
GROESBECK, TEXAS ~ 13, 14 FEBRUARY, 1929

FIGURE - 17



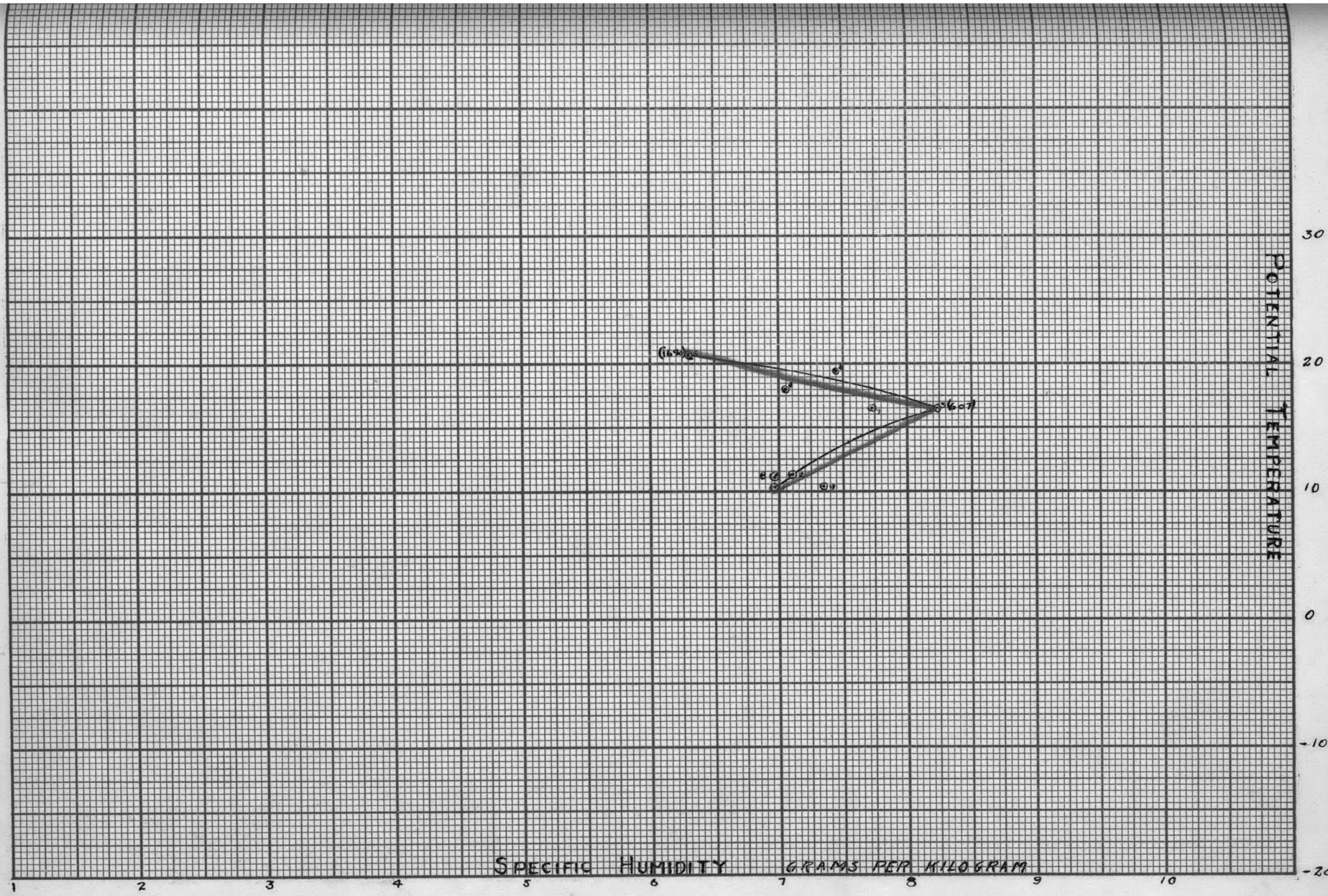
GROESBECK, TEXAS ~ 15 FEBRUARY, 1929.

FIGURE - 18



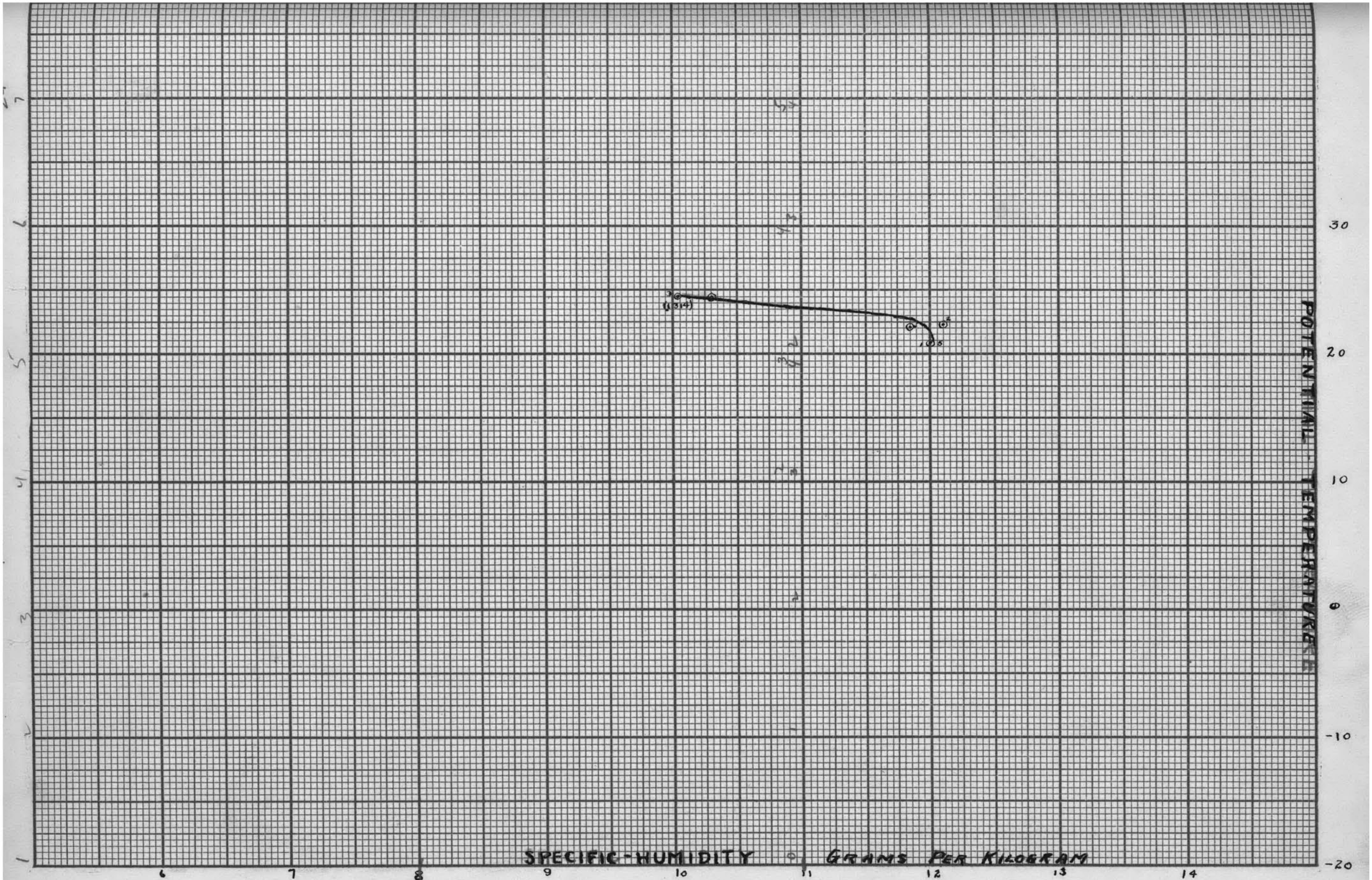
GROESBECK, TEXAS. ~ 16 FEBRUARY, 1929.

FIGURE - 19



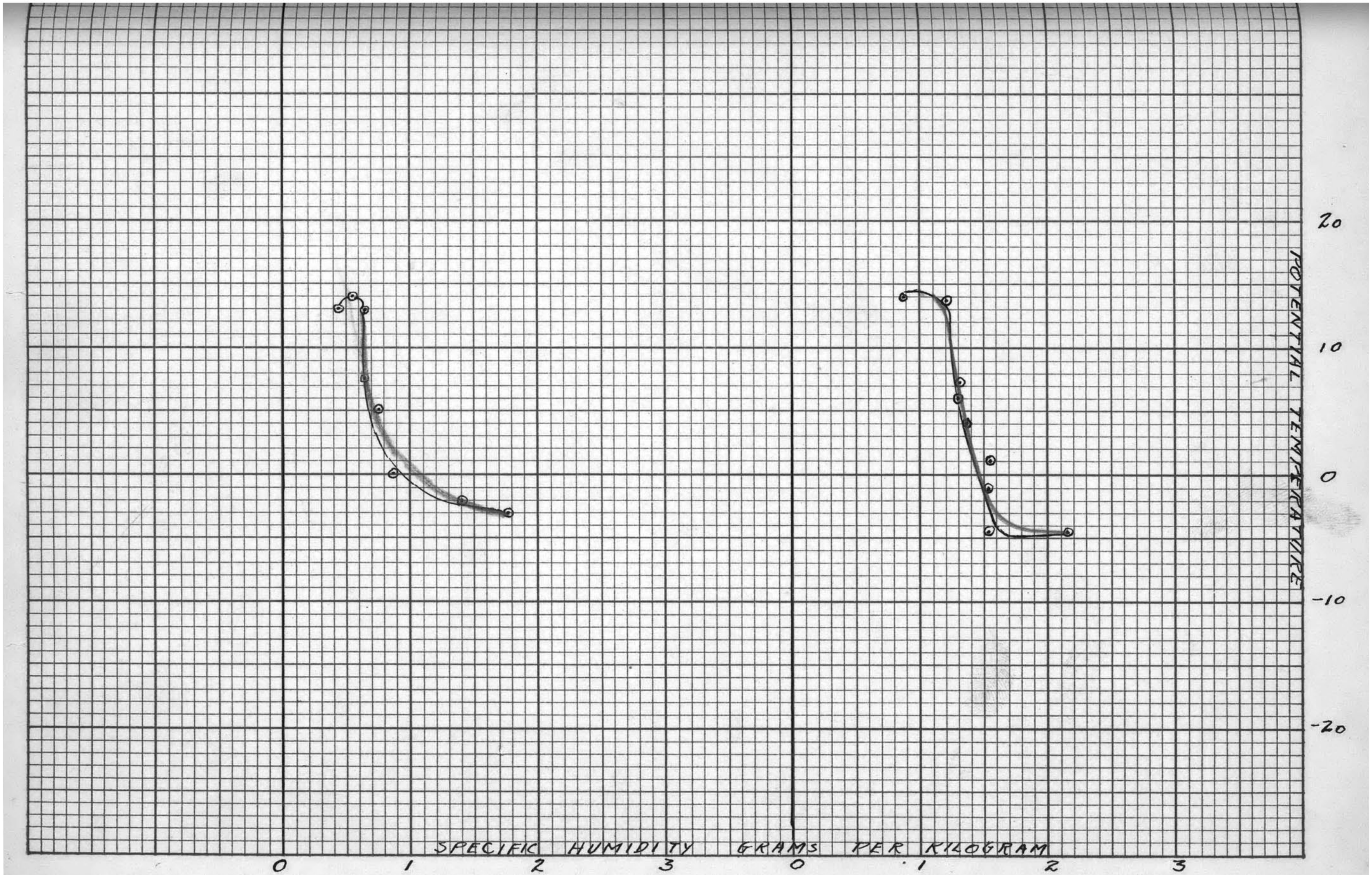
GROESBECK, TEXAS ~ 24 FEBRUARY, 1929.

FIGURE - 20



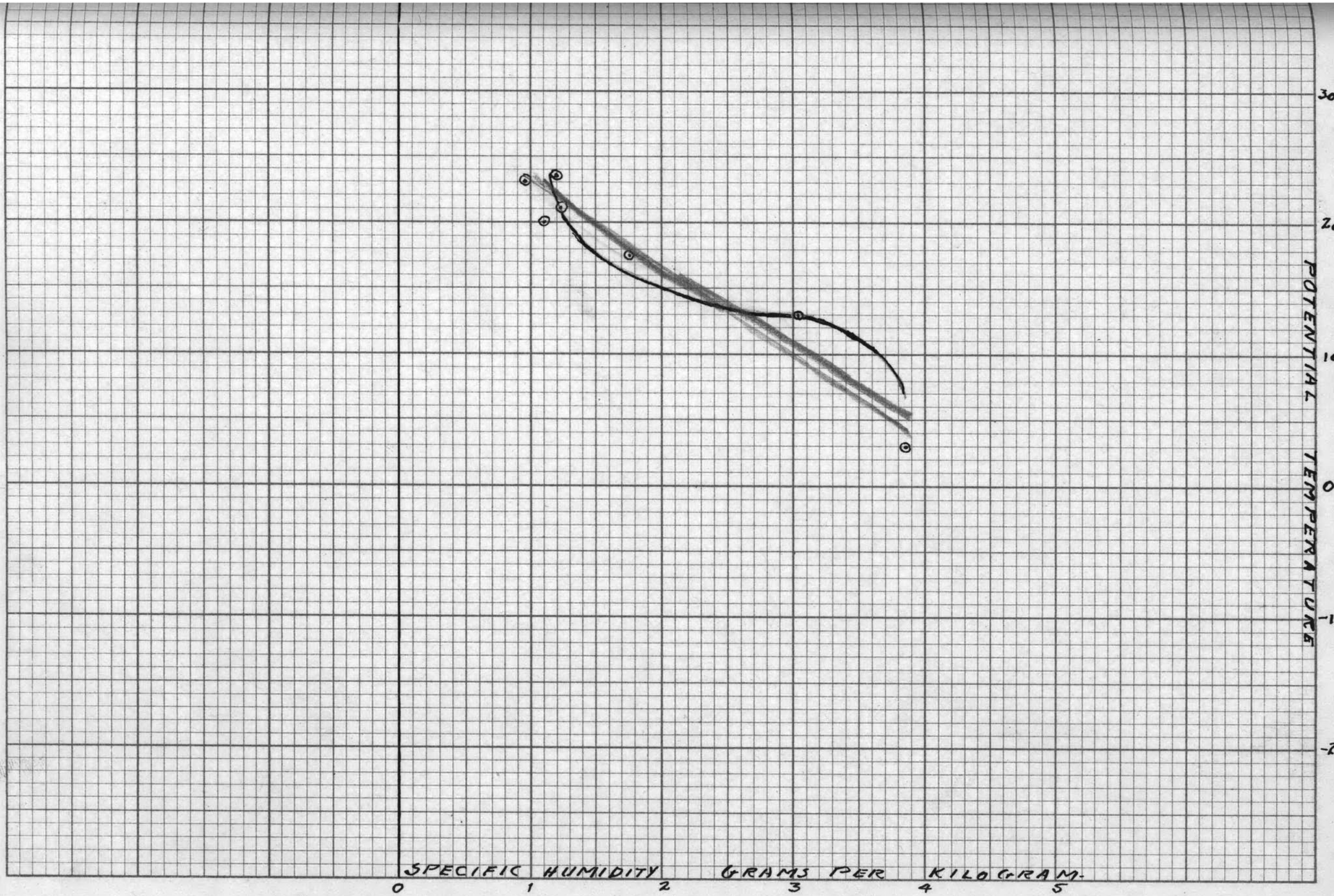
GROESBECK, TEXAS — 25 FEBRUARY, 1929.

FIGURE - 21



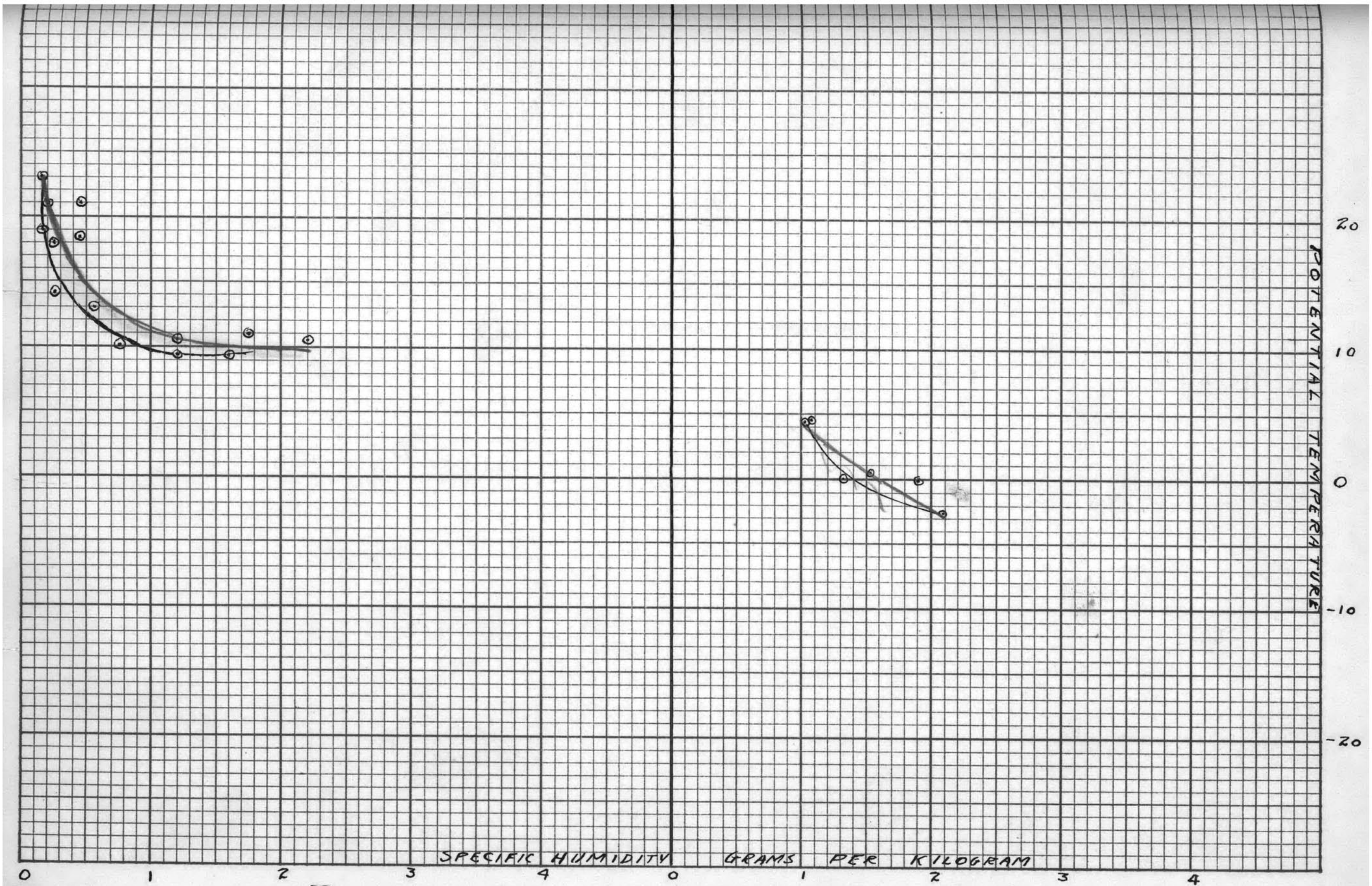
ANACOSTIA, D.C. ~ 12, 13 FEBRUARY, 1929.

FIGURE - 22



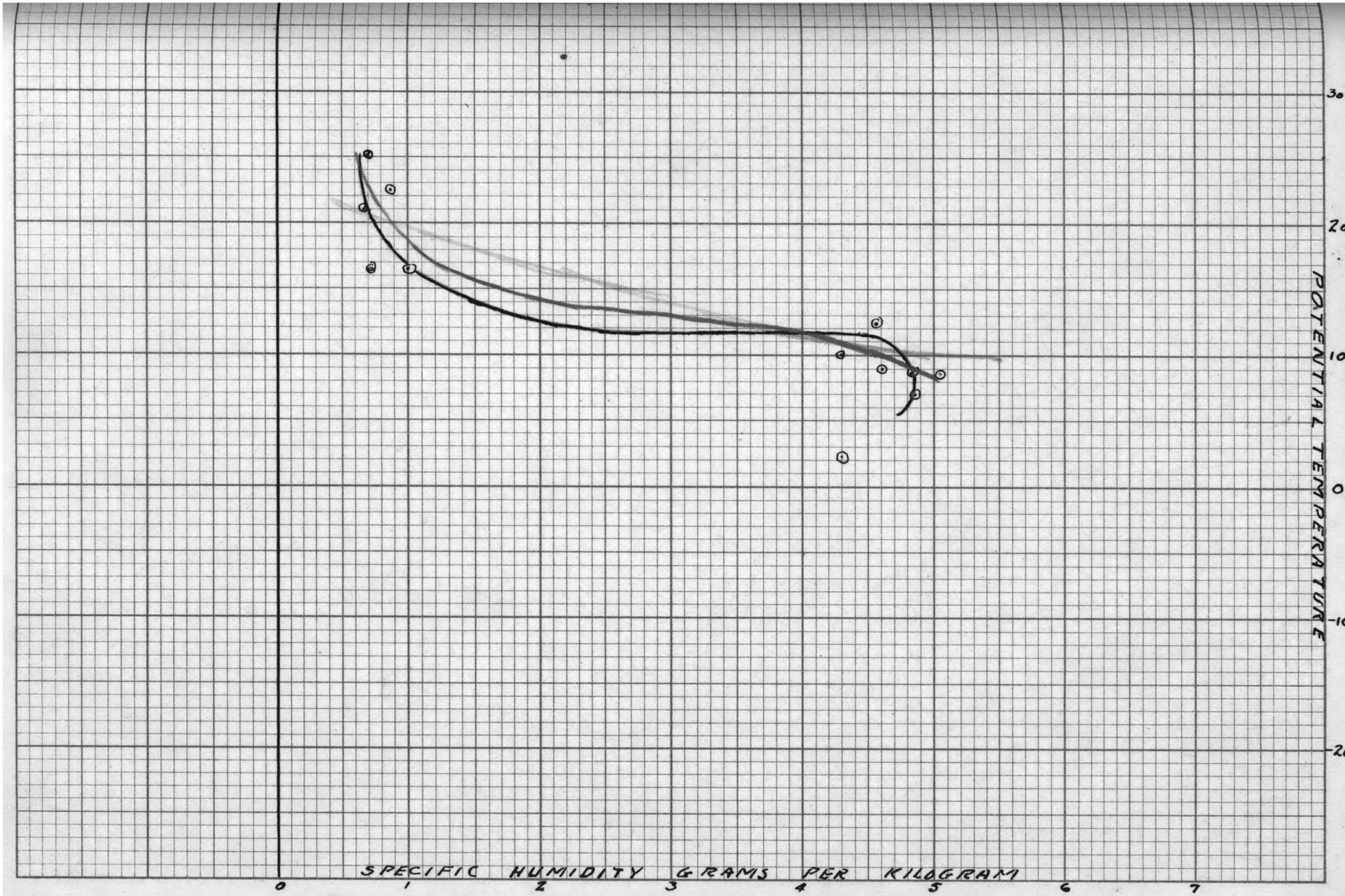
Anacostia, D.C. ~ 18 February, 1929

Figure 23



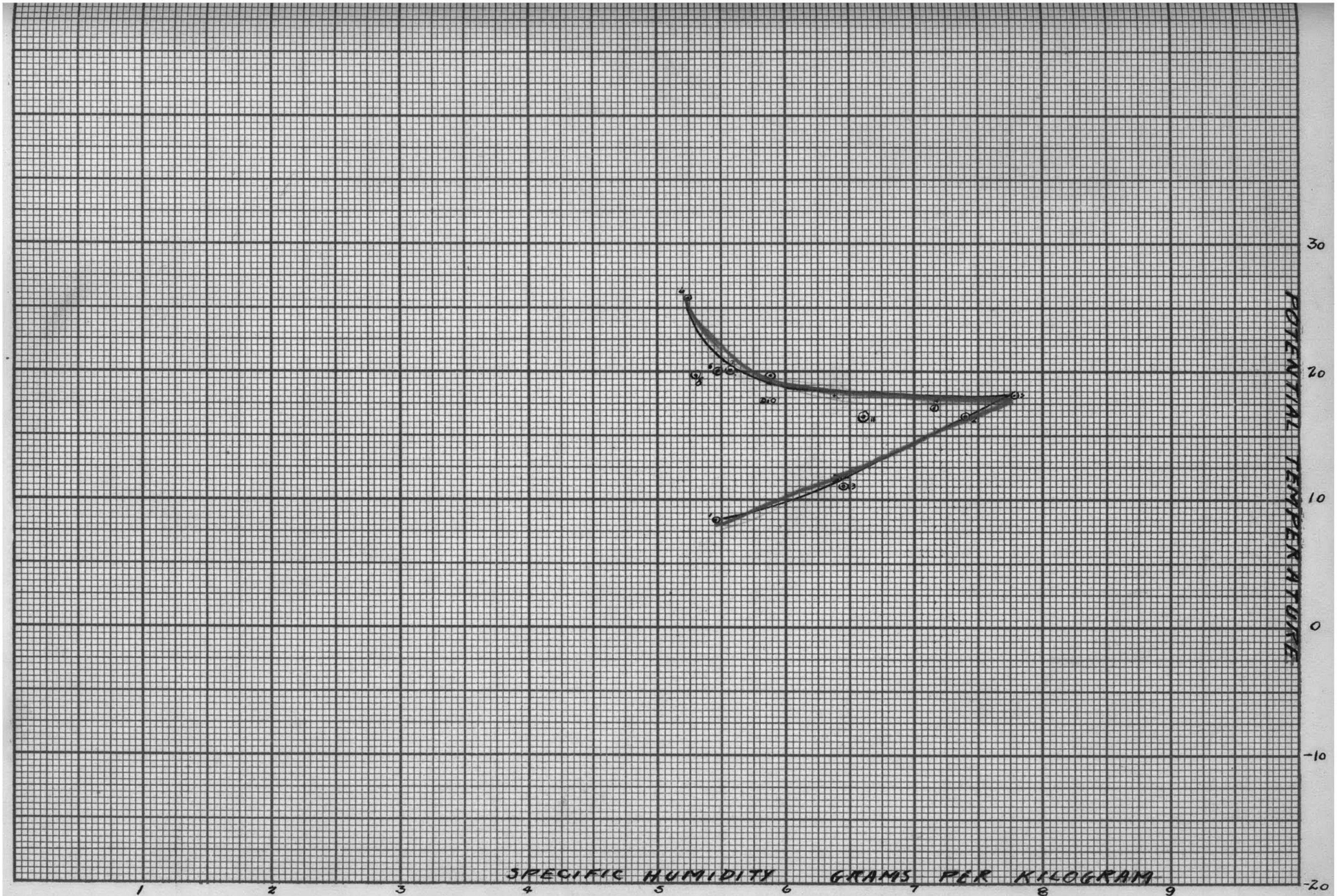
DUE WEST, S. C. ~ 11, 12 FEBRUARY, 1929.

FIGURE- 24



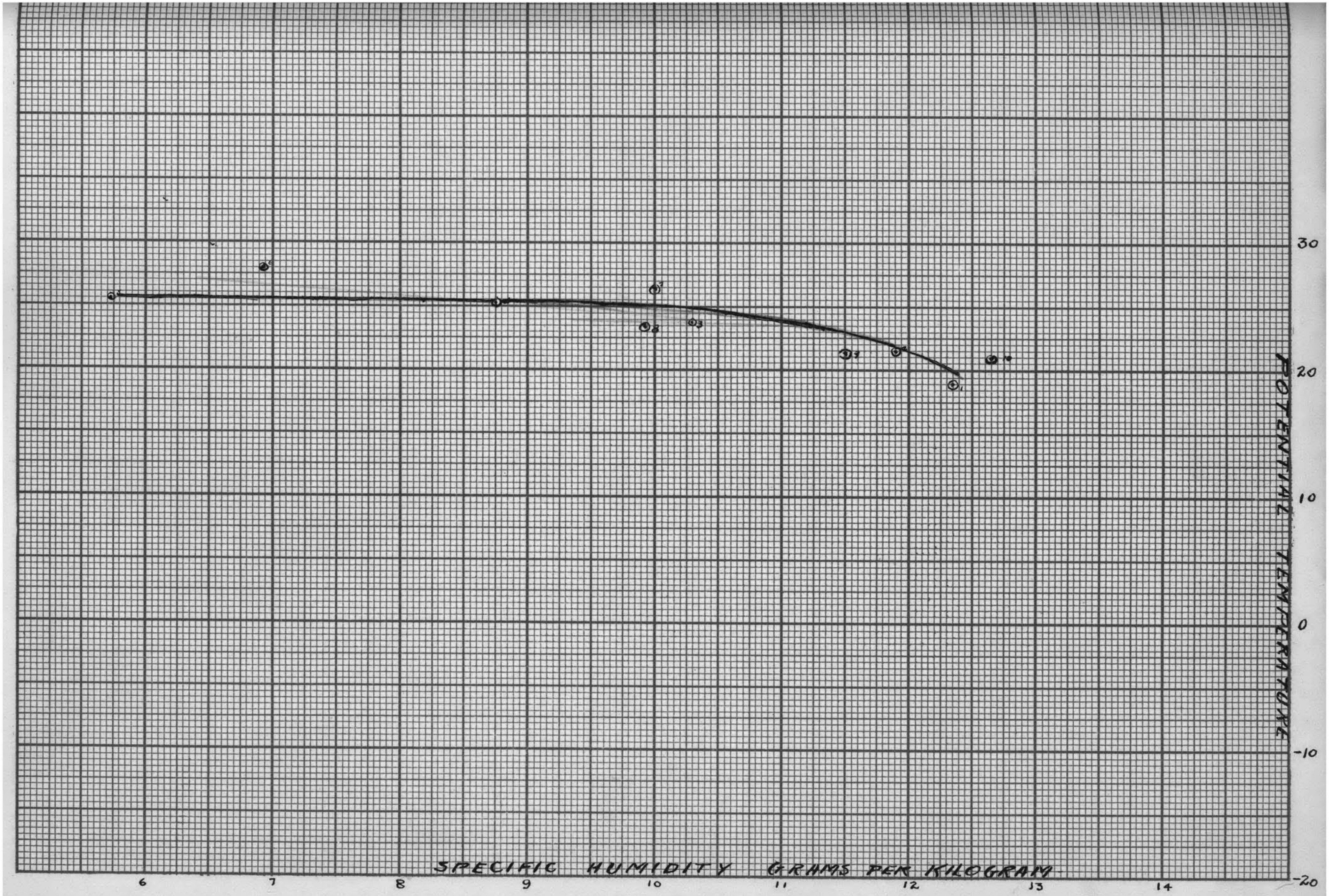
DUE WEST, S.C. ~ 18 FEBRUARY, 1929.

FIGURE – 25



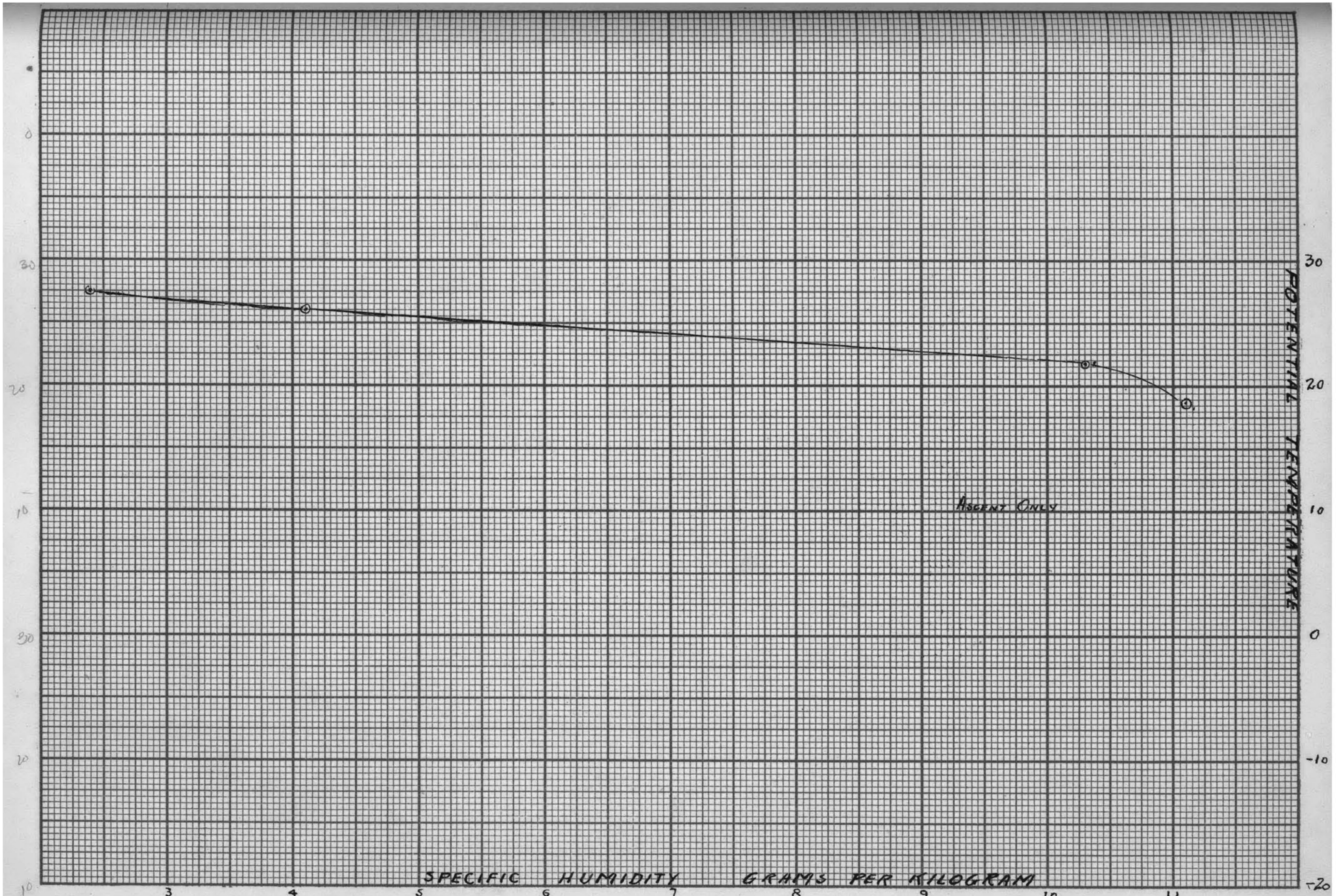
DUE WEST, S.C. - 25 FEBRUARY, 1929.

FIGURE - 26



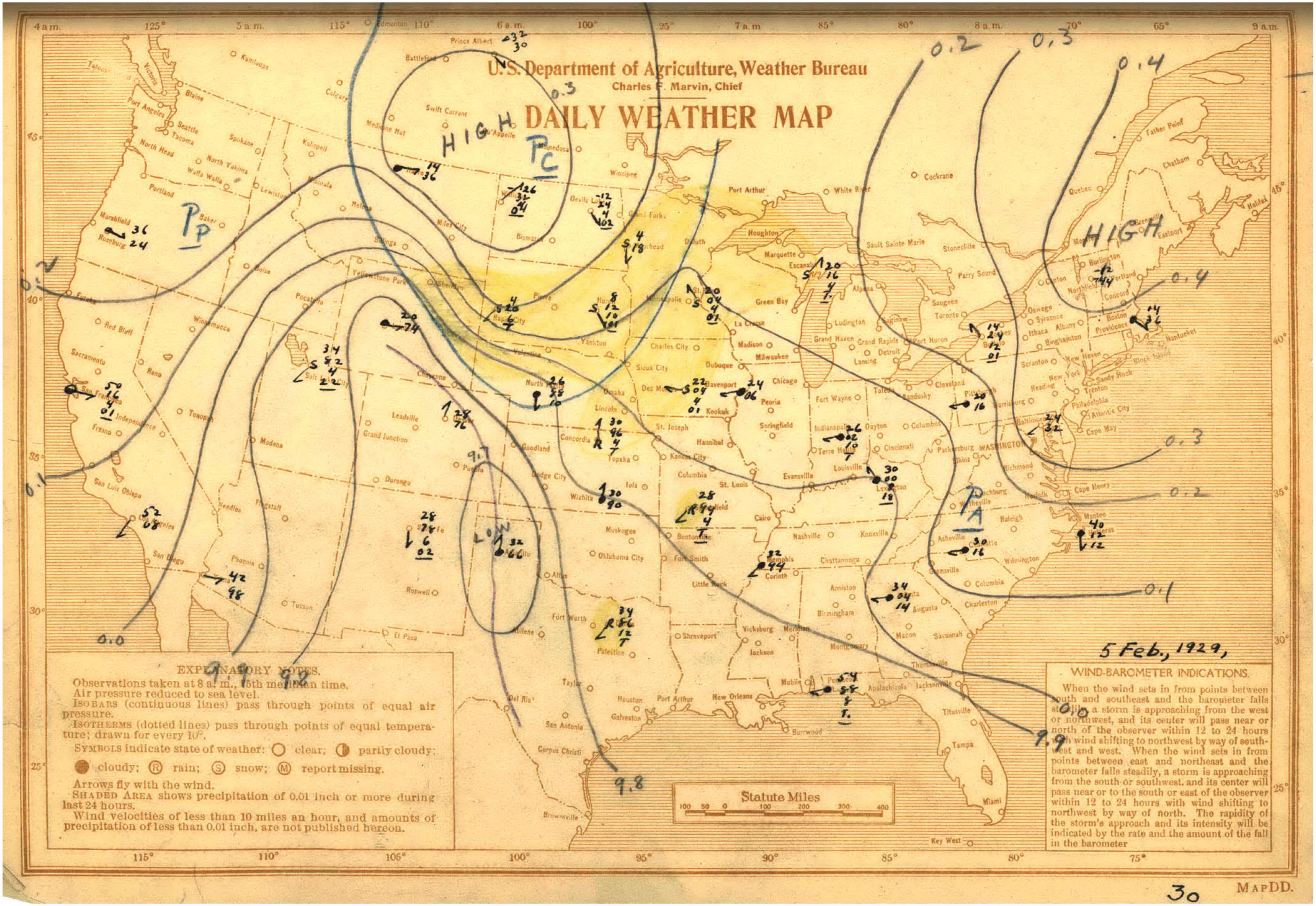
DUE WEST, S.C - 26 FEBRUARY, 1929.

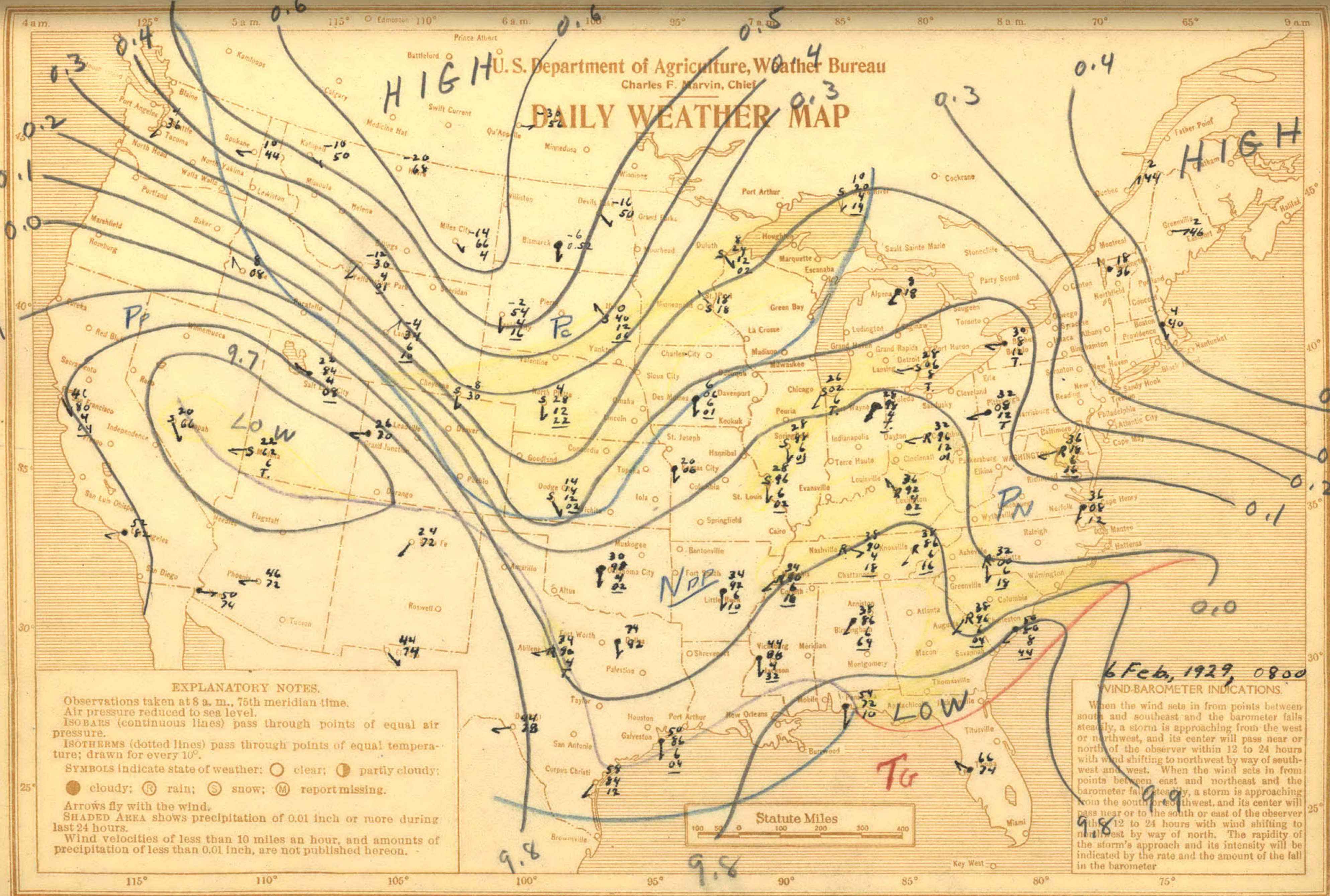
FIGURE - 27



DUE WEST, S.C. – 28 FEBRUARY, 1929.

FIGURE – 28


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
HIGH
LOW
5 Feb., 1929,
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer
Statute Miles
30
MAPDD.


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
HIGH
LOW
LOW
6 Feb, 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
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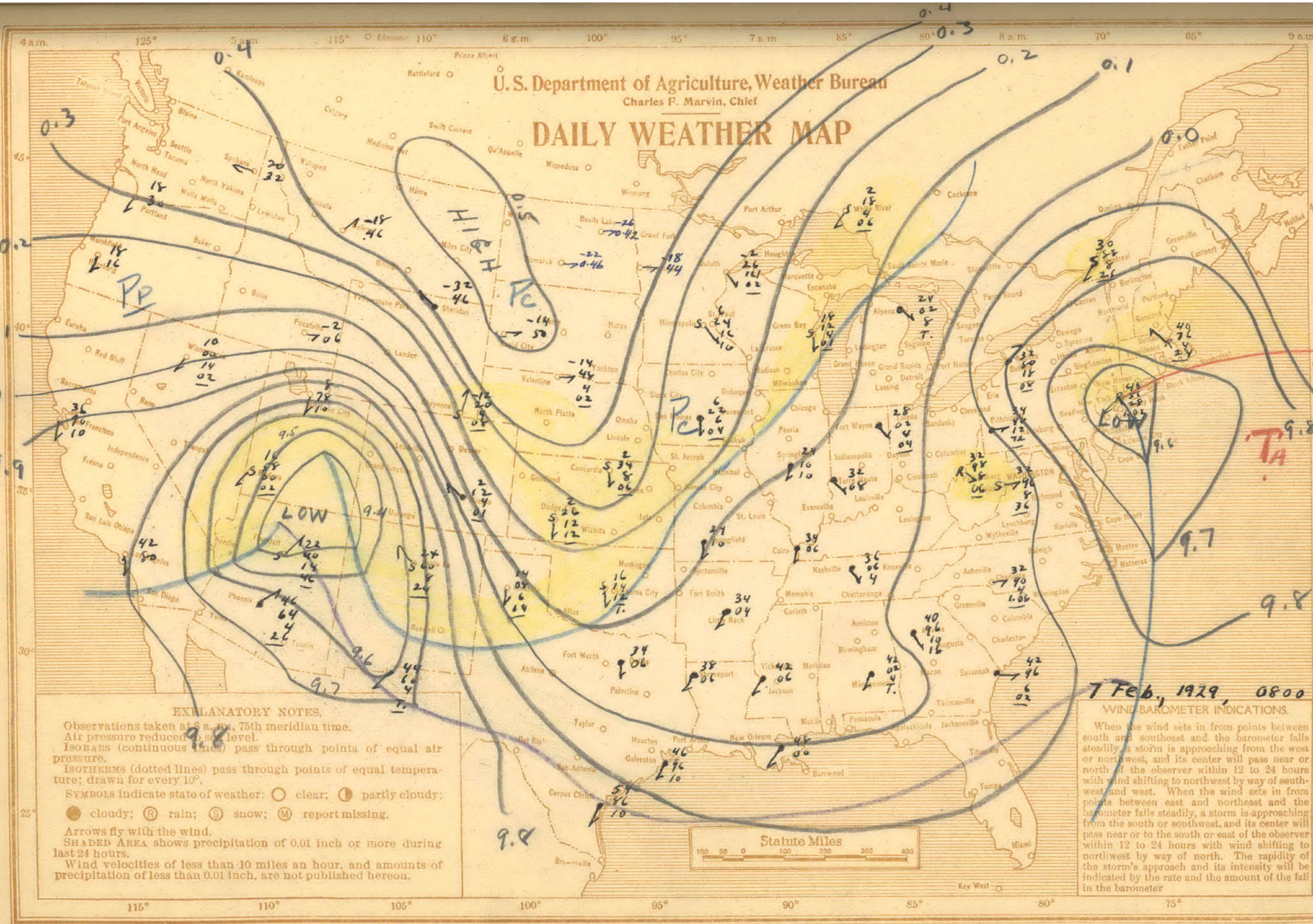
Statute Miles

MAPDD.


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
7 Feb., 1929, 0800
HIGH
LOW
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
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ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
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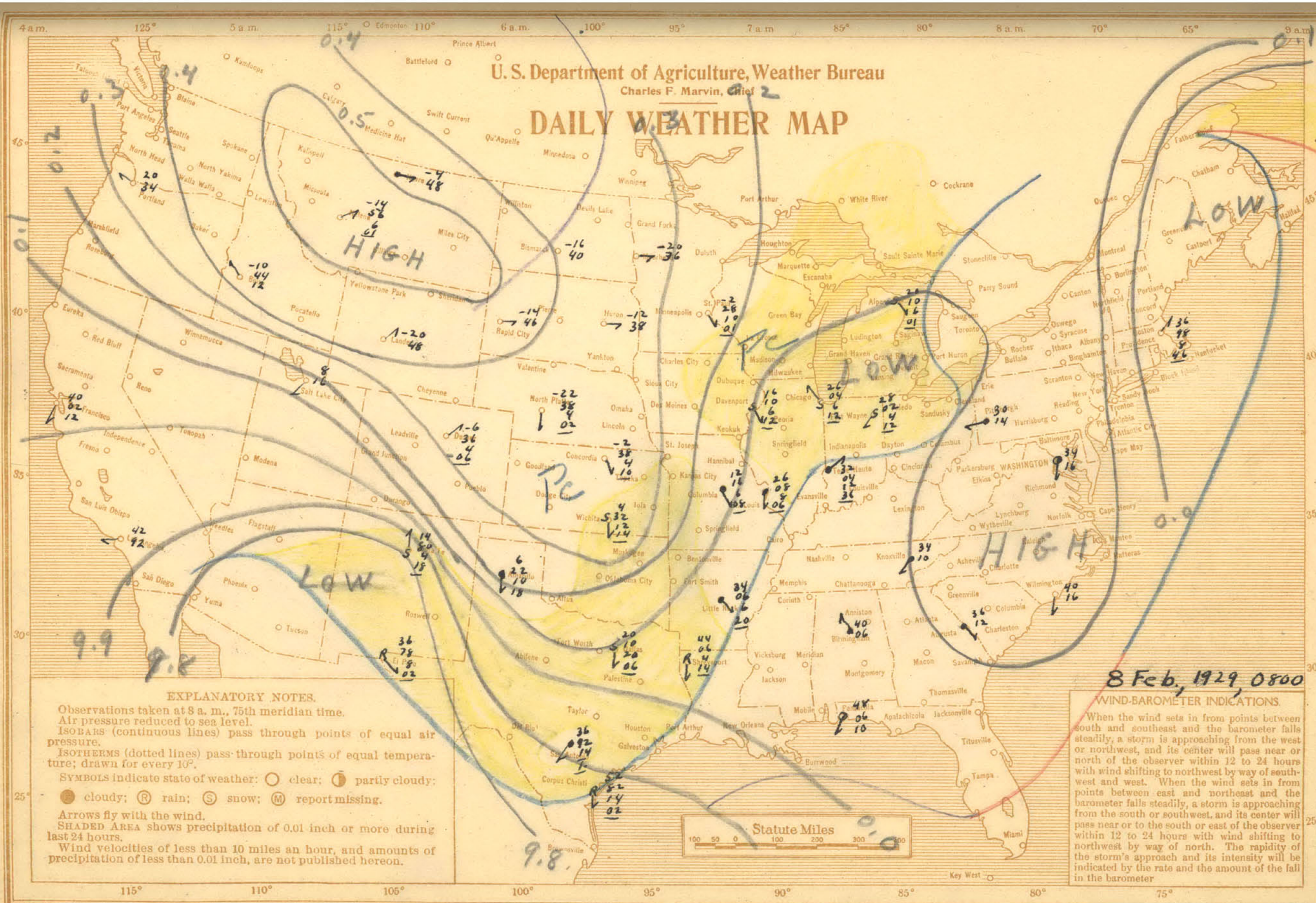
Statute Miles

MapDD.


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
LOW
LOW
LOW
HIGH
8 Feb, 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
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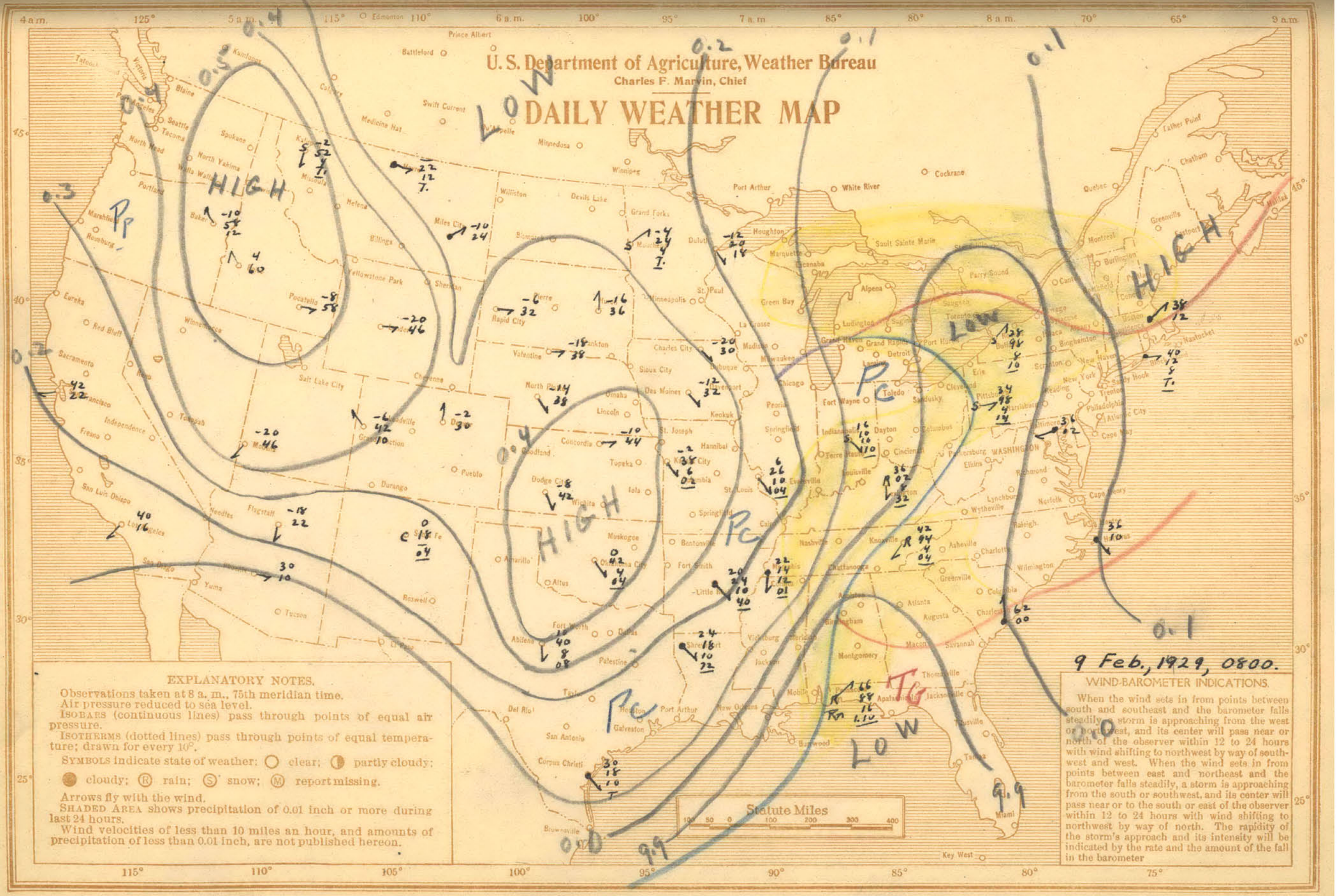
Statute Miles

MapDD.


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
LOW
9 Feb., 1929, 0800.
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
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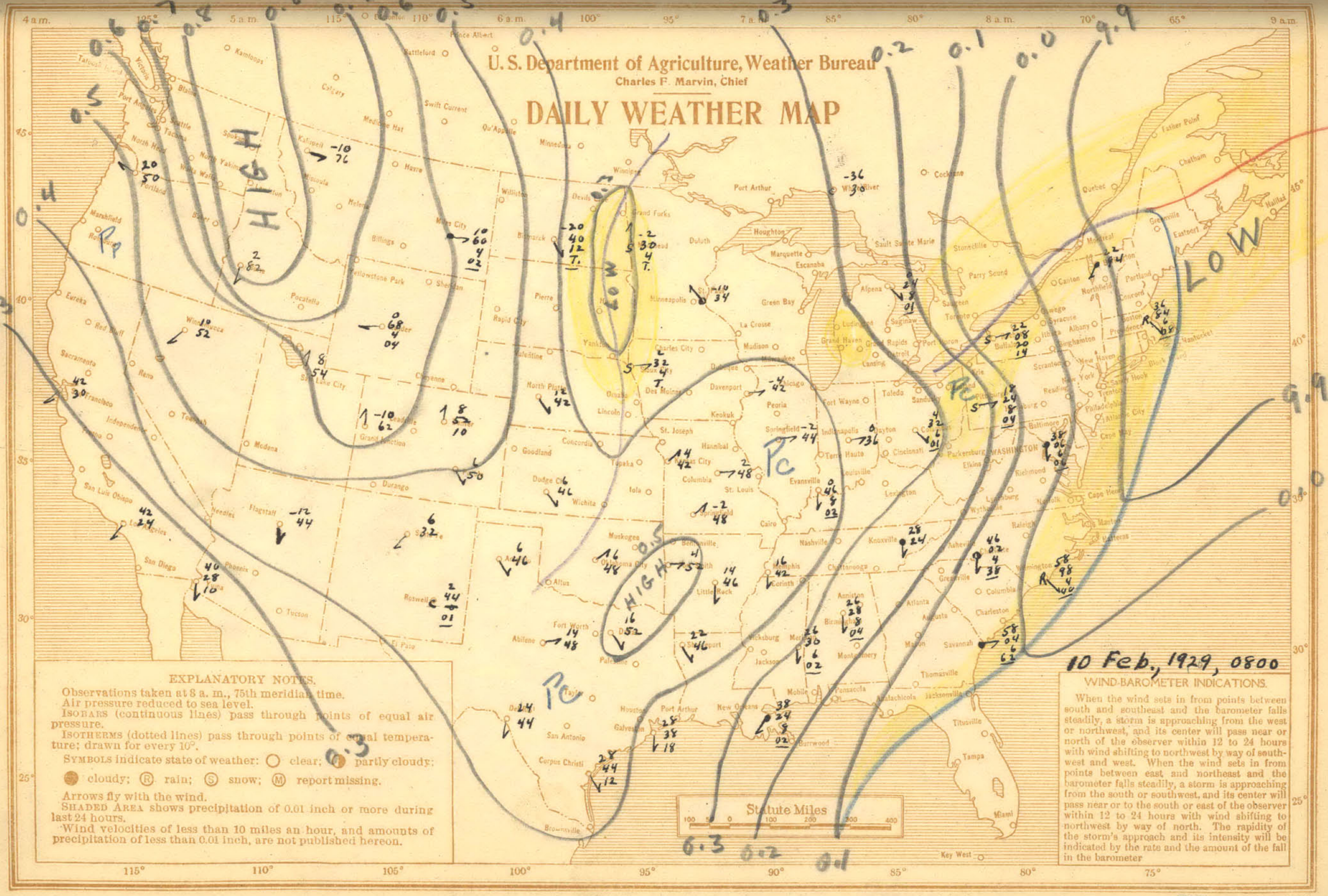
Statute Miles

34

MAPDD.


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
LOW
HIGH
LOW
10 Feb., 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
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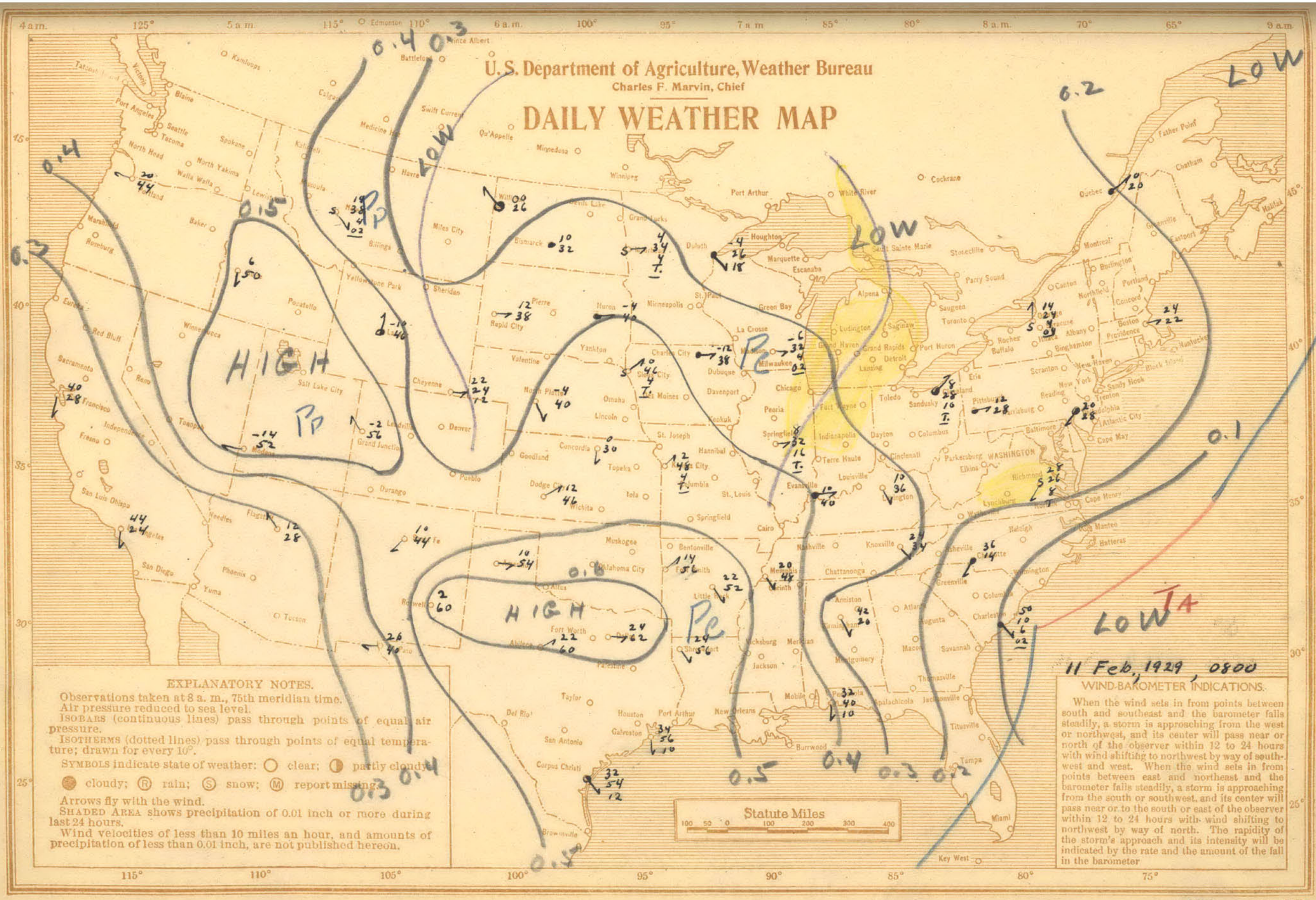
Statute Miles


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
HIGH
LOW
LOW
LOW
LOW
11 Feb, 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
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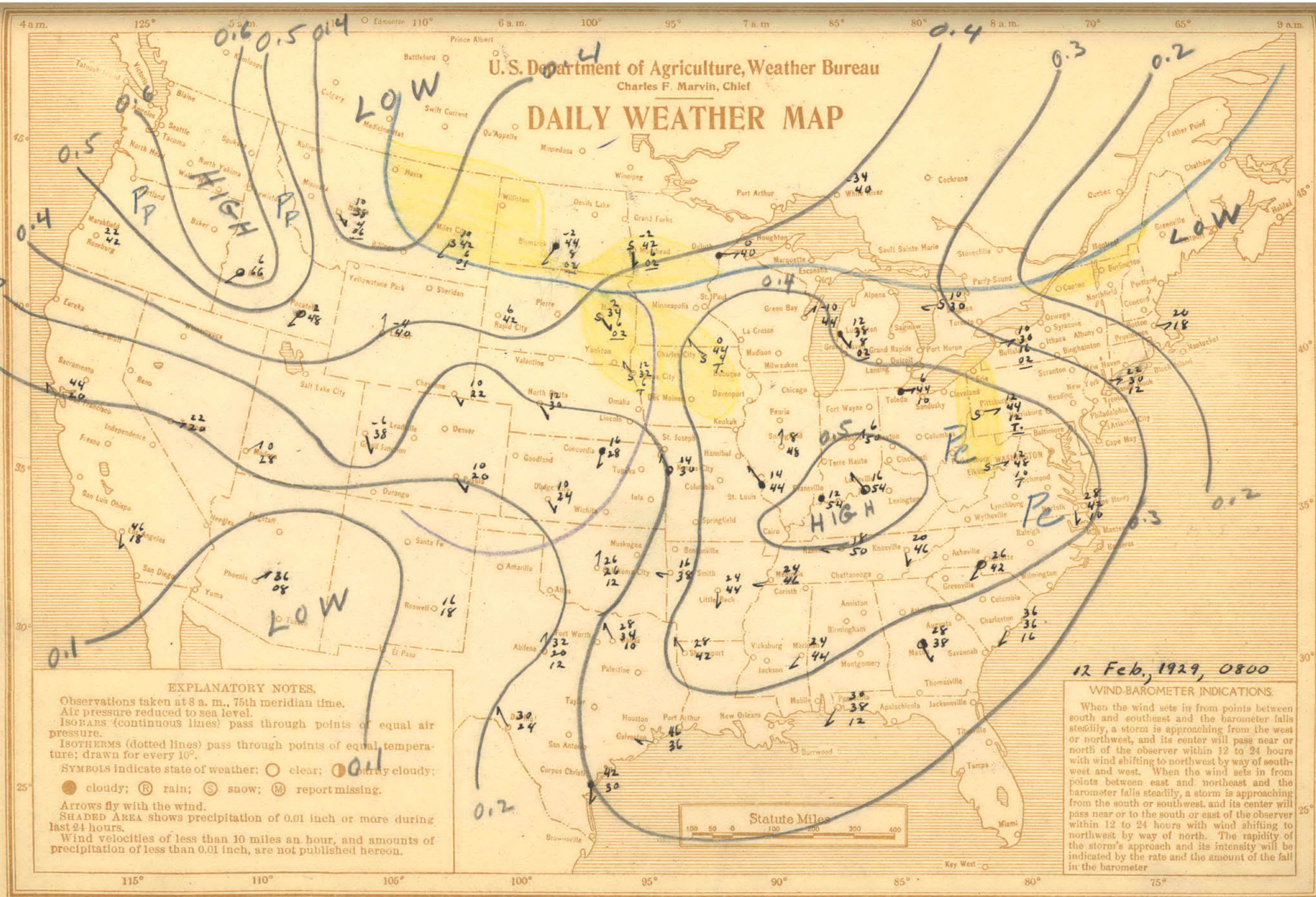
Statute Miles


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
12 Feb., 1929, 0800
HIGH
LOW
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
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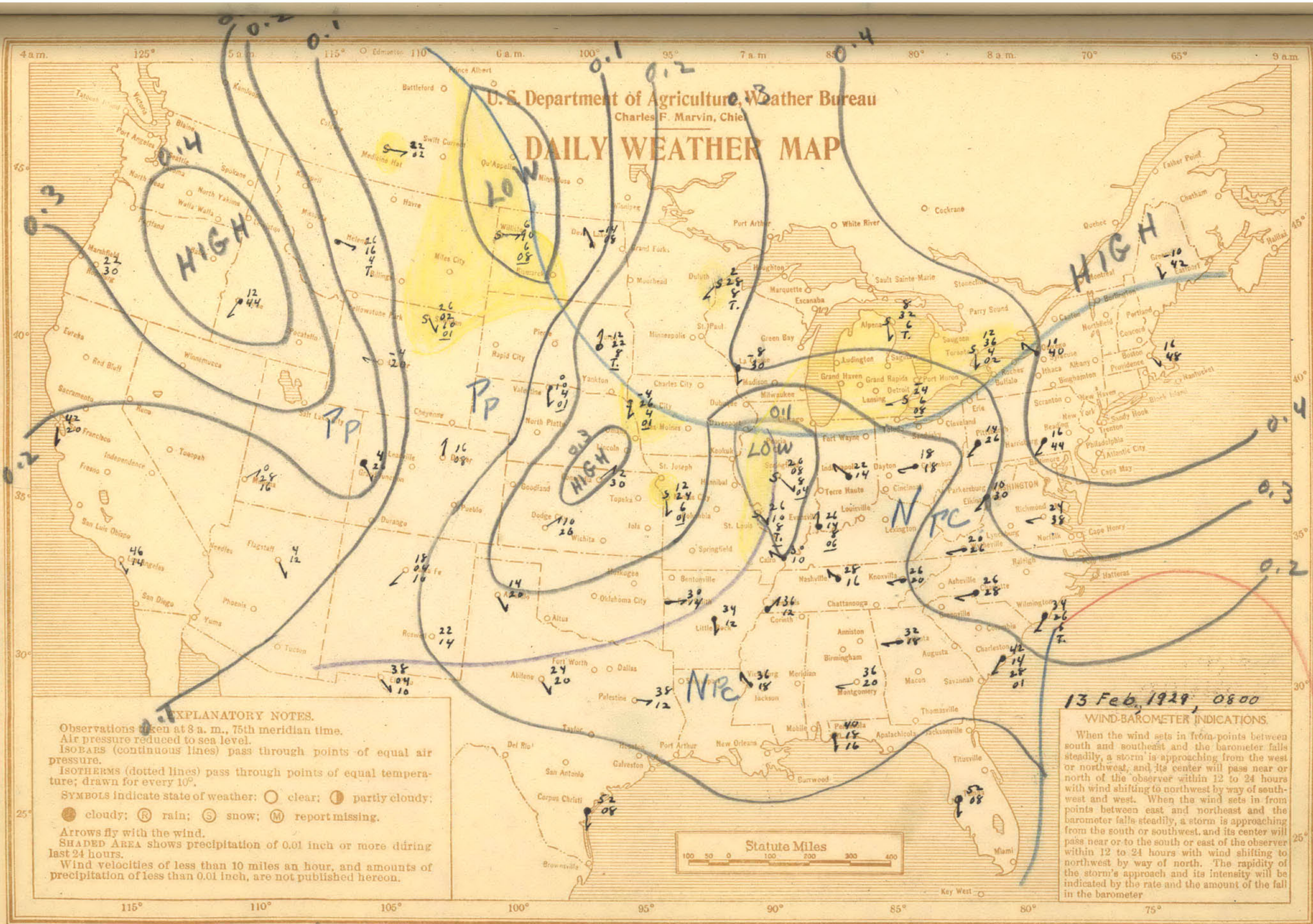
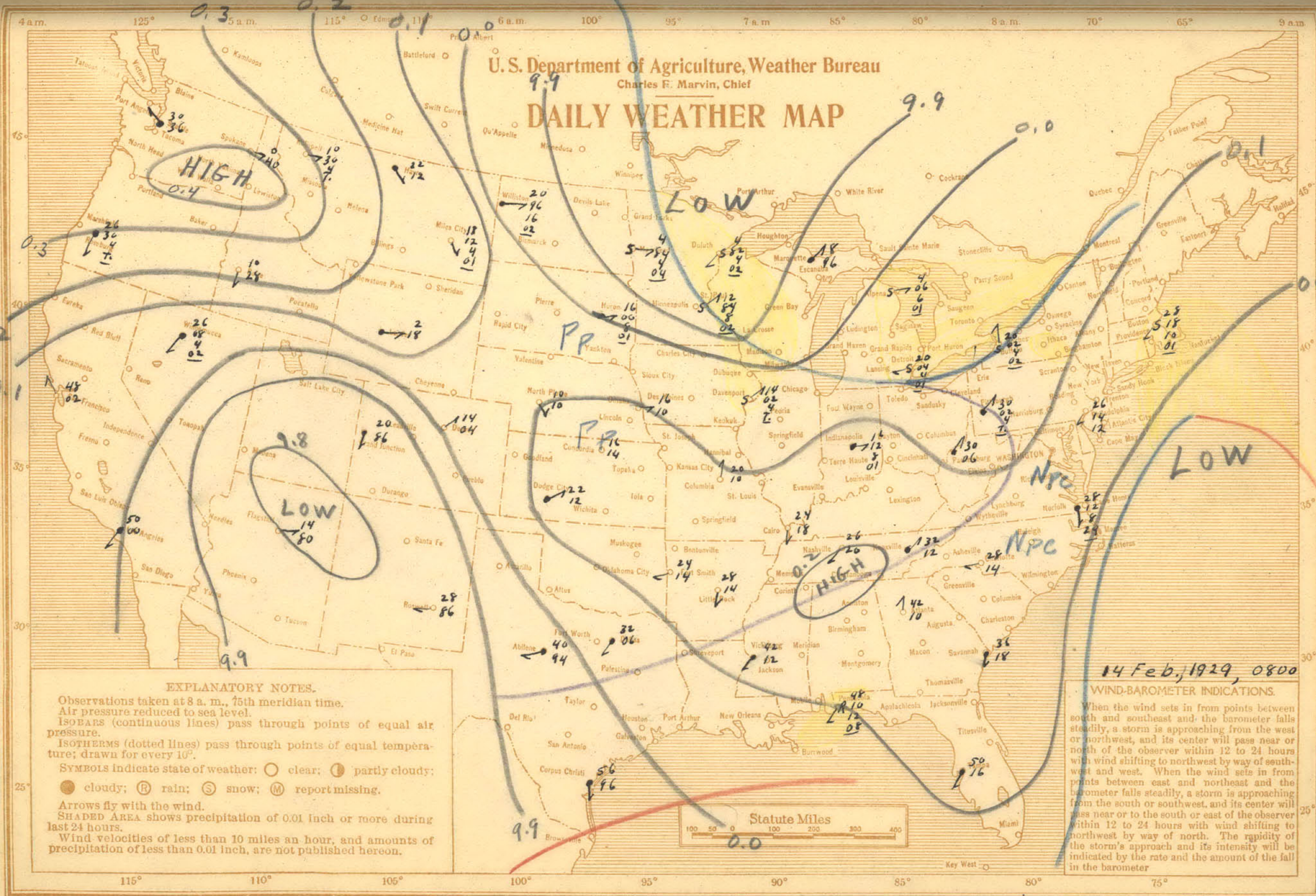
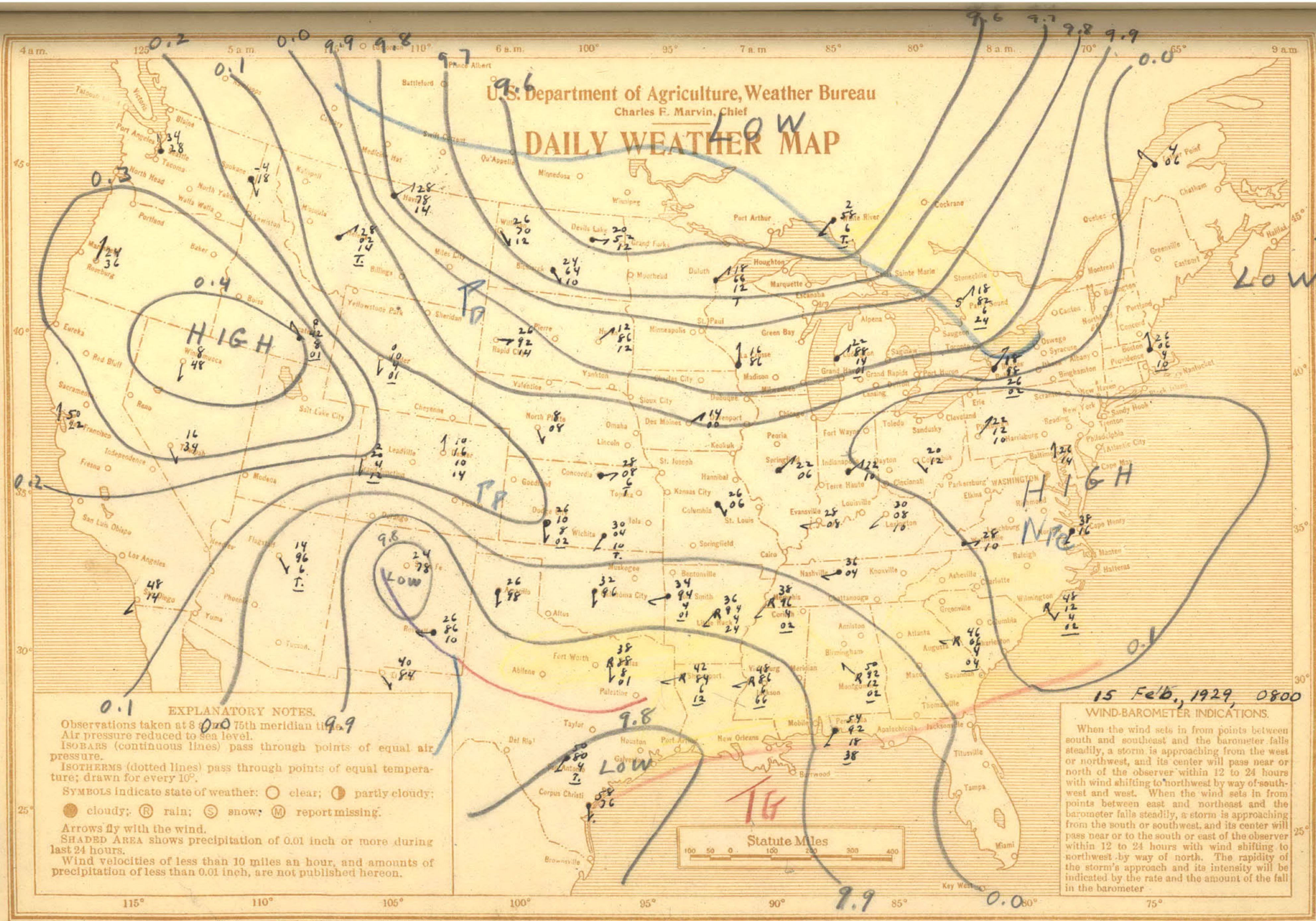
Statute Miles

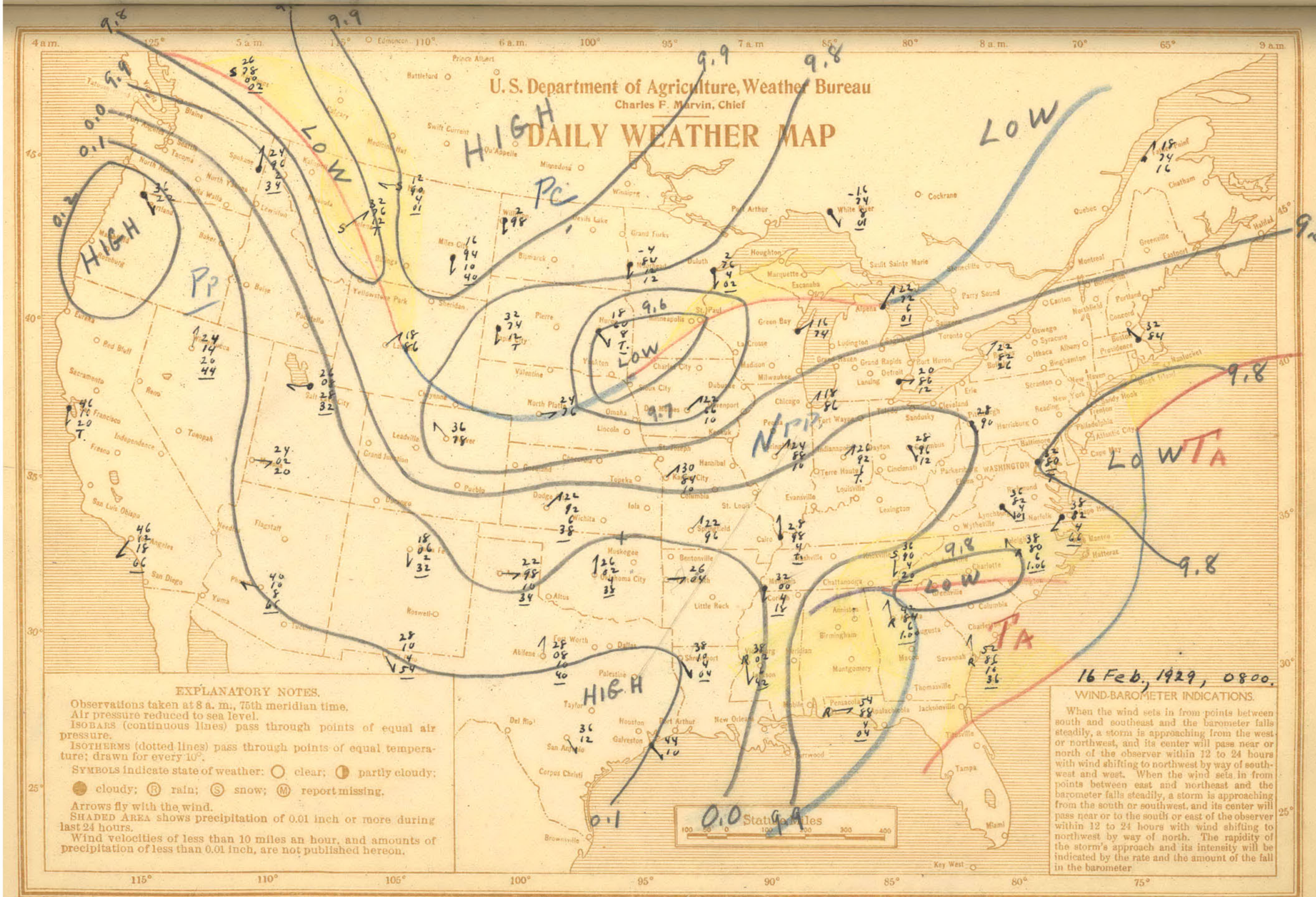

U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
13 Feb. 1929, 08.00
HIGH
LOW
HIGH
LOW
HIGH
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles

MapDD.


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
LOW
LOW
HIGH
LOW
14 Feb, 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer
Statute Miles

MAP DD.


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
15 Feb., 1929, 0800
HIGH
LOW
EXPLANATORY NOTES.
Observations taken at 8 a.m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
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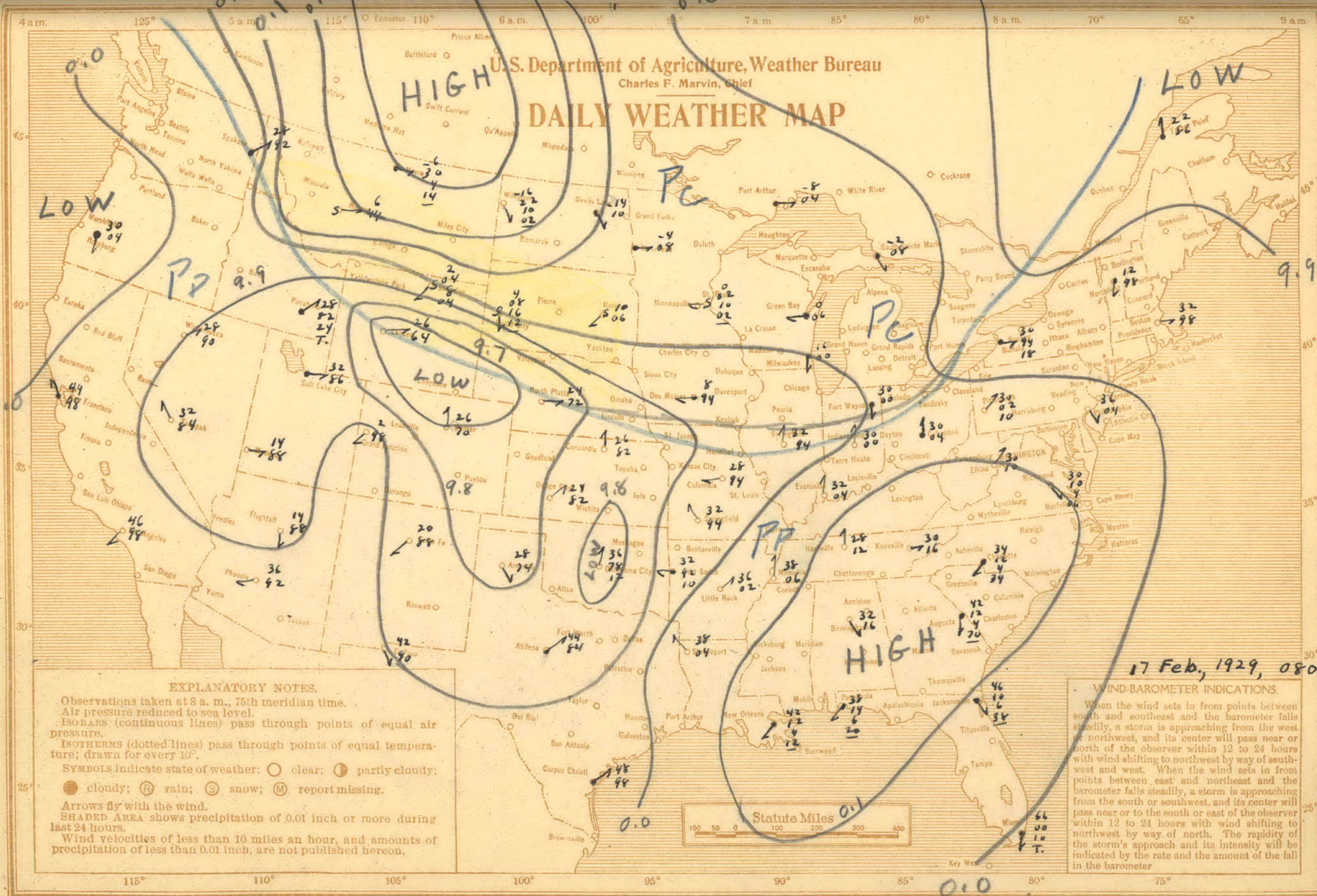
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of south-west and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
16 Feb., 1929, 0800.
HIGH
LOW
WASHINGTON

41

MapDD.


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
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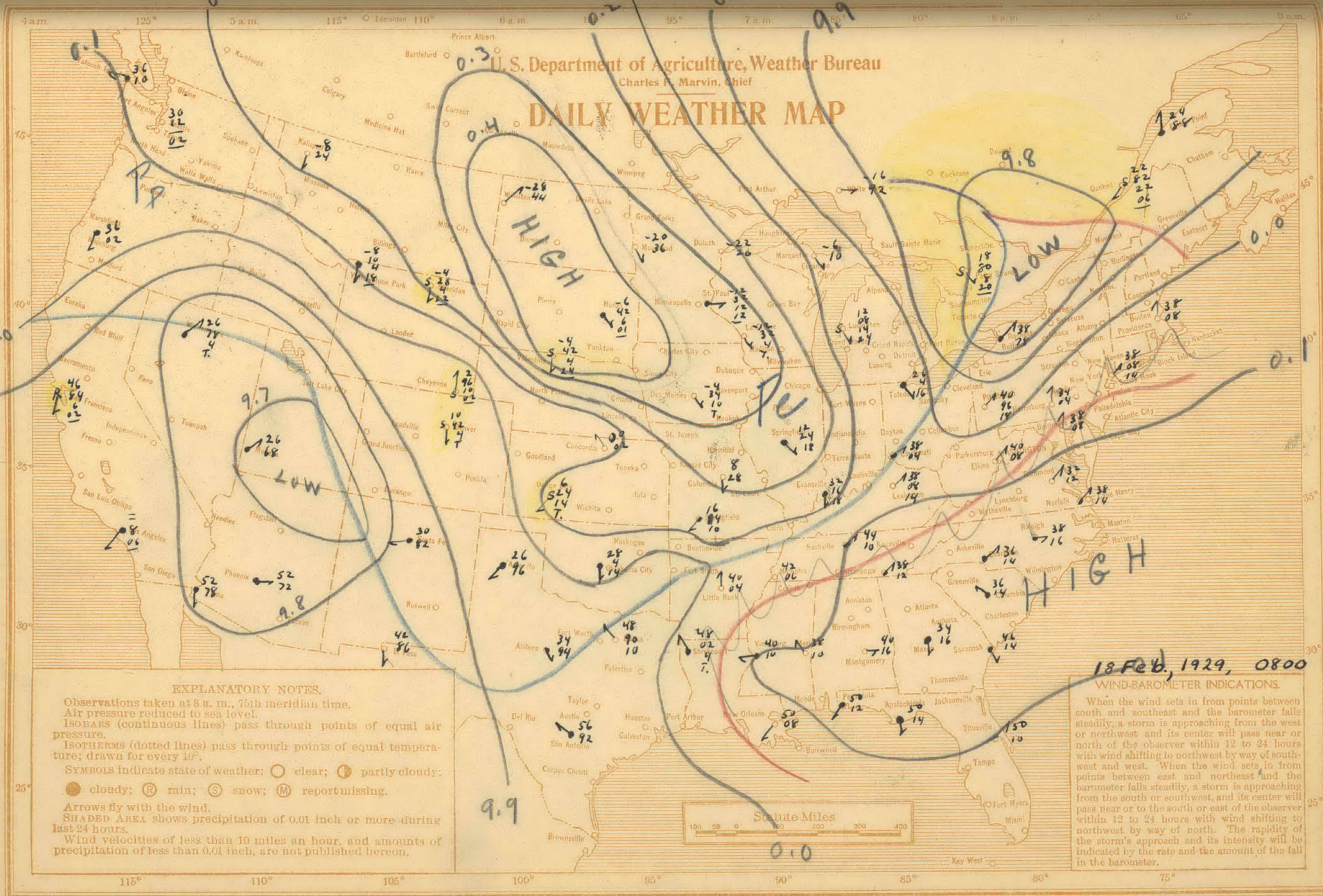
Statute Miles
HIGH
LOW
17 Feb., 1929, 0800

42

MAPDD.



EXPLANATORY NOTES.

Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: ○ clear; ◐ partly cloudy; ● cloudy; Ⓡ rain; Ⓢ snow; Ⓜ report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.

WIND-BAROMETER INDICATIONS.

When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
19 Feb, 1929, 0800
HIGH
LOW
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
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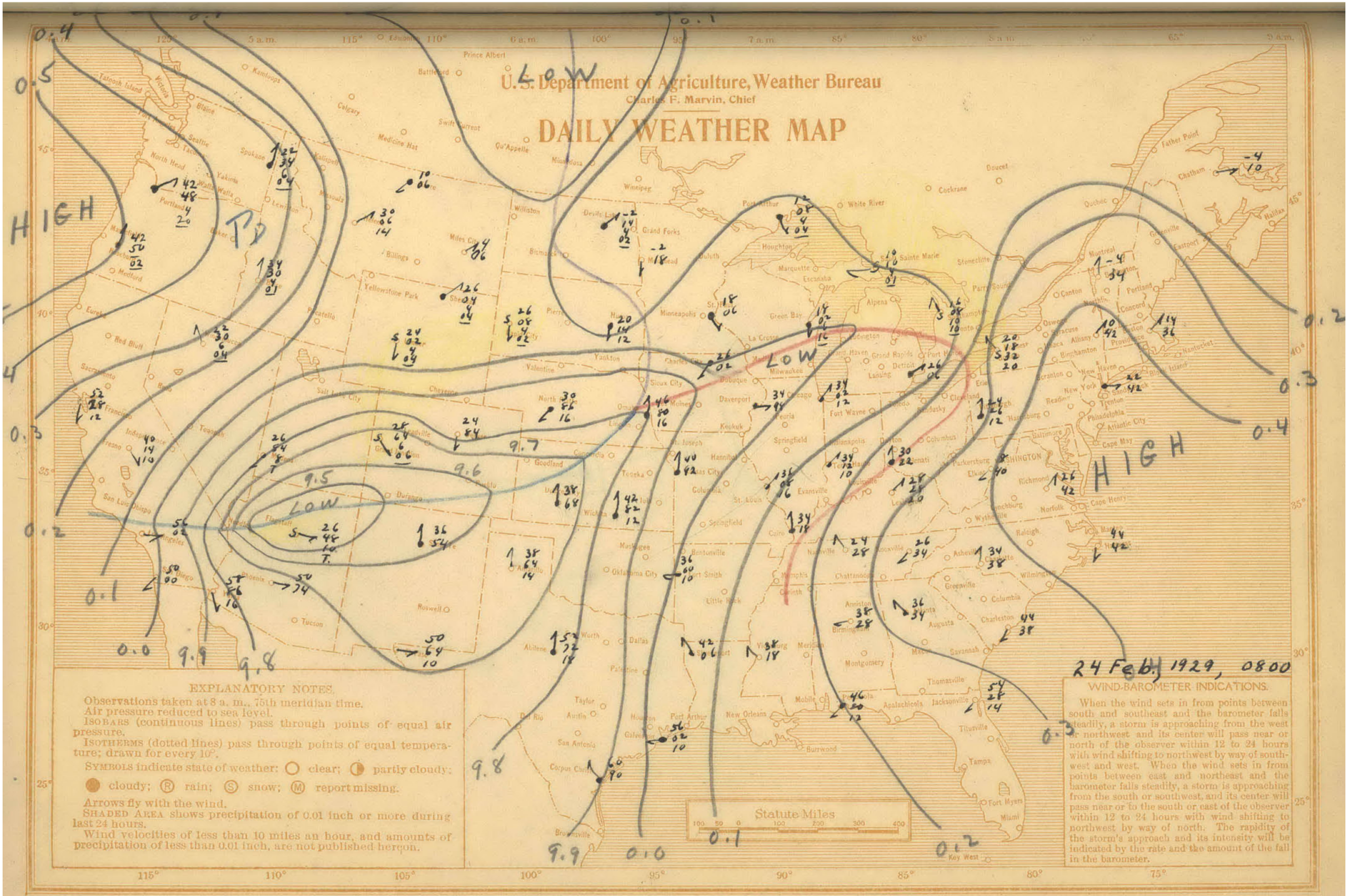
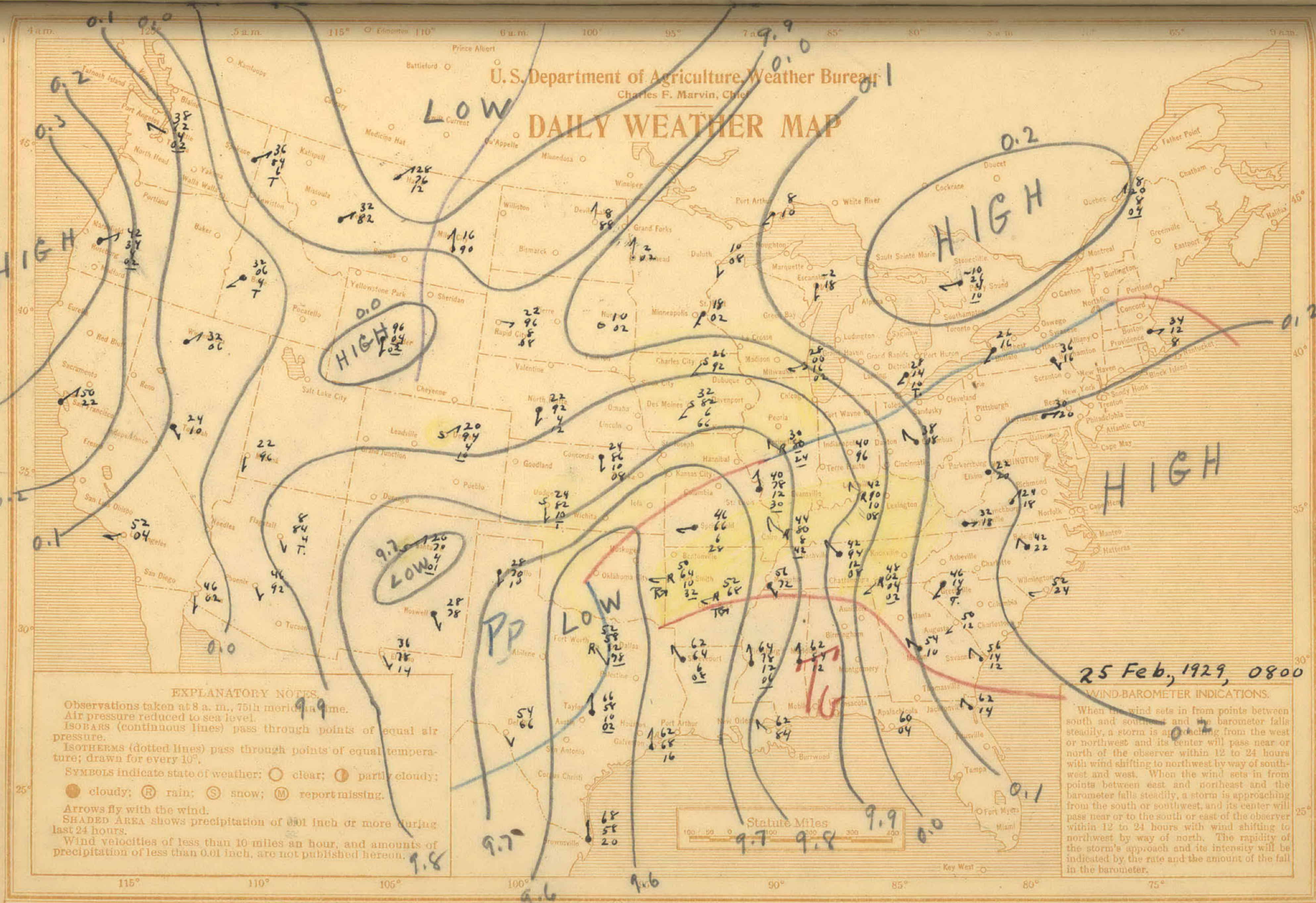
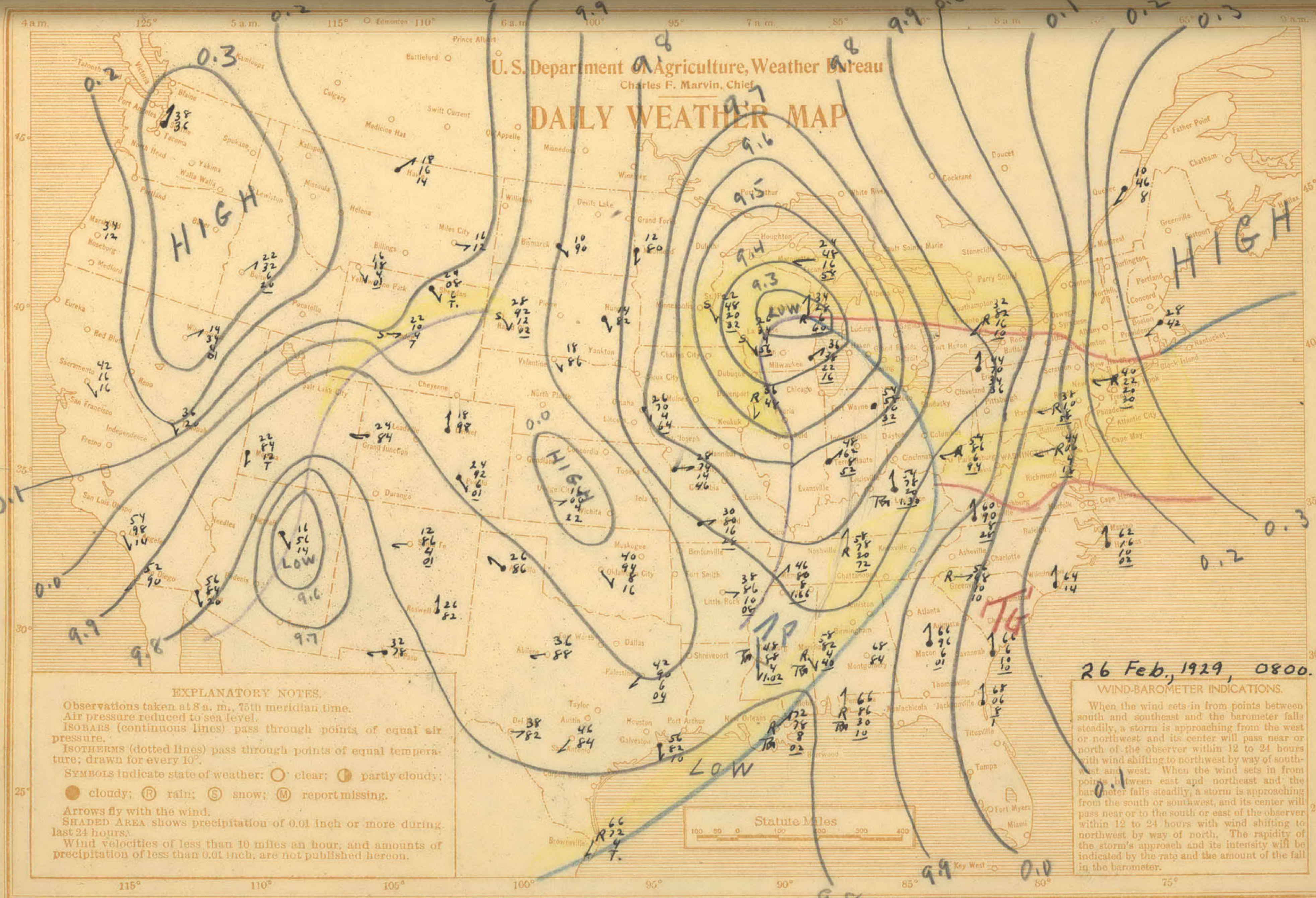
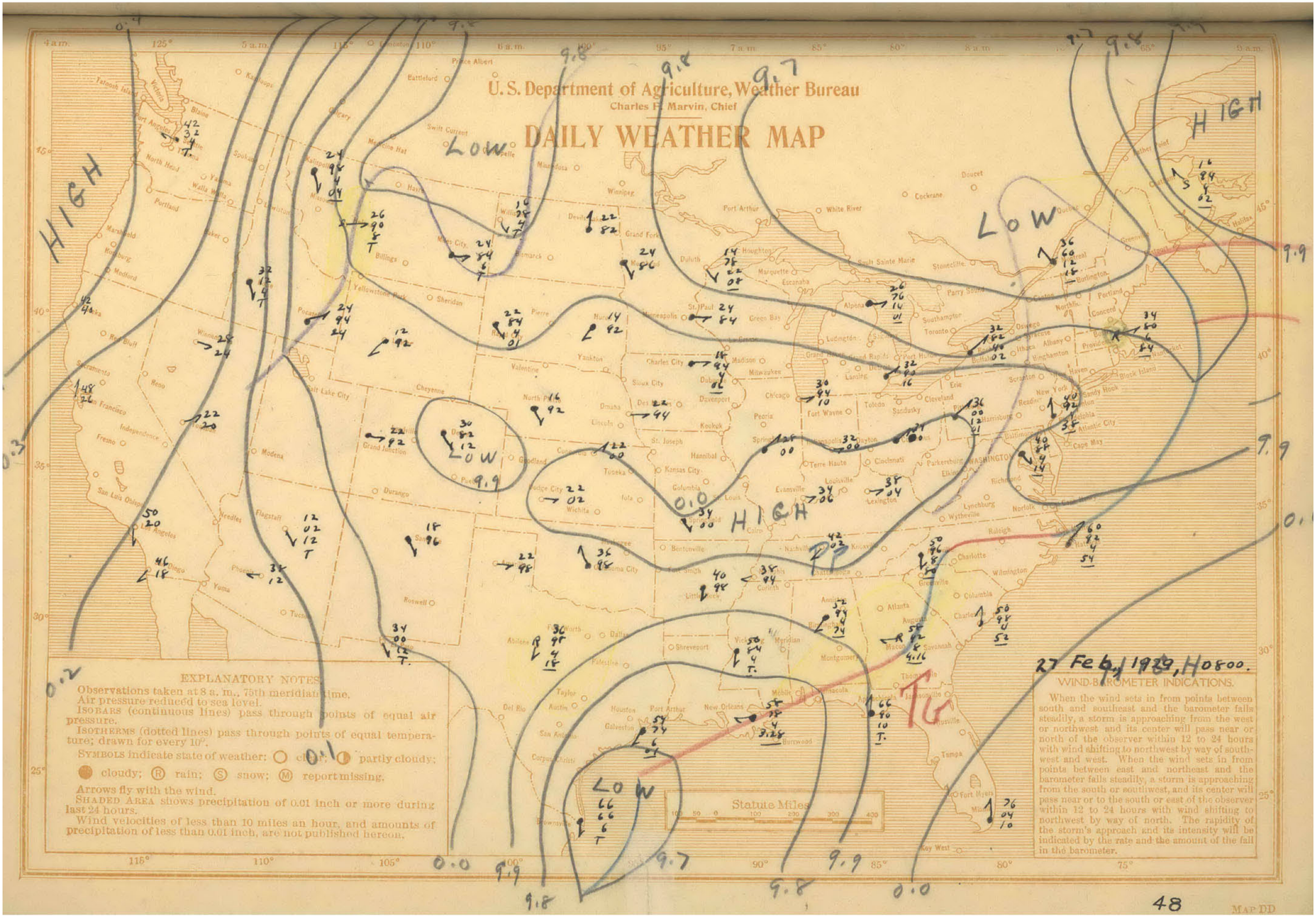
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer
Statute Miles


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
LOW
HIGH
LOW
LOW
HIGH
24 Feb. 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: ○ clear; ◐ partly cloudy; ● cloudy; Ⓡ rain; Ⓢ snow; Ⓜ report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles

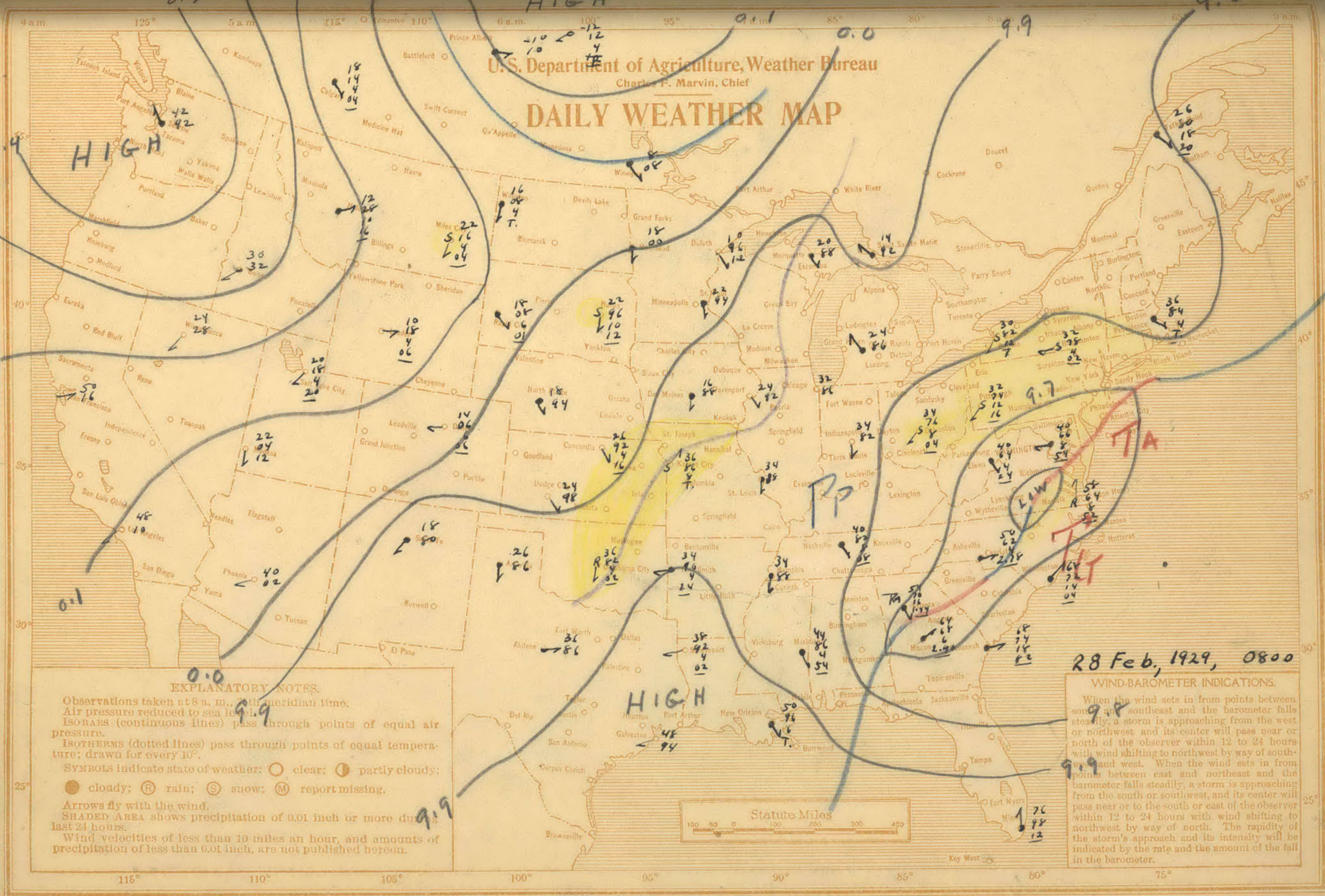
MAP DD


U. S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
LOW
HIGH
HIGH
HIGH
HIGH
LOW
LOW
25 Feb, 1929, 0800
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles


U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
26 Feb., 1929, 0800.
HIGH
HIGH
HIGH
LOW
LOW
LOW
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles
MAP DD



U.S. Department of Agriculture, Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
HIGH
LOW
LOW
HIGH
LOW
HIGH
LOW
27 Feb, 1929, H0800.
EXPLANATORY NOTES.
Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: clear; partly cloudy; cloudy; rain; snow; report missing.
Arrows fly with the wind.
SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
Wind velocities of less than 10 miles an hour, and amounts of precipitation of less than 0.01 inch, are not published hereon.
WIND-BAROMETER INDICATIONS.
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest and its center will pass near or north of the observer within 12 to 24 hours with wind shifting to northwest by way of southwest and west. When the wind sets in from points between east and northeast and the barometer falls steadily, a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within 12 to 24 hours with wind shifting to northwest by way of north. The rapidity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.
Statute Miles
MAP DD



EXPLANATORY NOTES.

Observations taken at 8 a. m., 75th meridian time.
Air pressure reduced to sea level.
ISOBARS (continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature; drawn for every 10°.
SYMBOLS indicate state of weather: ○ clear; ◐ partly cloudy; ● cloudy; Ⓡ rain; Ⓢ snow; Ⓜ report missing.
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SHADED AREA shows precipitation of 0.01 inch or more during last 24 hours.
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T A B L E S O F

D A T A

Giving values of pressure, temperature, humidity and corresponding computed values of specific humidity and potential temperature.

ELLENDALE, N.D.
2 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q	θ
444	972.0	-13.3	86	1.68	1.08	-10.8
549	958.6	-15.3	96	1.56	1.01	-11.6
845	922.0	-12.2	93	2.00	1.35	-6.0
939	910.7	-11.0	79	1.90	1.30	-4.0
1324	866.1	-11.9	62	1.37	0.99	-0.7
1553	840.8	-5.8	46	1.73	1.28	8.0
1859	809.1	-1.9	59	3.09	2.38	15.1
1980	797.1	-2.2	64	3.26	2.55	16.2
1789	816.7	-1.4	47	2.56	1.95	15.0
1368	861.7	-11.0	58	1.39	1.00	0.4
933	911.8	-10.0	76	1.99	1.36	-3.0
623	949.4	-12.5	88	1.85	1.21	-8.3
444	971.9	-13.2	88	1.73	1.11	-11.0

3 February, 1929.

444	966.9	-6.2	90	3.[illegible]8	2.11	-3.8
681	937.9	-8.0	97	3.03	2.01	-3.0
863	916.2	-7.0	97	3.30	2.24	0.0
1173	880.3	-9.5	95	2.60	1.84	0.4
1496	844.9	-1.5	45	2.43	1.79	12.0
1197	878.1	-8.4	95	2.86	2.03	2.0
878	915.1	-7.0	89	3.03	2.06	0.0
642	943.6	-7.6	86	2.78	1.84	-2.4
444	967.8	-5.8	90	3.39	2.18	-3.0

4 February, 1929.

444	966.5	-8.6	91	2.69	1.74	-6.0
58[illegible]	948.5	-10.3	100	2.55	1.68	-6.0
909	909.7	-7.7	94	3.01	2.06	-0.7
624	943.9	-10.8	92	2.24	1.48	-5.9
444	966.3	-9.4	94	2.59	1.67	-6.5

2-A

ELLENDALE, N.D.

5 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	965.7	-16.9	86	1.20	0.78	-14.2
623	943.0	-18.6	91	1.08	0.71	-14.1
871	912.2	-16.0	90	1.37	0.94	-9.1
1298	861.8	-17.6	91	1.19	0.86	-5.3
2202	764.8	-11.9	96	2.12	1.72	-3.6
1379	853.0	-16.5	83	1.20	0.88	-4.6
1225	870.7	-16.5	70	1.02	0.73	-6.2
784	923.6	-17.0	65	0.90	0.61	-11.3
556	952.3	-19.1	83	0.95	0.62	-15.8
444	966.7	-17.9	88	1.12	0.72	-14.5

6 February, 1929.

444	974.3	-20.0	82	0.85	0.54	-18.0
676	944.0	-22.8	80	0.64	0.42	-18.6
1097	891.8	-18.7	87	1.03	0.72	-10.4
1602	833.2	-20.6	87	0.86	0.64	-7.0
2256	762.8	-20.9	86	0.83	0.68	-0.5
1770	814.6	-19.2	87	0.98	0.75	-3.8
1690	823.4	-19.7	88	0.94	0.71	-5.0
1307	867.3	-19.8	86	0.91	0.65	-9.1
988	905.3	-19.0	84	0.97	0.67	-11.8
716	939.4	-22.9	86	0.68	0.45	-18.4
444	974.8	-20.6	79	0.78	0.50	-19.0

8 February, 1929.

444	970.9	-27.6	80	0.39	0.25	-25.6
628	946.6	-22.3	82	0.69	0.45	-18.5
852	918.0	-23.4	87	0.65	0.44	-16.5
1455	845.4	-21.1	88	0.83	0.61	-8.9
1959	789.6	-22.2	89	0.75	0.59	-4.4
2209	763.8	-19.3	59	0.66	0.54	1.2
1967	789.6	-20.5	77	0.77	0.61	-1.8
1775	810.3	-21.1	77	0.72	0.55	-5.3
1039	895.4	-18.8	81	0.95	0.66	-10.7
719	935.1	-22.0	84	0.72	0.48	-16.9
557	955.9	-21.3	84	0.77	0.50	-18.0
444	970.8	-23.5	79	0.58	0.37	-21.2

ELLENDALE, N.D.

9 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ
444	965.8	-17.7	79	1.03	0.66	-15.4
563	950.5	-19.2	84	0.95	0.62	-15.8
1093	885.6	-12.8	43	0.88	0.61	-3.8
1773	809.5	-16.4	64	0.94	0.72	0.0
1045	891.2	-13.4	50	0.96	0.67	-5.4
760	925.3	-13.8	64	1.19	0.80	-8.0
641	940.1	-18.3	79	0.97	0.64	-13.7
444	965.3	-17.8	79	1.02	0.66	-15.1

10 February, 1929.

444	968.8	-14.2	91	1.64	1.06	-12.0
816	922.2	-16.9	96	1.34	0.90	-10.9
1003	899.6	-18.4	94	1.17	0.81	-10.6
1229	872.9	-17.2	94	1.28	0.92	-7.0
1588	832.3	-17.2	95	1.29	0.97	-5.9
2488	737.6	-20.0	93	0.97	0.82	3.1
1322	863.0	-16.3	96	1.42	1.02	-5.2
827	922.2	-18.2	91	1.13	0.76	-12.3
444	970.7	-16.2	90	1.34	0.86	-14.0

11 February, 1929.

444	970.4	-8.4	64	1.93	1.24	-5.8
798	926.6	-12.4	73	1.55	1.04	-6.6
1291	868.2	-16.9	86	1.20	0.86	-6.3
1377	858.3	-15.2	84	1.38	1.00	-3.8
1418	853.9	-18.0	85	1.07	0.79	-6.0
1485	846.2	-15.2	84	1.38	1.01	-2.8
1764	815.5	-14.8	80	1.36	1.04	0.8
1484	846.2	-15.1	85	1.40	1.03	-2.8
1405	855.0	-17.9	85	1.08	0.79	-6.0
754	932.4	-12.4	86	1.82	1.21	-7.1
444	970.8	-8.7	73	2.14	1.37	-6.2

12 February, 1929.

444	972.6	-19.0	85	0.98	0.63	-17.0
709	938.4	-21.2	89	0.83	0.55	-16.8
892	915.6	-17.6	89	1.17	0.80	-11.1
1014	900.9	-18.4	88	1.07	0.74	-10.7
1099	890.8	-17.6	88	1.15	0.80	-8.9
986	904.3	-18.3	88	1.08	0.74	-10.8
831	923.6	-17.6	88	1.15	0.78	-11.4
625	949.8	-20.9	88	0.84	0.55	-17.2
444	973.2	-18.8	85	0.99	0.63	-16.8

ELLENDALE, N.D.

13 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	964.7	-23.2	84	0.65	0.42	-20.4
602	944.0	-24.0	90	0.64	0.42	-20.0
836	914.3	-19.0	92	1.06	0.72	-12.4
882	908.7	-19.8	96	1.02	0.70	-12.5
1442	843.0	-14.9	91	1.54	1.14	--2.0
1865	797.0	-15.3	53	0.86	0.67	2.4
2229	759.3	-18.0	88	1.11	0.99	3.0
2474	734.9	-17.3	90	1.22	1.03	6.4
3889	607.0	-24.1	85	0.60	0.62	14.4
4979	521.0	-34.2	73	0.18	0.22	15.4
4251	577.2	-27.7	80	0.39	0.42	14.0
3467	643.2	-22.6	87	0.70	0.68	11.3
2366	745.4	-15.5	87	1.38	1.15	8.2
1633	821.1	-12.1	90	1.95	1.48	3.0
1532	832.0	-13.1	91	1.81	1.35	1.0
1232	865.0	-12.9	90	1.82	1.30	-1.0
720	925.7	-18.8	87	1.02	0.69	-13.1
444	960.4	-17.1	89	1.22	0.79	-14.0

14 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	958.7	-9.9	84	2.22	1.44	-5.3
824	912.4	-12.0	81	1.77	1.21	-5.1
1327	854.0	-15.0	99	1.65	1.20	-3.0
1678	815.5	-16.3	91	1.35	1.03	-0.5
1212	867.4	-13.6	92	1.75	1.26	-3.0
1137	876.2	-14.3	92	1.64	1.17	-4.0
828	912.4	-12.3	93	1.98	1.35	-5.1
444	959.4	-9.3	81	2.25	1.46	-6.0

15 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ	
444	950.5	-9.8	80	2.14	1.40	3.5	-6.0	-2.5
474	946.7	-10.4	82	2.07	1.36	3.4	-6.2	-2.8
840	903.0	-5.9	96	3.59	2.48	6.2	2.3	8.5
1137	869.1	-8.3	99	3.01	2.15	5.4	2.4	7.8
1328	848.0	-8.0	96	3.00	2.20	5.5	5.0	10.5
1542	824.8	-9.4	100	2.76	2.09	5.2	6.0	11.2
1614	817.1	-8.4	99	2.98	2.28	5.7	7.6	13.3
2196	757.2	-12.1	69	1.50	1.23	3.1	9.7	12.8
2501	727.2	-15.5	82	1.30	1.11	2.8	9.0	11.8
2362	741.1	-13.9	58	1.07	0.90	2.3	9.0	11.3
2037	773.4	-13.0	76	1.52	1.22	3.1	7.6	10.7
1711	807.2	-10.4	63	1.59	1.23	3.1	6.5	9.6
1649	813.8	-12.1	96	2.08	1.60	4.0	4.0	8.0
9947	891.6	-6.6	95	3.34	2.33	5.8	2.8	8.6
444	950.8	-4.1	82	3.57	2234	5.9	0.0	5.9

ELLENDALE, N.D.
16 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	954.6	-20.3	86	0.87	0.57	-16.6
605	934.0	-21.9	89	0.77	0.51	-16.8
1014	885.1	-12.4	81	1.72	1.21	-3.2
1384	842.9	-15.0	90	1.50	1.11	-2.5
1804	797.9	-13.4	75	1.45	1.13	4.0
2305	747.2	-15.9	77	1.19	0.99	6.0
2671	712.2	-17.0	55	0.76	0.66	9.0
2790	700.9	-16.3	58	0.78	0.69	11.5
3399	646.1	-20.1	55	0.57	0.55	12.0
3095	673.0	-18.5	55	0.66	0.61	12.2
2982	683.2	-18.9	55	0.64	0.59	10.5
2007	778.3	-13.4	39	0.75	0.60	6.0
1799	800.1	-14.3	55	0.98	0.76	4.0
1595	822.0	-14.1	46	0.83	0.63	0.6
1406	842.9	-16.1	77	1.16	0.86	-3.7
1191	867.3	-14.3	77	1.37	0.99	-3.3
1013	888.5	-16.9	81	1.13	0.79	-8.0
727	923.7	-23.5	59	0.44	0.30	-18.0
444	960.1	-21.2	76	0.71	0.46	-18.2

17 February, 1929.

444	962.1	-20.3	80	0.81	0.52	-17.2
617	939.8	-22.6	77	0.62	0.41	-18.0
762	921.5	-21.6	72	0.64	0.43	-14.5
992	893.1	-22.6	78	0.63	0.44	-14.2
1266	860.8	-19.9	80	0.84	0.61	-9.0
1411	844.2	-20.7	80	0.78	0.58	-8.0
1675	814.6	-20.0	83	0.86	0.66	-4.5
1877	792.7	-19.9	83	0.87	0.69	-2.5
2299	748.6	-22.4	87	0.72	0.60	-1.0
2416	736.9	-21.6	85	0.72	0.61	1.3
2885	690.9	-24.6	85	0.57	0.52	3.4
2567	721.0	-24.4	89	0.61	0.53	0.0
2473	730.6	-25.4	90	0.56	0.48	-2.0
1495	835.4	-21.1	79	0.74	0.55	-7.2
1174	873.0	-23.6	78	0.58	0.41	-13.8
880	908.9	-22.5	77	0.63	0.43	-15.5
817	916.9	-22.6	75	0.61	0.41	-16.2
444	964.8	-21.2	76	0.71	0.46	-18.8

ELLENDALE, N.D.
18 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
444	972.0	-28.4	73	0.33	0.21	-26.5
527	960.9	-30.5	77	0.28	0.18	-27.8
1190	875.9	-27.0	66	0.34	0.24	-17.5
1505	838.4	-28.3	69	0.32	0.24	-15.7
1729	813.2	-26.6	46	0.25	0.19	-11.3
2082	774.3	-27.8	47	0.23	0.19	-8.8
2243	757.1	-27.1	46	0.24	0.20	-6.7
2518	728.6	-27.9	44	0.21	0.18	-4.4
2792	701.6	-27.3	34	0.17	0.15	-1.0
3435	641.6	-30.6	27	0.10	0.10	2.7
2904	691.4	-27.8	28	0.13	0.12	-0.2
2381	743.4	-25.9	27	0.16	0.13	-3.8
2198	762.5	-26.7	27	0.15	0.12	-6.8
2039	779.6	-26.0	27	0.16	0.13	-7.7
1901	794.7	-26.8	28	0.15	0.12	-9.7
1724	814.3	-26.1	29	0.17	0.13	-11.0
1336	859.3	-26.7	32	0.17	0.12	-16.0
1235	871.5	-27.6	35	0.17	0.12	-18.0
726	935.6	-27.0	50	0.26	0.17	-23.0
621	949.3	-28.0	56	0.26	0.17	-24.3
444	972.9	-25.9	69	0.40	0.26	-24.0

19 February, 1929.

444	969.5	-24.6	73	0.49	0.31	-22.0
574	950.9	-26.4	73	0.41	0.27	-22.5
753	927.9	-21.5	69	0.62	0.42	-16.0
860	914.2	-20.6	81	0.80	0.54	-14.0
1203	872.6	-21.8	80	0.70	0.50	-11.4
1372	852.6	-20.7	70	0.69	0.50	-8.6
1781	806.5	-21.8	79	0.70	0.54	-5.7
1991	783.6	-22.6	35	0.28	0.22	-4.3
2105	770.7	-20.7	18	0.18	0.15	-1.0
2459	734.4	-22.6	17	0.14	0.12	0.9
2818	699.0	-22.7	16	0.13	0.12	5.0
3332	651.4	-25.1	14	0.09	0.09	8.0
3690	619.8	-25.4	16	0.10	0.10	11.3
4265	573.5	-28.0	29	0.14	0.15	14.8
3691	621.8	-24.2	24	0.17	0.17	12.4
3529	635.5	-23.9	28	0.20	0.20	10.6
3416	645.5	-23.1	31	0.24	0.23	10.2
3359	650.4	-23.4	35	0.26	0.25	9.7
2604	720.7	-21.1	23	0.22	0.19	4.0
2403	740.7	-20.6	24	0.24	0.20	2.2
1768	806.5	-17.9	26	0.33	0.25	-1.7
1469	839.4	-18.8	49	0.57	0.42	-5.7
1304	858.1	-18.4	53	0.65	0.47	-6.8
742	925.6	-18.9	77	0.89	0.60	-13.3
444	963.8	-22.5	76	0.62	0.40	-20.0

ELLENDALE, N.D.
20 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	946.6	-15.0	87	1.45	0.99	-10.8
563	931.7	-16.2	90	1.34	0.90	-10.6
852	897.4	-3.4	71	3.27	2.26	5.2
1092	870.4	-5.4	82	3.20	2.28	7.0
1607	815.1	-6.9	80	2.74	2.09	9.3
2230	752.1	-10.7	78	1.92	1.60	12.0
2651	711.7	-14.3	91	1.62	1.42	12.3
2990	680.5	-16.6	94	1.35	1.24	13.9
3248	656.4	-17.9	92	1.17	1.11	15.0
2771	701.3	-14.3	86	1.53	1.36	13.9
2571	720.2	-13.9	97	1.79	1.55	12.0
1924	783.4	-7.9	73	2.30	1.83	11.3
1818	794.3	-8.2	84	2.58	2.02	10.0
1063	874.8	-3.0	74	3.53	2.51	7.5
788	905.4	-2.1	78	4.01	2.76	6.0
500	939.8	-11.6	83	1.88	1.25	-7.0
444	946.6	-10.7	83	2.04	1.34	-6.4

21 February, 1929.

444	962.1	-21.0	80	0.76	0.49	-18.2
843	911.6	-20.5	81	0.81	0.55	-13.7
963	896.9	-21.0	82	0.78	0.54	-13.2
1323	854.6	-17.1	71	0.97	0.71	-5.2
1832	798.7	-19.1	78	0.89	0.69	-2.2
2498	730.1	-22.5	88	0.72	0.61	1.3
2876	693.6	-23.4	76	0.57	0.51	4.3
2481	732.2	-22.6	84	0.68	0.58	1.0
1805	803.1	-19.4	69	0.77	0.60	-3.2
1476	839.2	-17.9	41	0.52	0.39	-4.7
1172	874.6	-18.5	66	0.79	0.56	-8.7
1079	885.7	-20.9	73	0.70	0.49	-12.1
785	921.9	-20.0	80	0.83	0.56	-14.0
621	942.5	-21.1	81	0.76	0.50	-17.0
444	965.3	-19.2	81	0.92	0.59	-17.0

ELLENDALE, N.D.
22 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
444	967.2	-25.4	82	0.51	0.33	-23.1
632	943.2	-11.4	70	1.62	1.07	-6.7
877	913.6	-11.0	77	1.85	1.26	-4.3
1440	849.1	-10.5	81	2.03	1.49	2.4
1723	818.4	-12.4	89	1.89	1.44	3.2
2317	756.9	-14.9	68	1.15	0.95	6.8
2588	730.5	-17.8	68	0.88	0.75	6.5
1983	791.2	-13.1	65	1.29	1.02	5.2
1327	862.3	-10.3	80	2.04	1.47	1.7
864	915.8	-8.7	75	2.20	1.49	-1.9
637	943.2	-9.9	70	1.85	1.22	-5.6
444	967.4	-17.2	77	1.05	0.68	-15.0

24 February, 1929.

444	963.8	-11.5	86	1.97	1.27	-8.8
735	928.0	-8.0	83	2.59	1.74	-2.0
948	903.0	-5.9	69	2.58	1.78	2.1
1234	870.5	-5.9	59	2.21	1.58	5.3
1860	803.4	-9.2	73	2.05	1.59	8.0
1120	883.9	-5.3	61	2.40	1.69	4.2
806	920.0	-5.0	65	2.62	1.77	1.6
537	952.2	-7.0	73	2.48	1.62	-3.3
444	963.8	-12.8	88	1.80	1.16	-10.1

25 February, 1929.

444	959.1	-18.7	87	1.03	0.67	-15.7
520	949.3	-13.3	98	1.91	1.25	-9.3
815	913.7	-2.6	67	3.30	2.25	4.6
933	900.1	-2.6	56	2.76	1.91	6.0
1731	813.6	-5.6	48	1.84	1.41	11.0
1038	888.8	-1.9	57	2.98	2.09	7.3
546	945.8	-3.5	78	3.57	2.37	1.2
444	958.2	-14.7	91	1.57	1.02	-11.2

ELLENDALE, N.D.
26 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ
444	955.3	-10.2	93	2.39	1.56	-6.4
797	913.0	-3.8	66	2.94	2.00	3.5
984	891.5	-4.4	58	2.46	1.72	4.6
1183	869.2	-3.8	56	2.50	1.79	7.7
1583	826.1	-6.0	48	1.78	1.34	9.2
2663	718.4	-14.1	59	1.07	0.93	12.0
3135	675.0	-18.2	85	1.05	0.97	12.3
3900	608.7	-22.2	87	0.73	0.75	16.1
2757	710.1	-16.2	88	1.31	1.15	10.2
2027	781.3	-9.4	63	1.74	1.39	10.0
1287	859.2	-3.3	41	1.91	1.39	8.8
688	926.7	-1.0	58	3.27	2.19	5.0
513	947.4	-4.8	89	3.65	2.40	-0.3
444	955.8	-3.3	85	3.98	2.57	-0.1

28 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ
444	962.1	-5.1	100	4.00	2.59	-2.2
619	941.0	-5.7	99	3.76	2.49	-1.0
676	934.1	-4.8	69	2.83	1.89	1.0
834	915.8	-6.6	92	3.24	2.20	0.0
942	903.3	-6.8	77	2.66	1.84	1.3
1494	841.0	-12.5	99	2.08	1.54	1.1
1626	826.7	-8.8	54	1.57	1.18	6.2
1493	841.0	-11.6	97	2.20	1.63	2.0
1020	894.3	-8.5	85	2.54	1.77	0.0
710	930.7	-6.8	98	3.39	2.26	-1.0
444	962.9	-4.4	93	3.94	2.55	-1.8

BROKEN ARROW, OK.

1 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	1005.1	-6.8	70	2.42	1.50	-7.5
547	965.4	-9.4	76	2.10	1.35	-6.7
740	941.8	-5.9	39	1.46	0.96	-1.0
1125	896.8	-6.2	37	1.35	0.94	2.5
1298	877.3	-2.3	28	1.42	1.00	8.0
1434	862.4	-2.2	32	1.63	1.18	9.0
1299	877.3	-1.8	29	1.53	1.08	9.0
1137	895.7	-5.8	32	1.21	0.84	2.5
754	940.7	-5.8	32	1.21	0.80	-1.0
628	955.9	-8.5	63	1.88	1.22	-5.0
233	1005.7	-5.4	66	2.57	1.60	-6.0

2 February, 1929.

233	999.0	-2.6	98	4.83	3.00	-2.6
729	938.3	-5.2	100	3.97	2.63	-0.5
1204	883.6	-4.7	97	4.02	2.83	5.0
730	938.3	-5.2	93	3.69	2.45	-0.5
233	999.3	-2.2	98	5.00	3.11	-2.2

7 February, 1929.

233	992.9	-7.4	95	3.13	1.96	-7.0
585	948.4	-10.2	97	2.49	1.63	-6.0
865	914.4	-4.8	100	4.10	2.80	2.5
588	947.2	-10.0	100	2.62	1.72	-6.0
233	991.7	-7.9	97	3.06	1.92	-7.0

8 February, 1929.

233	996.0	-12.4	96	2.04	1.28	-12.0
632	945.1	-15.1	96	1.58	1.04	-11.0
1228	874.4	-8.6	100	2.96	2.11	2.0
728	933.4	-15.6	96	1.52	1.00	-10.5
233	996.3	-12.0	96	2.10	1.31	-11.5

BROKEN ARROW, OK.
9 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	999.6	-17.9	77	0.98	0.61	-17.0
508	963.8	-15.8	71	1.10	0.71	-13.0
686	941.4	-16.2	76	1.13	0.75	-11.0
973	906.1	-13.2	65	1.28	0.88	-5.5
1407	856.4	-11.9	55	1.22	0.88	0.5
1714	823.2	-9.4	60	1.66	1.25	6.0
2124	781.0	-7.5	52	1.70	1.35	12.0
2876	708.4	-11.7	30	0.68	0.60	16.0
3158	683.3	-10.8	27	0.66	0.60	20.0
3063	691.9	-12.1	26	0.56	0.51	17.5
2010	793.2	-6.9	30	1.03	0.81	11.0
1531	843.9	-10.3	31	0.79	0.58	3.0
981	907.2	-15.7	41	0.65	0.45	-8.5
711	940.2	-14.9	47	0.79	0.52	-10.0
430	975.9	-14.9	56	0.95	0.61	-13.0
233	1001.6	-13.0	64	1.28	0.80	-13.5

10 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	1002.5	-0.6	37	2.15	1.34	-0.6
598	957.5	-3.9	42	1.86	1.21	-0.5
959	914.7	-6.7	48	1.68	1.15	0.5
1140	893.7	-5.7	44	1.67	1.16	3.0
1521	851.0	-8.3	47	1.43	1.05	4.0
1713	830.3	-8.8	48	1.40	1.06	5.5
2227	776.7	-11.2	44	1.03	0.83	8.5
2431	756.5	-10.8	42	1.02	0.84	11.0
2759	724.8	-12.7	44	0.99	0.85	13.0
2410	758.5	-11.0	42	1.01	0.83	11.0
2229	776.7	-11.0	44	1.06	0.85	8.5
1823	818.8	-8.6	42	1.24	0.94	7.0
1735	828.2	-9.2	53	1.49	1.12	6.0
1093	899.2	-5.1	51	2.04	1.41	3.0
970	913.6	-5.6	52	1.99	1.36	1.5
345	989.0	-2.8	50	2.42	1.52	-1.5
233	1003.1	-4.0	55	2.41	1.51	-4.0

BROKEN ARROW, OK.
12 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	997.5	-6.9	78	2.68	1.67	-6.5
524	961.3	-1.4	59	3.21	2.08	2.0
1162	887.2	-1.2	35	1.94	1.36	9.0
1820	816.5	-4.8	48	1.97	1.50	12.0
2637	734.3	-10.2	59	1.52	1.29	14.5
2825	716.6	-8.5	56	1.67	1.45	19.0
3475	658.7	-10.6	62	1.54	1.45	23.0
3694	640.2	-9.9	35	0.92	0.89	26.0
3852	627.9	-10.8	32	0.78	0.77	27.0
3627	646.8	-9.1	29	0.82	0.79	26.0
3420	664.4	-11.8	85	1.90	1.78	20.7
2793	720.5	-8.8	75	2.18	1.89	17.5
2624	736.3	-9.9	60	1.58	1.34	15.0
1542	845.6	-2.6	49	2.42	1.79	11.0
861	920.5	--1.4	42	2.84	1.92	5.0
683	941.2	-1.8	63	3.32	2.19	3.0
233	995.1	-1.0	64	4.20	2.63	-0.5

13 February, 1929.

233	995.2	-5.2	86	3.41	2.13	-5.0
796	925.9	-10.1	100	2.60	1.75	-4.0
1062	894.7	-5.7	50	1.90	1.32	3.0
1264	872.0	-6.6	52	1.83	1.31	4.0
1487	847.7	-5.7	47	1.79	1.32	7.0
1991	794.9	-8.9	52	1.50	1.17	9.2
2366	757.4	-8.9	48	1.38	1.13	13.0
3002	697.4	-12.6	44	0.92	0.82	16.0
3905	618.9	-17.8	41	0.54	0.58	20.0
4001	611.3	-17.3	38	0.51	0.52	21.5
3948	616.1	-18.0	37	0.47	0.48	21.0
3210	679.3	-13.6	40	0.76	0.70	17.0
2051	789.8	-7.9	43	1.35	1.06	11.0
1942	801.1	-7.8	43	1.36	1.05	10.0
1499	847.7	-5.7	37	1.41	L.04	7.0
1411	857.1	-6.3	43	1.55	1.12	6.0
969	906.8	-5.0	42	1.69	1.16	2.8
794	927.1	-7.4	75	2.47	1.66	-1.5
233	995.6	-3.0	74	3.53	2.21	-3.0

BROKEN ARROW, OK.
15 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	987.7	1.6	77	5.28	3.33	2.5
561	948.1	-0.5	80	4.69	3.08	4.0
643	938.6	0.0	61	3.73	2.48	5.0
1524	840.2	-5.6	80	3.06	2.27	8.5
1771	814.3	-7.2	100	3.34	2.56	9.0
1881	802.8	-6.4	100	3.58	2.79	11.0
1334	860.3	-4.1	81	3.52	2.55	7.5
673	935.1	-2.0	92	4.77	3.18	3.5
233	987.9	0.3	94	5.87	3.70	1.5

16 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ	
233	987.3	-3.1	91	4.30	2.71	6.8	-2.0	-4.8
495	955.5	1.6	49	3.36	2.19	5.5	5.5	11.0
1028	894.0	-0.8	38	2.17	1.52	3.8	8.5	12.3
1544	838.0	-2.6	22	1.08	0.80	2.0	11.5	13.0
1722	819.4	-1.1	17	0.95	0.72	1.8	15.0	16.8
2886	706.9	-8.2	11	0.34	0.30	0.8	19.7	20.5
3014	695.2	-6.4	11	0.39	0.35	0.9	23.0	
3830	626.6	-10.6	14	0.35	0.35	0.9	27.0	
3052	693.2	-5.5	10	0.39	0.35	0.9	24.5	
2727	722.6	-6.5	10	0.36	0.31	0.8	20.0	
1644	828.6	1.0	9	0.59	0.44	1.1	16.5	
1213	874.3	-0.7	9	0.52	0.37	0.9	11.5	
765	924.7	2.0	33	2.33	1.57	3.9	8.0	11.9
685	934.0	1.0	58	3.80	2.54	6.4	6.7	
233	987.5	5.5	60	5.42	3.42	8.6	6.5	15.1

17 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	982.7	2.0	73	5.15	3.27	3.5
489	952.1	3.8	61	4.89	3.20	8.0
1514	840.0	8.0	29	3.11	2.31	23.0
2051	786.9	3.6	32	2.53	2.00	23.5
2955	703.1	-3.8	40	1.78	1.58	25.5
3076	692.4	-1.7	28	1.49	1.34	29.0
3541	652.8	-5.2	24	0.95	0.90	30.0
2541	740.0	3.1	21	1.60	1.35	28.0
2367	756.2	3.4	22	1.71	1.41	27.0
2290	763.3	4.0	23	1.87	1.53	26.5
2150	776.6	3.1	33	2.52	2.02	24.2
1345	857.2	6.7	34	3.34	2.43	19.5
1180	874.6	5.3	34	3.03	2.16	16.5
591	940.0	4.5	62	5.22	3.46	9.5
233	982.1	7.8	63	6.67	4.23	9.0

BROKEN ARROW, OK.
18 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	990.6	-4.8	88	3.61	2.27	-4.0
651	939.3	-8.1	100	3.09	2.05	-3.0
1109	886.8	3.8	79	6.34	4.45	14.0
1352	860.7	2.5	100	7.31	5.30	15.0
1756	818.8	0.3	95	5.93	4.50	17.0
2046	789.7	4.1	30	2.46	1.94	24.0
2971	704.4	-1.1	16	0.89	0.79	28.0
3060	696.6	-1.0	16	0.90	0.81	29.0
2949	706.3	-0.9	16	0.91	0.80	28.0
1921	802.1	5.8	24	2.21	1.71	24.0
1675	827.0	1.1	86	5.68	4.28	16.5
1270	869.4	2.9	90	6.77	4.85	14.5
677	937.0	-9.2	86	2.42	1.61	-4.5
233	991.9	-5.4	83	3.24	2.04	-5.0

19 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	993.9	-10.6	86	2.13	1.33	-10.0
620	944.8	-15.2	100	1.64	1.08	-11.0
994	899.2	-15.2	100	1.64	1.14	-7.0
1440	848.6	-8.2	100	3.07	2.26	4.5
2210	770.3	1.6	36	2.47	2.00	23.0
2664	728.3	-0.2	27	1.62	1.38	26.0
2117	780.4	1.5	34	2.32	1.85	22.0
1703	821.7	1.6	42	2.88	2.18	17.5
1263	868.8	-11.4	100	2.31	1.66	-0.5
906	910.3	-15.4	100	1.61	1.10	-8.5
548	954.3	-13.8	100	1.86	1.22	-10.2
233	994.3	-9.7	77	2.07	1.29	-9.0

21 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	987.4	-5.2	95	3.77	2.38	-4.2
481	956.9	-1.0	68	3.83	2.50	2.5
745	926.1	3.9	44	3.55	2.39	10.0
979	900.0	3.1	44	3.13	2.16	11.5
1200	875.8	3.7	30	2.39	1.70	14.6
1624	831.2	0.5	30	1.90	1.42	15.5
2433	751.2	-3.9	20	0.88	0.73	19.0
2649	731.1	-5.5	27	1.04	0.89	20.0
2031	790.9	-1.5	22	1.19	0.94	17.5
1275	869.3	2.2	29	2.08	1.50	13.5
895	911.2	4.5	38	3.20	2.19	12.0
233	990.0	-1.7	94	4.99	3.14	2.5

BROKEN ARROW, OK.
22 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	1004.1	-3.9	77	3.40	2.10	-4.5
747	940.6	-7.0	83	2.82	1.86	-2.0
1007	910.0	-3.1	30	1.42	0.97	4.5
1891	813.7	-6.3	29	1.05	0.80	10.0
2172	785.0	-7.9	36	1.13	0.90	11.0
2936	711.4	-13.3	33	0.64	0.56	13.5
3027	702.6	-12.6	20	0.42	0.37	15.5
3149	692.0	-13.1	18	0.36	0.32	16.5
2964	709.5	-12.7	18	0.38	0.32	15.0
2932	712.4	-13.2	24	0.47	0.41	13.5
2096	794.1	-7.3	28	0.93	0.73	11.0
1429	864.6	-3.1	28	1.32	0.96	8.5
966	916.7	-2.4	28	1.40	0.96	4.5
577	962.9	-4.8	66	2.71	1.75	-1.5
233	1005.8	-1.8	70	3.69	2.28	-2.6

23 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
233	998.9	-1.7	73	3.88	2.42	-1.5
532	962.2	3.7	55	4.38	2.84	6.6
1022	905.6	1.0	41	2.69	1.85	9.2
1349	869.6	2.7	31	2.30	1.65	14.5
1738	828.7	0.1	31	1.91	1.43	15.5
2138	788.3	1.0	24	1.57	1.24	20.5
2603	743.9	-1.7	29	1.54	1.29	22.6
2817	724.1	-1.0	11	0.62	0.53	25.5
3413	671.9	-4.4	11	0.47	0.44	28.0
2908	716.3	-0.8	8	0.46	0.40	27.0
2691	736.0	-1.6	12	0.64	0.54	23.2
2468	756.9	0.1	13	0.80	0.66	23.0
2269	776.2	-0.9	18	1.02	0.82	19.5
1524	851.5	1.8	21	1.46	1.07	15.0
994	908.9	3.7	15	1.19	0.82	11.5
806	930.5	1.0	41	2.69	1.80	6.6
512	964.7	4.1	54	4.42	2.85	7.0
233	998.0	8.0	51	5.47	3.42	8.0

BROKEN ARROW, OK.
24 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ	
233	985.4	5.0	58	5.06	3.20		6.0	
457	958.8	6.4	64	6.15	4.00		10.0	
728	927.9	8.3	94	10.29	6.90		14.7	
1130	883.9	8.8	75	8.49	6.00		19.0	
1660	828.5	4.4	94	7.86	5.90		19.5	
1950	799.5	3.1	76	5.80	4.54		21.5	
2359	759.6	-0.3	96	5.72	4.70		22.5	
1881	805.7	2.8	76	5.58	4.40		20.5	
1510	843.1	5.2	94	8.31	6.15		19.5	
928	905.0	8.1	86	9.29	6.40		16.5	
402	964.9	4.3	54	4.48	2.90		7.0	
233	985.1	5.5	59	5.33	3.37		6.7	
		25 February, 1929.						
233	972.9	6.4	94	9.03	5.78	14.5	9.0	23.5
464	945.8	4.7	99	8.45	5.56	13.9	9.5	23.4
560	934.9	6.0	97	9.07	6.05	15.1	11.5	26.6
1109	874.1	4.2	92	7.59	5.42	13.6	15.0	28.6
1191	865.3	5.0	89	7.76	5.60	14.0	17.0	31.0

(Ascent only)

DUE WEST, S.C.
1 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
217	1000.9	-4.2	68	2.93	1.82	-4.2
538	960.9	-5.7	64	2.43	1.56	-2.5
645	948.0	-5.3	58	2.28	1.50	-0.5
1222	881.5	-7.8	57	1.81	1.28	2.0
1664	832.8	-6.7	51	1.78	1.33	7.5
2584	740.7	-9.6	35	0.95	0.80	14.5
1558	845.3	-5.7	26	0.99	0.73	7.5
1421	860.3	-8.2	25	0.77	0.56	3.7
791	932.8	-5.8	46	1.73	1.16	-0.4
217	1002.7	0.4	41	2.58	1.60	0.3

2 February, 1929.

217	1003.2	-3.9	68	3.01	1.87	-4.1
516	966.0	-1.6	46	2.47	1.60	1.0
606	955.7	-1.6	34	1.82	1.19	2.0
1126	895.4	-2.8	37	1.79	1.24	6.1
600	957.0	-1.6	35	1.88	1.22	2.0
411	980.2	-3.0	43	2.05	1.30	-1.5
217	1004.5	-0.6	48	2.79	1.73	-1.0

3 February, 1929.

217	1002.9	2.5	61	4.46	2.77	2.1
578	959.2	3.6	66	5.21	3.35	6.6
1262	881.1	-1.0	73	4.11	2.90	9.5
1704	833.7	-1.8	100	5.27	3.95	12.4
1872	816.4	-1.8	100	5.27	4.02	14.6
	(No descent)					

4 February, 1929.

217	999.3	2.9	62	4.66	2.95	3.0
664	945.4	1.9	54	3.78	2.49	6.2
1287	874.9	-0.3	74	4.41	3.14	10.0
1399	862.8	-0.4	76	4.49	3.24	11.0
	(No descent)					

DUE WEST, S.C.

5 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ	
217	994.6	-0.3	93	5.54	3.48	8.7	0.0	8.7
516	957.9	-2.7	96	4.69	3.07	7.7	-0.1	7.6
755	929.7	-1.7	78	4.14	2.80	7.0	4.2	11.2
1025	898.8	-1.8	93	4.90	3.40	8.5	6.3	14.8
863	917.2	-1.1	77	4.30	2.92	7.3	6.0	13.3
582	950.2	-3.3	92	4.28	2.80	7.0	0.3	7.3
217	994.9	-0.3	91	5.42	3.41	8.5	0.0	8.5

8 February, 1929.

217	994.7	1.4	88	5.95	3.73	2.0
444	967.4	6.4	70	6.73	4.34	9.0
981	906.6	4.7	78	6.66	4.58	12.7
440	968.7	6.1	73	6.87	4.42	9.0
320	983.2	3.4	77	6.00	3.80	4.6
217	995.8	4.7	77	6.58	4.12	4.9

273
25.8
298.8

9 February, 1929.

298.8	217	989.7	7.9	97	10.33	6.50	8.9	+16.3 = 25.2
308.0	539	952.0	11.5	90	12.21	8.00	15.0	+20.0 = 35.0
313.3	748	928.7	11.7	98	13.48	9.04	18.0	+22.3 = 40.3
317.8	1163	883.7	11.2	98	13.03	9.20	21.8	+23.0 = 44.8
314.9	1702	828.1	9.2	77	8.96	6.75	25.0	+16.9 = 41.9
318.4	2443	756.8	4.5	100	8.42	6.94	28.0	+17.4 = 45.4
319.4	2694	733.6	3.7	97	7.72	6.57	30.0	+16.4 = 46.4
315.7	1728	824.7	7.8	95	10.05	7.60	23.7	+19.0 = 42.7
315.8	1140	885.0	10.8	97	12.56	8.85	20.7	+22.1 = 42.8
310.7	656	937.7	10.9	98	12.70	8.47	16.5	+21.2 = 37.7
300.5	217	988.5	8.8	98	11.09	6.98	10.0	+17.5 = 27.5

11 February, 1929.

217	995.4	9.8	29	3.51	2.20	10.5
563	954.4	5.5	27	2.44	1.60	9.5
1568	842.1	-3.5	34	1.56	1.15	10.4
1869	810.5	-3.3	16	0.74	0.57	13.1
2562	742.2	-5.1	14	0.56	0.47	18.6
2682	730.9	-4.4	12	0.51	0.44	21.0
3122	691.4	-6.9	5	0.17	0.15	23.0
2717	727.9	-4.7	5	0.21	0.18	21.0
2599	739.1	-5.6	5	0.19	0.16	19.0
2232	774.3	-2.7	6	0.29	0.23	18.0
1825	815.0	-2.5	6	0.30	0.23	14.0
1472	852.3	-2.5	22	1.09	0.80	10.0
672	941.6	4.2	22	1.82	1.20	9.2
217	995.3	10.0	24	2.95	1.85	11.0

DUE WEST, S.C.
12 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		θ	
217	1003.3	-2.4	67	3.36	2.09	5.2	-2.6	2.6
566	960.1	-2.7	48	2.35	1.52	3.8	0.4	4.2
1104	897.4	-3.8	35	1.56	1.08	2.7	4.6	7.3
615	954.9	-3.5	44	2.02	1.32	3.3	0.0	3.3
217	1004.0	0.0	50	3.06	1.90	4.8	-0.2	4.6

13 February, 1929.

217	998.3	-1.4	65	3.54	2.21	-1.0
708	938.6	-0.5	26	1.52	1.01	4.3
1195	883.1	-1.6	39	2.09	1.47	8.1
732	936.0	0.0	23	1.41	0.94	5.7
217	998.0	1.5	52	3.54	2.21	1.6

14 February, 1929.

217	994.9	0.0	96	5.87	3.68	0.5
523	957.7	1.8	90	6.26	4.07	5.1
679	939.7	2.7	39	2.89	1.92	8.0
2257	770.7	-7.7	85	2.72	2.20	13.0
2458	750.8	-7.7	41	1.31	1.08	15.5
2894	709.8	-9.0	38	1.09	0.96	19.0
3071	694.0	-8.5	27	0.81	0.73	21.0
	(No descent)					

18 February, 1929.

217	995.3	1.9	98	6.86	4.30	10.8	2.2	13.0
407	972.1	4.8	88	7.57	4.85	12.1	7.0	19.1
874	918.1	2.3	94	6.78	4.60	11.5	9.0	20.5
976	906.9	2.1	88	6.25	4.30	10.8	10.0	20.8
1261	875.4	5.2	16	1.41	1.00	2.5	16.5	19.0
1702	829.9	5.5	10	0.90	0.68	1.7	21.0	22.7
2466	755.4	2.0	12	0.85	0.70	1.8	25.1	26.9
1846	815.0	5.2	13	1.15	0.88	2.2	22.5	24.7
1289	873.0	5.5	12	1.08	0.77	1.9	16.5	18.4
1047	899.5	3.6	83	6.56	4.55	11.4	12.2	23.6
491	962.9	5.4	83	7.45	4.82	12.1	8.6	20.7
217	995.6	8.0	75	8.05	5.04	12.6	8.4	21.0

DUE WEST, S.C.

19 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
217	992.2	3.0	91	6.90	4.34	3.5
684	937.2	8.8	52	5.89	3.92	14.0
1137	887.5	5.7	70	6.41	4.50	15.5
1687	830.1	8.0	30	3.22	2.42	23.3
1915	807.6	5.5	84	7.59	5.85	23.5
2089	790.5	6.8	11	1.09	0.86	26.7
3140	694.9	2.0	7	0.49	0.44	32.3
1933	805.3	8.2	7	0.76	0.59	26.0
1799	818.8	3.0	93	7.05	5.40	19.7
1272	873.2	6.8	67	6.62	4.72	18.0
1236	876.8	6.5	74	7.16	5.10	17.2
685	937.2	9.6	63	7.53	5.00	15.0
491	959.2	9.6	64	7.65	4.96	13.0
217	991.1	13.7	59	9.25	5.80	14.5

20 February, 1929.

217	988.5	11.4	89	12.00	7.57	18.9	12.6	31.5
399	967.2	11.6	74	10.11	6.50	16.3	14.5	30.8
926	908.2	9.8	48	5.82	4.00	10.0	18.0	28.0
1748	821.7	3.0	59	4.47	3.40	8.5	19.2	27.7
2161	781.1	3.2	84	6.45	5.50	13.8	23.6	37.4
1734	822.9	3.1	62	4.73	3.58	9.0	19.0	28.0
1133	886.2	8.2	52	5.65	3.98	10.0	18.0	28.0
772	925.8	9.9	55	6.71	4.52	11.3	16.4	27.7
556	950.2	10.0	64	7.86	5.16	12.9	14.5	27.4
217	989.6	11.4	93	12.54	7.90	19.8	12.1	31.9

23 February, 1929.

217	1004.4	-0.5	52	3.05	1.89	-0.3
483	971.6	1.7	17	1.17	0.75	4.5
1546	851.9	-2.9	15	0.72	0.52	9.7
1078	903.7	-0.5	15	0.88	0.61	7.6
660	952.2	-0.9	25	1.42	0.93	3.1
217	1006.1	4.0	35	2.85	1.76	3.4

24 February, 1929.

217	1003.1	2.2	71	5.08	3.15	7.9	2.0	9.9
275	995.9	0.7	75	4.82	3.02	7.6	1.4	9.0
468	972.2	3.2	47	3.61	2.31	5.8	5.5	11.3
643	951.6	3.3	39	3.02	1.97	4.9	7.5	12.4
990	911.7	1.3	40	2.68	1.83	4.6	8.5	13.1
526	965.7	3.9	37	2.99	1.93	4.8	7.0	11.8
364	985.3	4.0	60	4.88	3.09	7.7	5.0	12.5
217	1003.3	4.4	68	5.68	3.52	8.8	4.0	12.8

39°

PM

DUE WEST, S.C.

25 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
217	995.6	7.8	82	8.68	5.44	13.6	8.4	22.0
617	948.7	11.7	82	11.28	7.40	18.5	16.4	34.9
1100	895.4	9.0	97	11.14	7.78	19.5	18.1	37.6
1356	868.2	7.9	77	8.20	5.88	14.7	19.7	34.4
1807	821.0	3.5	92	7.22	5.48	13.7	20.0	33.7
2707	734.5	0.1	100	6.15	5.23	13.1	25.7	38.8
1824	819.1	3.5	93	7.30	5.55	13.9	20.0	33.9
1616	840.4	5.3	80	7.13	5.30	13.3	19.8	33.1
1073	897.8	8.5	93	10.32	7.15	17.9	17.1	35.0
736	934.8	11.8	63	8.72	5.82	14.6	17.6	32.2
645	944.9	12.1	71	10.03	6.60	16.5	16.5	33.0
293	985.1	10.1	82	10.14	6.40	16.0	11.3	27.3
217	994.6	10.9	79	10.30	6.45	16.1	11.0	27.1

26 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
217	990.2	18.0	95	19.62	12.34	30.9	19.0	49.9
696	936.3	16.0	98	17.83	11.90	29.8	21.5	51.3
1217	880.6	12.9	98	14.58	10.33	25.8	23.7	49.5
1709	830.3	9.6	98	11.71	8.75	21.9	25.1	47.0
1822	819.0	9.8	62	7.51	5.72	14.3	25.5	39.8
2043	797.6	9.2	76	8.85	6.92	17.3	28.0	45.3
1642	837.1	11.4	100	13.48	10.00	25.0	26.5	51.5
1180	884.2	13.0	94	14.08	9.92	24.8	23.5	48.3
754	930.0	15.1	100	17.17	11.50	28.8	21.2	50.0
217	989.9	19.8	87	20.11	12.65	31.6	21.0	52.6

28 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
217	978.7	16.9	98	18.87	11.10	27.9	18.7	46.6
785	915.6	14.3	93	15.16	10.30	25.9	21.7	47.6
1490	842.0	11.4	41	5.53	4.10	10.3	26.0	36.3
1842	807.2	9.5	26	3.09	2.39	6.0	27.5	33.5

(No descent)

GROESBECK, TEX.

1 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ
141	1011.9	-1.0	75	4.22	2.59	-2.0
536	962.8	-4.4	75	3.18	2.06	-1.7
714	941.4	-4.3	75	3.21	2.12	0.4
925	916.9	5.1	32	2.81	1.91	12.3
1010	907.7	5.2	100	8.84	6.06	13.1
1114	896.2	4.4	81	6.77	4.71	13.5
1217	885.0	3.5	100	7.85	5.52	13.1
2235	780.5	0.2	100	6.20	4.95	20.4
1223	885.0	3.5	100	7.85	5.53	13.2
873	923.9	5.5	28	2.53	1.71	12.0
561	960.5	-4.2	73	3.15	2.04	-1.0
141	1012.5	-0.2	66	3.97	2.41	-1.2

3 February, 1929.

141	1005.4	5.3	97	8.64	5.34	5.2
290	987.1	3.4	97	7.56	4.77	4.6
363	978.5	6.1	94	8.85	5.64	8.1
302	985.9	3.2	96	7.37	4.66	4.4
141	1005.7	5.4	96	8.61	5.34	5.2

5 February, 1929.

141	993.1	5.9	94	8.72	5.47	6.5
516	949.1	8.8	97	10.98	7.22	13.2
980	897.2	6.7	81	7.95	5.52	15.7
1426	849.6	2.9	99	7.44	5.45	16.1
1724	818.9	1.6	99	6.79	5.16	18.0
1864	804.8	6.7	27	2.65	2.05	24.8
2703	726.1	0.9	32	2.09	1.79	27.4
2107	781.6	6.6	26	2.53	2.01	27.2
1892	802.7	2.0	98	6.91	5.38	18.8
1089	885.7	7.0	77	7.72	5.43	17.0
535	946.7	11.5	60	8.14	5.35	16.4
337	969.7	5.6	99	9.00	5.78	8.1
141	993.2	6.8	95	9.39	5.90	6.7

7 February, 1929.

141	1000.1	4.0	91	7.40	4.61	4.0
441	963.8	1.3	92	6.17	3.99	4.2
889	911.4	-0.9	93	5.27	3.60	6.3
543	951.7	-0.5	93	5.45	3.57	3.5
141	1000.4	4.0	91	7.40	4.61	4.0

18.2
19
37.2

GROESBECK, TEX.

8 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		θ.	θe=
141	1001.2	-3.0	100	4.77	2.96	7.4	-3.0	44
496	957.1	-6.4	100	3.58	2.33	5.8	-3.0	28
1051	893.7	8.6	100	11.17	7.77	19.4	17.8	37.0 100
1351	862.0	7.5	100	10.37	7.48	18.7	20.0	38.7 117
1084	890.3	8.7	100	11.25	7.88	19.7	18.1	37.8 108
524	954.7	-5.7	100	3.80	2.48	6.2	-2.0	42
141	1002.4	-2.9	98	4.71	2.93	7.3	-3.1	42

9 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
141	1006.1	-8.0	80	2.50	1.54	-8.6
652	942.0	-13.2	74	1.46	0.97	-8.7
1234	875.0	-1.5	77	4.16	2.96	9.0
1415	855.9	3.5	66	5.18	3.77	16.4
1217	877.2	-0.9	74	4.20	2.99	9.3
640	944.4	-12.6	77	1.60	1.05	-8.1
141	1007.2	-8.1	77	2.38	1.47	-8.8

10 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
141	1014.9	-6.8	58	2.01	1.25	-10.0
464	973.5	-9.4	53	1.46	0.93	-7.2
954	914.5	-5.5	22	0.85	0.58	1.6
1336	871.4	-1.4	25	1.36	0.97	9.0
1523	851.6	-2.0	33	1.71	1.25	11.1
1341	871.4	-0.6	26	1.51	1.08	10.8
748	939.0	-5.3	21	0.83	0.55	-0.2
507	968.7	-9.1	31	0.88	0.57	-8.1
141	1015.5	-6.0	53	1.58	0.97	-9.3

GROESBECK, TEX.
11 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	1019.1	-3.0	78	3.72	2.27	-4.7
305	998.2	-1.8	53	2.79	1.74	-1.8
817	935.6	-4.8	56	2.30	1.53	0.3
1005	913.4	-3.0	35	1.67	1.14	4.1
1186	892.7	-3.9	32	1.41	0.98	5.0
1317	878.1	-3.6	24	1.09	0.77	6.7
1970	808.2	-5.6	19	0.73	0.56	11.3
2083	796.7	-5.2	19	0.75	0.59	13.0
2174	787.4	-5.[illegible]	17	0.66	0.52	13.7
2856	722.3	-3.8	11	0.49	0.42	22.6
3488	666.5	-7.0	9	0.31	0.29	26.0
3641	653.3	-6.6	7	0.25	0.24	28.2
4361	595.9	-11.1	6	0.14	0.15	30.8
4963	551.0	-13.5	7	0.13	0.15	35.3
3643	654.2	-5.5	6	0.23	0.22	28.3
3511	665.6	-6.1	6	0.22	0.21	27.0
2652	742.3	-3.3	5	0.23	0.19	21.0
2176	788.4	-6.1	5	0.18	0.14	13.0
1325	878.1	-1.9	7	0.37	0.26	8.6
902	926.2	-3.9	9	0.40	0.27	2.3
496	975.0	-3.4	35	1.61	1.03	-1.3
141	1019.4	1.0	64	4.20	2.56	-0.6

12 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	1010.2	-2.9	87	4.18	2.58	-3.7
316	988.4	2.0	43	3.03	1.91	3.2
869	922.7	-0.3	43	2.56	1.73	6.0
1031	904.2	0.5	16	1.01	0.70	8.6
1379	865.7	-1.4	14	0.76	0.55	10.0
1772	824.1	0.0	13	0.79	0.60	15.8
2262	774.8	-2.4	38	1.90	1.53	18.3
2531	749.1	-0.9	33	1.87	1.55	23.2
2647	738.1	-1.6	39	2.09	1.76	23.3
2835	721.1	-0.8	18	1.03	0.89	26.2
3841	634.9	-7.2	19	0.63	0.62	30.0
3067	701.1	-0.7	18	1.04	0.93	28.0
2797	725.1	-1.4	33	1.80	1.55	25.0
2473	755.2	-0.3	33	1.97	1.62	23.0
2110	790.3	-1.2	47	2.60	2.04	17.8
1816	819.8	0.7	31	1.99	1.52	16.8
1555	847.0	-0.5	29	1.70	1.25	13.1
1174	888.2	0.6	26	1.66	1.17	10.0
949	913.4	0.1	34	2.09	1.42	7.7
534	961.7	2.2	41	2.94	1.90	5.8
333	985.9	1.5	45	3.06	1.94	2.8
141	1009.6	3.8	54	4.33	2.66	3.0

GROESBECK, TEX.
13 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	1003.7	1.2	88	5.86	3.64	1.0
363	976.4	0.2	83	5.15	3.28	2.1
403	971.6	4.7	54	4.61	2.95	7.2
1137	887.8	3.3	41	3.17	2.22	12.7
1608	837.6	2.3	40	2.88	2.12	17.2
1799	818.0	5.0	33	2.88	2.19	21.3
2578	742.8	-1.6	34	1.82	1.53	22.6
3248	683.0	-5.3	33	1.30	1.18	26.0
2584	742.8	-0.5	35	2.05	1.72	24.0
1915	807.2	4.6	33	2.80	2.16	22.5
1720	826.6	2.9	38	2.86	2.15	18.5
1171	884.4	5.0	36	3.14	2.22	15.0
776	928.4	4.5	36	3.03	2.04	10.8
553	954.6	-0.9	67	3.80	2.48	2.8
141	1004.7	2.3	81	5.84	3.61	2.0

14 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	999.8	1.3	95	6.37	3.97	1.3
443	963.2	6.2	58	5.50	3.55	9.0
848	916.8	6.9	41	4.08	2.77	14.0
1227	875.3	4.5	88	7.41	5.27	17.3
1643	832.0	8.5	27	3.00	2.25	24.0
2793	722.5	1.1	29	1.92	1.66	28.1
3364	672.9	-1.3	34	1.87	1.73	31.8
2925	711.5	1.0	26	1.71	1.50	28.2
1878	809.2	9.5	23	2.73	2.11	27.2
1652	832.0	5.3	94	8.38	6.27	20.8
1450	852.9	7.0	94	9.42	6.88	20.0
993	901.6	6.2	97	9.20	6.36	14.7
855	916.8	4.4	64	5.35	3.64	11.8
470	960.8	7.4	52	5.36	3.48	11.0
141	1000.2	4.1	85	6.96	4.34	4.0

GROESBECK, TEX.
15 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
141	995.9	6.3	100	9.54	5.96	6.7
259	981.6	5.4	100	8.97	5.70	7.1
506	952.4	6.1	100	9.41	6.17	10.0
871	911.0	5.5	100	9.03	6.17	13.0
1394	855.0	9.8	38	4.61	3.36	23.0
1830	811.2	7.2	32	3.25	2.50	24.7
2829	717.2	-0.6	61	3.54	3.08	27.0
1599	834.1	8.5	25	2.78	2.08	24.0
1124	883.2	11.0	32	4.20	2.96	21.3
827	915.7	4.8	98	8.43	5.72	12.0
515	951.2	5.5	98	8.85	5.80	9.7
259	981.6	4.3	100	8.30	5.27	6.0
141	995.9	5.6	100	9.09	5.68	6.0

16 February, 1929.

141	1002.6	0.8	92	5.95	3.70	0.8
395	971.5	1.4	60	4.06	2.60	3.9
495	959.4	1.4	60	4.06	2.64	4.7
931	908.7	-2.2	68	3.47	2.38	5.1
1525	843.5	-1.8	54	2.85	2.11	12.1
2277	767.1	-5.0	32	1.29	1.05	16.3
2984	700.6	-9.1	21	0.59	0.53	19.3
3184	682.9	-8.3	17	0.52	0.47	23.0
3364	667.4	-8.8	15	0.44	0.41	24.0
3586	648.6	-6.0	11	0.41	0.39	29.3
3732	637.7	-6.4	10	0.36	0.35	30.3
3218	681.9	-3.8	5	0.22	0.21	28.0
2803	718.6	-5.4	5	0.20	0.17	21.2
2610	736.6	-5.5	6	0.23	0.19	19.0
1608	835.8	-0.5	13	0.76	0.57	14.0
1298	868.9	0.5	18	1.14	0.82	12.1
520	957.0	1.0	30	1.97	1.28	4.5
141	1003.1	3.0	78	5.91	3.68	3.0

GROESBECK, TEX.
17 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	998.1	5.0	79	6.89	4.30	5.0
694	933.2	9.0	32	3.67	2.45	14.7
1056	893.3	8.2	29	3.15	2.20	17.5
1434	853.3	9.1	22	2.54	1.85	22.3
2033	793.5	5.9	19	1.76	1.38	25.1
2166	780.8	5.9	17	1.58	1.26	26.3
2745	727.3	2.2	16	1.15	0.98	28.8
2973	707.3	2.6	7	0.52	0.46	31.8
3545	658.9	-0.2	6	0.36	0.34	34.7
2959	709.3	3.4	6	0.47	0.41	32.3
2799	723.3	2.7	7	0.52	0.45	29.7
2065	791.3	8.0	9	0.97	0.76	27.5
1833	813.9	7.6	10	1.04	0.80	25.0
1486	849.2	9.2	12	1.40	1.03	23.0
1452	852.4	9.0	12	1.38	1.01	22.2
1236	874.9	10.3	19	2.38	1.69	21.7
737	929.6	6.5	55	5.32	3.56	12.8
141	999.0	10.7	64	8.24	5.14	10.7

18 February, 1929.

141	997.3	9.5	95	11.28	7.03	10.0
513	953.7	12.8	92	13.60	8.88	16.8
792	922.8	12.7	67	9.84	6.65	19.3
1083	891.4	15.0	21	3.58	2.50	24.7
2094	790.1	7.9	13	1.38	1.09	27.8
1108	889.1	14.6	16	2.66	1.86	24.7
777	925.1	11.1	91	12.02	8.10	17.8
448	962.2	13.3	89	13.60	8.78	16.5
141	998.2	9.9	96	11.71	7.32	10.0

19 February, 1929.

141	1000.0	-0.6	96	5.58	3.47	-0.6
569	947.8	-3.6	98	4.45	2.92	0.8
744	927.6	4.5	98	8.25	5.54	10.7
634	940.6	-2.3	98	4.96	3.29	2.5
141	1000.7	-1.0	92	5.18	3.22	-1.0

GROESBECK, TEX.

20 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	999.7	-3.4	87	4.01	2.50	-3.4
522	952.3	-7.1	100	3.37	2.20	-3.3
855	913.4	3.0	45	3.41	2.32	10.2
1131	883.3	4.8	38	3.27	2.31	15.5
1426	851.9	4.4	41	3.43	2.51	17.3
1149	881.1	4.8	37	3.18	2.25	15.2
1025	894.8	3.0	45	3.41	2.37	12.0
480	958.3	-6.6	100	3.52	2.29	-3.3
141	1000.7	-3.2	93	4.36	2.72	-3.2

22 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	1012.9	1.5	93	6.33	3.68	0.5
429	977.3	-2.0	100	5.18	3.30	0.0
528	965.4	-1.1	88	4.91	3.17	1.8
679	947.5	-1.9	91	4.76	3.13	2.5
979	912.6	2.4	40	2.90	1.98	9.8
1082	901.2	2.8	33	2.47	1.71	11.3
1476	858.9	3.2	30	2.30	1.67	15.7
1211	887.7	3.7	30	2.39	1.68	13.2
975	913.8	2.3	31	2.24	1.53	9.7
835	930.0	3.2	33	2.53	1.69	9.0
545	964.2	-1.9	100	5.23	3.38	1.0
141	1014.1	1.9	92	6.44	3.95	0.7

23 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	1013.1	1.0	92	6.04	3.70	0.0
286	995.3	5.2	64	5.66	3.55	5.5
640	953.0	2.8	73	5.45	3.56	6.8
843	929.4	3.5	27	2.12	1.42	9.7
1170	892.6	2.8	14	1.05	0.73	12.0
1471	860.1	5.3	8	0.71	0.51	17.8
2309	776.1	3.5	26	2.04	1.64	24.7
1662	840.4	5.5	16	1.44	1.07	20.0
1401	867.9	5.1	16	1.40	1.00	17.0
1255	883.6	3.4	17	1.32	0.93	13.7
946	917.8	4.3	18	1.49	1.01	11.5
743	941.1	3.5	21	1.65	1.09	8.6
520	967.3	4.3	29	2.41	1.55	7.2
330	990.3	2.7	69	5.12	3.22	3.8
141	1013.5	4.5	82	6.90	4.24	3.5

GROESBECK, TEX.

24 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
141	997.1	10.0	91	11.17	6.97		10.2	
384	968.2	8.4	100	11.02	7.10		11.2	
607	942.8	11.5	92	12.48	8.24	20.6	16.5	37.1
1248	872.7	7.7	94	9.88	7.04	17.6	18.0	35.6
1690	827.1	5.0	96	8.37	6.30	15.8	20.7	36.5
1250	872.7	8.2	96	10.44	7.45	18.6	19.5	38.0
541	950.0	12.0	84	11.79	7.73		16.2	
329	974.4	8.8	96	10.87	6.96		11.0	
141	996.7	10.6	91	11.63	7.37		10.2	

25 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.		
141	984.2	19.4	84	18.93	12.00	30.0	20.7	50.7	323.7
601	933.0	16.4	97	18.10	12.10	30.3	22.3	52.7	325.7
1314	857.5	11.9	99	13.79	10.03	25.1	24.5	49.6	322.6
512	942.5	16.6	95	17.96	11.87	29.8	22.0	51.8	324.8
141	984.1	19.4	84	18.93	12.00	30.0	20.7	50.0	323.0

26 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	994.5	5.2	97	8.57	5.38	6.0
579	943.4	8.0	41	4.40	2.90	12.8
919	905.6	10.6	23	2.94	2.03	18.7
505	951.9	7.2	35	3.56	2.32	11.5
141	995.3	4.7	97	8.28	5.17	5.0

27 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	991.4	8.1	70	7.56	4.75	9.0
509	948.2	10.4	31	3.91	2.57	15.0
1344	857.6	7.1	20	2.02	1.47	20.0
2224	770.1	2.0	96	6.77	5.47	23.5
2690	727.0	-0.3	100	5.96	5.10	26.0
3421	663.4	-3.2	79	3.71	3.49	30.3

(No descent)

GROESBECK, TEX.
28 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
141	994.5	4.8	91	7.82	4.90	5.0
500	951.8	6.6	57	5.55	3.64	10.8
834	913.9	5.0	50	4.36	2.98	12.5
1056	889.5	7.0	40	4.01	2.80	16.6
1481	844.5	4.1	33	2.70	1.98	18.0
2300	762.5	-2.2	46	2.35	1.92	20.0
3019	696.8	-5.9	37	1.38	1.23	23.8
2531	741.8	-2.7	32	1.56	1.31	21.9
2293	764.5	-1.5	40	2.16	1.76	20.4
1537	840.1	4.7	30	2.56	1.90	20.5
1389	855.6	4.7	38	3.25	2.37	17.5
1016	895.3	8.0	40	4.29	2.99	17.0
827	916.3	7.0	47	4.71	3.19	14.2
504	953.0	7.1	65	6.56	4.29	11.2
349	971.2	5.4	86	7.71	4.92	8.0
141	996.3	7.4	86	8.86	5.43	7.7

ROYAL CENTER, IND.

1 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	1006.2	-21.8	82	0.72	0.44	-22.1
403	982.1	-23.4	98	0.74	0.47	-22.0
591	957.2	-21.1	100	0.94	0.61	-17.8
828	927.0	-20.8	100	0.97	0.65	-15.2
583	958.4	-20.0	100	1.04	0.68	-16.7
356	988.4	-23.9	98	0.70	0.44	-23.0
225	1006.4	-21.6	82	0.73	0.45	-22.0

4 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	1000.4	-12.0	96	2.10	1.31	-12.0
415	975.8	-12.5	100	2.10	1.34	-11.0
805	927.7	-7.2	38	1.27	0.85	-1.6
1317	869.0	-7.3	30	0.99	0.71	3.5
1808	816.0	-7.0	53	1.46	1.11	9.0
1406	859.2	-7.2	32	1.07	0.78	4.8
715	938.6	-7.3	33	1.09	0.72	-2.6
383	979.6	-9.8	66	1.76	1.12	-8.3
225	999.9	-8.2	83	2.55	1.59	-8.2

5 February, 1929. (a.m. flight)

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	990.3	-9.7	93	2.50	1.57	-9.0
480	958.4	-5.5	63	2.44	1.59	-2.1
781	922.5	-4.7	29	1.20	0.81	1.8
1318	861.9	-4.9	53	2.16	1.56	6.8
1651	826.0	-6.9	92	3.16	2.38	8.3
2004	789.4	-7.1	67	2.26	1.79	11.7
2365	753.9	-8.7	87	2.55	2.10	13.8
2015	788.4	-7.8	76	2.41	1.90	11.0
1863	804.1	-7.7	75	2.40	1.87	9.3
1734	817.6	-5.9	100	3.74	2.84	10.0
1623	829.1	-6.7	100	3.49	2.62	8.5
1208	874.3	-5.6	53	2.03	1.44	5.0
774	923.7	-3.2	36	1.69	1.14	2.8
660	937.2	-5.0	36	1.45	0.96	0.0
432	964.7	-4.8	50	2.05	1.33	-2.0
225	990.6	-7.0	84	2.86	1.80	-6.5

ROYAL CENTER, IND.
5 February, 1929. (p.m. flight)

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	987.5	-1.4	76	4.13	2.61	-0.6
444	960.6	-3.4	77	3.55	2.30	-0.3
778	920.9	-3.5	100	4.58	3.10	3.0
799	918.5	-2.5	92	4.57	3.10	4.2
1007	894.7	-3.5	75	3.44	2.40	5.0
1388	852.5	-4.4	100	4.34	3.10	8.3
2083	780.4	-5.6	84	3.22	2.57	14.6
1430	848.1	-4.4	100	4.24	3.11	9.0
646	936.8	-3.0	98	4.67	3.10	2.0
550	948.0	-3.6	82	3.72	2.44	0.7
225	987.7	-1.5	72	3.89	2.45	-0.6

8 February, 1929.

225	989.5	-1.0	92	5.18	3.25	-0.3
536	951.1	-4.6	100	4.17	2.73	-0.7
1343	858.8	-8.4	100	3.01	2.18	3.4
1562	834.1	-8.1	88	2.72	2.03	6.2
1848	803.0	-9.2	91	2.56	1.98	8.0
1991	789.0	-8.8	73	2.12	1.67	9.9
2436	745.0	-9.7	77	2.07	1.73	14.0
2783	712.4	-8.6	50	1.48	1.29	19.0
2990	693.6	-10.1	66	1.72	1.54	19.4
2634	726.1	-8.3	59	1.79	1.53	17.6
2426	746.0	-9.3	75	2.08	1.74	14.0
2158	772.3	-9.5	71	1.95	1.58	11.1
1826	805.9	-8.5	69	2.06	1.59	8.5
1450	846.8	-8.1	77	2.38	1.75	5.3
1322	860.2	-8.5	95	2.84	2.06	3.4
937	903.8	-6.6	85	2.99	2.06	1.2
536	951.1	-4.7	92	3.81	2.50	-0.5
225	989.2	-1.8	79	4.16	2.62	-0.8

ROYAL CENTER, IND.
9 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	992.6	-12.6	92	1.91	1.20	-12.3
355	975.8	-15.0	100	1.67	1.07	-13.2
623	941.9	-13.3	99	1.93	1.27	-9.0
732	928.4	-13.7	97	1.82	1.22	-8.0
1445	845.7	-11.7	67	1.51	1.11	1.3
2100	776.3	-11.0	52	1.25	1.00	8.8
2299	756.5	-10.0	50	1.31	1.08	12.0
2651	722.7	-11.5	55	1.26	1.09	14.0
2317	755.4	-10.6	51	1.26	1.04	11.7
2044	782.5	-10.8	30	0.73	0.58	8.5
1744	815.0	-10.8	38	0.93	0.71	5.7
1519	838.1	-12.1	41	0.89	0.66	1.4
938	904.5	-12.7	72	1.48	1.02	-5.2
538	953.0	-11.9	86	1.90	1.24	-8.0
357	975.8	-12.8	74	1.51	0.96	-10.9
225	992.7	-10.8	75	1.83	1.15	-10.4

11 February, 1929.

225	997.6	-10.2	97	2.49	1.56	-10.0
668	941.6	-14.6	100	1.73	1.14	-10.0
1535	839.2	-18.1	100	1.25	0.93	-4.8
2134	774.4	-21.5	100	0.90	0.72	-2.2
2401	746.9	-20.6	100	0.99	0.83	1.8
3442	648.1	-24.7	92	0.61	0.59	8.0
3573	636.4	-24.5	78	0.52	0.51	10.0
3937	605.8	-26.5	77	0.42	0.43	11.8
3170	673.3	-22.7	78	0.62	0.57	7.7
1997	788.9	-17.7	78	1.01	0.80	0.3
1440	850.1	-18.0	100	1.26	0.92	-5.5
1153	883.5	-17.6	100	1.31	0.92	-8.4
653	944.1	-14.9	100	1.69	1.12	-10.6
225	998.6	-10.1	80	2.08	1.30	-10.1

13 February, 1929.

225	992.2	-7.2	97	3.24	2.03	-6.7
530	954.1	-8.3	100	3.04	1.99	-3.8
726	929.5	-8.3	100	3.04	2.02	-2.7
1650	824.4	-12.1	100	2.17	1.64	2.8
715	930.7	-8.4	100	3.01	2.01	-3.0
410	968.0	-8.2	100	3.07	1.97	-5.8
225	991.2	-5.1	88	3.52	2.21	-4.4

ROYAL CENTER, IND.
14 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	991.7	-12.6	96	2.00	1.26	-12.0
355	974.9	-14.4	96	1.69	1.08	-12.3
472	960.1	-10.1	85	2.06	1.34	-6.8
584	946.3	-10.3	96	2.45	1.61	-6.0
934	904.3	-10.5	53	1.33	0.92	-2.9
1690	819.2	-12.9	88	1.78	1.35	2.7
2622	724.0	-18.9	92	1.07	0.92	6.0
2824	704.5	-17.1	90	1.23	1.09	10.0
3428	649.6	-22.8	92	0.74	0.71	10.4
2727	714.3	-18.6	97	1.15	1.00	7.5
2066	780.0	-13.6	92	1.75	1.40	5.7
1893	798.0	-14.6	92	1.59	1.24	2.7
1023	893.9	-9.9	97	2.56	1.79	-1.4
746	926.3	-9.3	98	2.72	1.83	-3.2
608	943.1	-10.5	100	2.51	1.66	-6.0
225	990.5	-5.0	74	2.98	1.87	-4.3

15 February, 1929.

225	990.0	-11.0	100	2.40	1.51	-10.2
381	970.2	-7.0	82	2.79	1.79	-4.6
660	936.3	-6.6	63	2.22	1.47	-1.4
1495	940.0	-13.4	81	1.56	1.16	0.0
1840	802.8	-10.0	30	0.79	0.61	7.1
1982	788.0	-9.9	30	0.79	0.62	8.9
1710	816.6	-10.0	26	0.68	0.52	6.0
1394	850.9	-12.5	67	1.41	1.03	0.0
1001	895.5	-9.1	76	2.15	1.50	-0.6
334	975.5	-6.0	78	2.89	1.84	-4.0
225	989.0	-3.2	68	3.19	2.00	-2.3

ROYAL CENTER, IND.
16 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
225	984.6	-7.0	95	3.23	2.12	5.3	-5.8	-0.5
468	954.5	-6.2	75	2.73	1.78	4.5	-2.7	+1.8
1065	884.5	-6.4	60	2.15	1.52	3.8	3.3	+7.1
1493	837.0	-9.2	58	1.63	1.21	3.0	4.8	+7.8
1684	816.8	-9.0	36	1.03	0.79	2.0	6.7	+8.7
1949	789.3	-10.9	32	0.77	0.61	1.5	7.9	+9.4
2064	777.6	-9.8	25	0.67	0.54	1.4	10.0	11.4
3070	682.4	-12.3	18	0.38	0.35	0.9	18.3	18.9
4267	581.8	-22.5	18	0.15	0.16	0.4	20.0	24.0
4616	554.0	-25.7	57	0.34	0.38	1.0	20.1	21.1
3692	627.7	-19.0	41	0.47	0.47	1.2	17.8	19.0
2817	705.3	-13.6	37	0.70	0.62	1.6	14.0	15.6
2711	715.1	-14.3	45	0.80	0.70	1.8	12.0	13.8
1865	798.8	-7.3	40	1.32	1.03	2.6	10.2	12.8
1651	821.1	-8.0	39	1.22	0.93	2.3	7.4	9.7
1490	838.1	-6.5	38	1.35	1.00	2.5	7.5	10.0
1058	885.4	-5.0	54	2.18	1.54	3.9	4.6	8.5
576	940.8	-2.6	68	3.35	2.22	5.6	2.3	7.9
225	982.9	2.6	60	4.42	2.80	7.0	4.0	11.0

17 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	10Q/4	Θ.	
225	984.9	7.2	65	6.60	4.17	10.4	8.6	19.0
628	937.3	1.4	82	5.54	3.67	9.2	6.6	15.8
1096	884.0	-2.6	89	4.39	3.09	7.7	8.5	16.2
1340	857.2	-2.6	79	3.89	2.83	7.1	9.8	16.9
2027	785.7	-4.5	56	2.36	1.88	4.7	14.7	19.4
2953	697.4	-11.2	73	1.72	1.53	3.8	18.0	21.8
2121	776.2	-6.1	68	2.50	2.00	5.0	14.0	19.0
1561	833.5	-3.3	74	3.44	2.56	6.4	11.4	17.8
1349	856.1	-3.2	98	4.60	3.34	8.4	9.0	17.4
659	933.1	2.8	79	5.90	3.94	9.9	8.3	18.2
361	967.9	5.7	74	6.78	4.36	10.9	8.2	19.1
225	984.1	4.5	78	6.57	4.16	10.4	6.0	16.4

ROYAL CENTER, IND.
18 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	993.9	-6.9	92	3.16	1.98	-6.3
616	945.1	-12.0	100	2.19	1.44	-7.5
909	909.4	-14.6	100	1.73	1.18	-7.4
1573	835.0	-3.9	38	1.68	1.25	10.4
2604	731.3	-11.7	41	0.92	0.78	13.2
2871	706.5	-10.8	37	0.90	0.79	17.0
3075	688.0	-12.7	51	1.05	0.95	17.3
2423	750.3	-9.6	44	1.19	0.99	13.3
1988	793.6	-6.1	35	1.28	1.00	12.2
1618	831.8	-5.7	46	1.75	1.31	9.0
1488	845.8	-7.8	50	1.58	1.16	5.3
1293	867.3	-7.4	49	1.61	1.15	3.8
961	905.3	-10.8	38	0.93	0.64	-3.2
777	927.3	-13.9	97	1.79	1.20	-8.2
531	957.8	-12.7	97	2.00	1.30	-9.3
225	996.6	-7.8	85	2.69	1.68	-7.3

19 February, 1929.

225	993.5	-13.0	96	1.92	1.20	-12.8
517	955.8	-17.0	100	1.39	0.90	-13.5
846	914.8	-16.8	100	1.41	0.96	-10.2
1180	874.9	-17.4	100	1.34	0.95	-7.3
1330	857.7	-15.8	100	1.55	1.12	-4.1
1156	878.1	-16.9	100	1.40	0.99	-7.2
601	945.3	-14.8	100	1.70	1.12	-10.3
534	953.7	-16.3	100	1.48	0.97	-12.8
225	993.5	-12.2	89	1.91	1.20	-11.7

20 February, 1929.

225	997.0	-11.4	78	1.80	1.12	-11.0
653	942.1	-17.4	84	1.13	0.75	-13.0
889	912.7	-18.5	92	1.10	0.75	-11.8
1786	809.7	-13.6	28	0.53	0.41	2.7
934	906.5	-16.5	40	0.58	0.40	-9.3
414	970.7	-13.2	59	1.16	0.74	-11.0
225	994.8	-8.8	63	1.83	1.15	-8.4

ROYAL CENTER, IND.
21 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	983.5	-8.5	97	2.90	1.84	-7.2
602	936.5	-11.8	100	2.23	1.48	-6.8
812	911.3	-11.2	98	2.30	1.57	-4.2
946	895.7	-13.1	100	1.99	1.38	-5.0
1641	817.9	-10.3	72	1.84	1.40	5.3
1925	788.2	-11.8	77	1.72	1.36	6.8
2285	752.2	-11.5	77	1.76	1.46	11.0
2604	721.6	-14.1	81	1.47	1.26	11.3
2955	689.0	-16.3	61	0.90	0.81	13.3
2531	729.1	-14.0	74	1.35	1.15	10.6
2316	750.1	-14.2	88	1.58	1.31	8.1
1553	828.5	-7.9	73	2.30	1.72	7.0
1171	870.5	-9.3	64	1.78	1.27	2.7
1050	884.3	-12.3	85	1.81	1.27	-2.8
611	936.5	-10.0	86	2.25	1.50	-5.0
225	984.0	-4.6	76	3.17	2.00	-3.3

22 February, 1929.

225	1000.4	-14.8	86	1.46	0.91	-14.8
421	974.7	-18.5	95	1.14	0.73	-16.7
574	955.6	-14.7	96	1.65	1.07	-11.3
1061	896.0	-16.6	87	1.25	0.87	-8.2
1354	861.8	-14.4	23	0.40	0.29	-3.1
2305	759.7	-18.9	28	0.32	0.26	1.9
2658	724.7	-19.5	25	0.28	0.24	5.4
3521	644.4	-25.3	36	0.22	0.21	8.3
	(No descent)					

23 February, 1929.

225	1000.1	-8.8	84	2.44	1.52	-8.8
499	965.5	-8.1	83	2.56	1.65	-5.3
989	907.8	-3.4	52	2.40	1.65	4.0
1127	892.2	-3.9	44	1.94	1.36	5.3
2110	786.5	-11.1	40	0.95	0.75	7.8
2531	744.3	-14.8	42	0.71	0.59	8.3
2789	719.6	-13.4	39	0.75	0.65	12.7
2428	754.9	-13.5	45	0.86	0.71	8.5
1595	840.6	-5.8	34	1.28	0.95	8.2
897	918.2	-2.3	48	2.43	1.64	4.3
552	959.2	-4.3	66	2.82	1.83	-0.9
225	999.7	-1.2	66	3.65	2.28	-1.2

5/8 427/836

ROYAL CENTER, IND.

24 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
225	990.4	1.8	63	4.38	2.76	2.8
438	964.5	-0.2	61	3.67	2.37	2.8
651	939.1	1.6	51	3.50	2.32	7.0
1049	894.1	0.5	73	4.62	3.22	9.3
1928	800.3	-6.3	93	3.36	2.62	11.3
2181	774.9	-4.3	46	1.97	1.59	16.3
2410	752.7	-4.6	41	1.71	1.42	18.7
3527	653.0	-11.1	27	0.64	0.61	23.2
2650	731.7	-4.6	26	1.08	0.92	20.5
1961	798.2	-1.7	31	1.65	1.28	16.8
1922	802.4	-3.1	80	3.78	2.93	14.6
1653	830.0	-2.4	80	4.01	3.00	12.5
1151	883.8	2.6	75	5.52	3.88	12.5
1047	895.2	2.9	79	5.94	4.13	11.8
686	936.0	0.6	67	4.27	2.84	6.0
225	990.9	6.2	58	5.50	3.45	7.2

14° 20° at 8000

25 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
225	986.8	3.2	71	5.45	3.44	8.6	4.4	13.0
553	947.9	6.3	61	5.90	3.88	9.7	11.0	20.7
763	923.7	5.3	56	4.99	3.38	8.5	12.0	20.5
2026	789.0	-1.3	53	2.91	2.29	5.7	18.0	23.7
2276	764.6	-1.2	53	2.93	2.38	5.9	20.7	26.6
3500	654.5	-8.3	95	2.89	2.75	6.9	26.2	33.1
2211	771.0	-0.7	97	5.60	4.53	11.3	20.6	31.9
1982	793.2	-1.3	87	4.78	3.76	9.4	17.2	26.6
1689	822.9	-0.6	63	3.66	2.77	6.9	15.2	22.1
1119	883.0	3.7	82	6.53	4.61	11.5	13.8	25.3
482	954.2	8.2	72	7.83	5.10	12.8	12.3	25.1
225	984.3	7.6	73	7.62	4.84	12.1	9.1	19.2

26 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.		Θ.	
225	974.7	8.2	96	10.44	6.68	16.7	10.5	27.2
662	924.2	5.6	96	8.73	5.88	14.7	12.2	26.9
1166	868.8	1.6	100	6.86	4.92	12.3	13.3	25.6
1328	851.6	4.4	48	4.01	2.92	7.3	17.8	25.1
1450	838.7	3.3	44	3.41	2.53	6.3	17.9	24.2
1166	868.8	1.6	98	6.72	4.82	12.1	14.6	26.7
862	902.1	3.2	82	6.30	4.35	10.9	11.7	22.6
647	926.3	4.4	99	8.28	5.57	13.9	11.0	24.9
225	975.3	8.0	90	9.66	6.18	15.5	10.1	25.6

ANACOSTIA, D.C.
1 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
34	1024.0	-2.7	56	2.00	1.62	-4.5
308	986.0	-3.2	57	2.00	1.68	-2.0
1214	878.0	-9.2	66	1.40	1.32	1.0
1458	850.0	-10.8	61	1.10	1.07	2.0
1803	814.0	-9.8	60	1.20	1.22	6.5
2464	748.0	-11.3	60	1.10	1.22	12.0
2958	702.0	-14.0	50	0.70	0.83	14.0

2 February, 1929.

34	1029.0	-3.4	57	2.00	1.60	-5.5
1224	875.0	-12.4	67	1.00	0.95	-2.0
1885	803.0	-11.3	53	0.90	0.93	6.0
2215	768.0	-11.5	46	0.80	0.86	9.0
2896	702.0	-16.4	44	0.50	0.59	11.5

4 February, 1929.

34	1030.0	-3.7	70	2.40	1.93	-6.0
543	959.0	-4.4	71	2.30	2.00	-1.0
1112	891.0	-7.8	74	1.80	1.68	1.5
1905	805.0	-7.4	62	2.00	2.07	10.0
2458	746.0	-11.7	62	1.00	1.03	12.0
2591	733.0	-14.2	54	0.70	0.79	10.0
2794	713.0	-14.8	41	0.50	0.58	12.0

5 February, 1929.

34	1028.0	-5.2	88	2.60	2.10	-7.5
112	1012.0	-6.1	89	2.50	2.08	-7.0
406	973.0	-3.6	73	2.50	2.13	-1.5
812	926.0	-5.4	69	2.00	1.80	2.0
1117	888.0	-5.4	57	1.60	1.50	5.0
1514	846.0	-7.3	56	1.40	1.37	6.0
2337	759.0	-6.4	35	0.80	0.88	16.0
2997	697.0	-9.5	25	0.50	0.60	20.0

7 February, 1929.

34	1006.0	8.4	68	5.60	4.63	8.0
924	894.0	1.4	78	4.00	3.72	10.5
1330	845.0	3.5	52	3.00	2.95	17.5
1889	789.0	2.6	50	2.80	2.95	22.5
2320	745.0	1.9	30	1.60	1.79	26.0
2906	692.0	-2.3	18	0.70	0.84	28.0

ANACOSTIA, D.C.
8 February, 1929.

Alt.	Press.	Temp.	f.	e.	q.	θ.
34	1024.0	-0.1	97	4.40	3.56	-2.0
427	971.0	0.1	84	3.90	3.34	2.5
610	947.0	-0.4	84	3.70	3.25	4.0
1168	880.0	0.5	60	2.90	2.74	11.0
1560	837.0	-0.2	58	2.80	2.78	14.0
1966	795.0	0.6	42	2.00	2.09	19.5
2819	713.0	-6.0	80	2.20	2.57	21.5

12 February, 1929.

34	1033.0	-0.4	50	2.20	1.77	-3.0
700	945.0	-6.2	51	1.60	1.40	-2.0
1437	854.0	-12.4	57	0.90	0.88	0.0
2133	785.0	-13.6	50	0.70	0.74	5.0
2326	774.0	-13.7	42	0.60	0.64	7.5
2590	747.0	-11.6	33	0.60	0.67	13.0
2644	742.0	-11.0	26	0.50	0.56	14.0
2720	734.0	-12.6	22	0.40	0.45	13.0

13 February, 1929.

34	1028.0	-2.3	69	2.67	2.16	-4.5
416	975.0	-6.6	65	1.77	1.51	-4.5
853	920.0	-7.7	66	1.67	1.51	-1.0
1128	887.0	-8.8	72	1.67	1.56	1.0
1615	831.0	-10.4	71	1.36	1.36	4.0
1829	810.0	-10.6	62	1.26	1.29	6.0
1971	794.0	-10.8	64	1.26	1.32	7.2
2616	732.0	-11.2	57	1.05	1.20	13.8
2885	705.0	-13.7	51	0.75	0.88	14.0

14 February, 1929.

34	1020.0	-3.5	89	3.10	2.53	-5.0
498	960.0	-3.8	92	3.10	2.68	-0.5
996	903.0	-4.5	74	2.30	2.12	3.5
1341	862.0	-4.5	7[illegible]	2.30	2.22	7.2
1615	833.0	-5.4	74	2.20	2.20	9.0
1900	805.0	-6.7	69	1.80	1.86	10.5
2825	712.0	-14.6	86	1.10	1.28	12.0
2946	700.0	-15.7	70	0.80	0.95	12.3

ANACOSTIA, D.C.

18 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	Θ.
34	1019.0	4.2	76	4.70	3.84 3.8	3.0
670	938.0	7.5	44	3.40	3.01 3.0	13.0
1415	852.0	4.1	30	1.80	1.76 1.8	17.5
2408	755.0	-2.9	28	1.00	1.10 1.1	20.0
2550	741.0	-3.3	31	1.10	1.23 1.2	21.0
2758	720.0	-4.0	23	0.80	0.92 0.9	23.0
3085	692.0	-6.8	39	1.00	1.20 1.2	23.0
19 February, 1929.						
34	1018.0	1.1	87	4.30	3.52	0.0
305	978.0	1.4	75	3.80	3.22	3.2
1041	906.0	8.0	45	3.60	3.30	17.5
1905	802.0	2.0	48	2.50	2.58	20.0
2215	672.0	1.0	37	1.80	1.94	22.2
3221	679.0	-7.5	57	1.40	1.71	24.0
20 February, 1929.						
34	1022.0	-5.1	64	1.90	1.55	-6.8
254	990.0	-6.0	64	1.80	1.51	-5.0
732	929.0	-9.1	70	1.50	1.34	-3.5
955	903.0	-10.6	66	1.30	1.20	-2.5
1524	836.0	-10.3	59	1.10	1.09	3.7
1707	816.0	-10.4	60	1.10	1.11	5.7
2134	771.0	-6.6	38	1.00	1.08	14.0
2388	748.0	-7.5	30	0.70	0.78	16.0
2657	722.0	-8.9	32	0.70	0.80	17.5
23 February, 1929.						
34	1030.0	-0.6	51	2.20	1.77	-3.0
1016	900.0	-10.2	46	0.90	0.83	-2.0
1250	873.0	-10.1	48	0.90	0.86	0.5
1422	855.0	-8.3	49	1.10	1.07	4.0
1606	832.0	-8.4	49	1.10	1.10	6.0
2540	737.0	-16.3	48	0.50	0.56	7.2

ANACOSTIA, D.C.
25 February, 1929.

Alt.	Press.	Temp.	f.	e.	Q.	θ.
34	1023.0	2.8	70	3.80	3.09 7.7	1.0 8.7
305	985.0	1.8	62	3.20	2.70	3.0
574	952.0	6.8	36	2.70	2.35 5	11.0
851	922.0	5.9	29	2.20	1.98	12.5
1263	874.0	4.9	36	2.30	2.19	16.0
1534	845.0	2.9	31	1.70	1.67	16.5
1875	812.0	0.8	48	2.40	2.46	18.0
2469	753.0	-2.3	24	0.90	~~1.00~~ 01	21.0
2946	706.0	-3.2	9	0.30	0.35	25.0

$\frac{5}{8}\frac{4}{3}$ $\frac{20}{24}$ $\frac{5}{6}\cdot\frac{e}{p}$

$\frac{5}{8}\cdot\frac{2.40}{812} = \frac{1200}{8\cdot 812} = \frac{3}{1.624}$

$\frac{5}{8}\cdot\frac{0.90}{753} = \frac{4.5}{6024}$ $\frac{4}{3}$

$\frac{5}{8}\frac{0.30}{700}$ $\frac{1.5}{8\ 0.7}$

$\frac{5}{8}\frac{2.40}{812}$ (0.8) $\frac{4}{3} = \frac{16}{8\cdot 812}$ (2)

$\frac{1.5}{5.6}$ $\frac{4}{3}$

$\frac{2}{0.812} = \frac{1}{0.406}$

$\frac{40}{1020}\cdot\frac{5}{8}\cdot\frac{4}{3} = \frac{10}{1020.3}$ (05)

0.01