TABLE 3.—*Type of payment schedule. Fixed premium.*

[Amounts payable for $10 annual premium, when average date Fall frost is Oct. 15 and standard deviation of first killing frost is 12 days.]

When killing frost occurs before—	The relative payment is—
Sept. 15	575
20	225
25	100
30	50
Oct. 5	30
10	20

Adjustments should be made for local topography. Hillsides should be given higher payments, valley bottoms lower payments than those shown.

Table 3 is of similar character for insurance computed in another manner. Here the premium is fixed and the amounts payable if frost occurs before specified dates in the Fall is stated. Each method can be employed for either Spring or Fall frost. Although the application to Spring frost, of the method indicated by Table 3, requires the adoption of a business procedure such as the payment of no losses until after July and no policies written after some date in the early Spring; for example, the average date of last killing frost.

These illustrations show only two of the many possible methods of frost insurance. The frequency distribution of the critical frost dates has been studied in enough detail to enable determinations of the chance of frost at any time to be made for nearly all the agricultural regions of the United States.

Although other phenomena do not show the same frequency distributions as critical frost dates, the distributions for many of these phenomena have been partially investigated and the mathematical studies already completed indicate that the chance of any weather condition at all can be determined with more or less accuracy. Therefore practicable insurance against any unfavorable weather depends solely upon the determination of the hazard and a sufficient number of properly distributed risks.

It may prove possible after weather insurance companies have become well established to write insurance on the basis of crop damage not to exceed the face of the policy. It is not yet practicable to insure a farmer to have a good crop because of the fact that the value of the crop depends on so many causes other than the weather, and insurance of the crop against weather damage rather than insurance against the fact of unfavorable weather will put the better farmers at a disadvantage unless a satisfactory adjustment for the personal and moral elements can be determined.

CONCLUSION.

The farmer has always recognized that the chance of loss must be taken into account and that the returns in favorable years must carry the losses from unfavorable years. The farm business must be operated with a large enough profit and loss margin to cover these losses. The farmer has attempted to cover the risk of loss by diversification and by the selection of planting dates late enough for the chance of frost to be small. The date in each region has been determined by custom and these dates are those determined by the farmers of the region who have not suffered from loss by frost often enough to become bankrupt. These dates of planting rest on an empirical basis as a result of experience. A statistical determination of the risk involved at various times will show how far custom is the result of actual conditions in the region and how far other factors—e. g., tradition—have influenced the dates.

When the risk of loss from unfavorable weather is accurately determined and the crop of each year carries its proper portion of this risk, especially if the risks are widely distributed by insurance, bankruptcy as a result of unseasonable weather is transferred from the class of calamities to that of avoidable losses. In all cases when the chance of loss can be computed in a very large number of cases insurance is the proper method of eliminating the chance of accidental grouping of unfavorable occurrences from bearing too heavily upon the individual. Therefore, the distribution of the risk of crop damage from any condition for which the risk can be computed is a legitimate field for insurance. It is clear that weather hazard can be so determined in many instances and that insurance against the occurrence of killing frost or any unfavorable weather condition may be arranged not as a gambling operation between the farmer and the insurance company but on a sound business basis.

When such insurance has become well established it will be applicable in a much wider field than the simple distribution of the risk of the individual farmer. For example, the insurance rate quoted on a farm will give the purchaser information which will assist him in a determination of the just value; the country banker and storekeeper will be able to insure themselves so that the depression resulting from poor crops will not bear too heavily at any one time; and weather insurance in connection with farm loans may well become as general as fire insurance with loans on buildings and goods or life insurance with personal notes. The fact that the weather hazard is coming into the same class as the fire hazard in that it may be offset by a fixed charge makes possible another step in the series of farm management studies which is developing the business side of farming from a phrase to a reality.

WHAT IS A "GEOCOL"?

In the REVIEW for July, 1916, page 393, was reprinted an article on the rainfall of New South Wales, wherein was employed the geographical term "geocol" when describing the influence of Australia's topography on the rainfall of New South Wales. "Geocol" is not defined in the latest of our large dictionaries, and as the feature is an interesting one the text of the original definition is quoted.[1]

> If the stereogram (or relief map) of New South Wales be examined, it is seen * * * that the main divide is constituted of three well-defined land masses separated by *cols on a gigantic scale*. For these the term *Geocol* is suggested (analogous to Geosyncline) to differentiate these important positive land forms from the ordinary col between two hills.

Concerning the etymology of this word, Taylor has elsewhere[2] stated:

> "Geocol" is admittedly a hybrid word of the same form as peneplain. The prefix geo- is added in the same sense as in geosyncline and geanticline.

[1] *Taylor, Griffith.* A correlation of contour and climate. Proc., Linnean soc. New South Wales, Sydney, 1906, 31:517.

[2] *Taylor, Griffith.* Physiography of eastern Australia. [Melbourne, 1911.] p. 13, footnote. (Australia. Bur. Met'y., Bull. no. 8. 4°.)

In the first paper cited Mr. Taylor outlines the manner in which he finds the Cassilis geocol to affect temperature distribution, rainfall distribution, and even the movements of HIGHS and LOWS. The map of isotherms shows that these tend to form a saddle at the geocol, which is not unlike the saddle in the isohypses; similarly there is a saddle in the isohyets at the geocol; again the geocol forms a great breach in the mountainous barrier of the Blue Mountains—New England massif, a breach toward and through which HIGHS sometimes are guided by the Blue Mountains. Such a HIGH has a Southerly Burster associated with it (pp. 523–526, and his plates xlv–xlviii.) The Cassilis geocol seems also to have served as a gateway for the eastward migration of plant forms which are otherwise confined to the western side of the divide.

The study of topographic influence on weather and climate which Mr. Taylor has carried through for eastern Australia, notably for New South Wales, suggests interesting relations which might well form the subject of some studies by a college or other student of the weather of the United States. Perhaps such a study seems too detailed for the American; but such detailed knowledge is just what the actual or prospective resident of any place needs and demands of those to whom he should turn for information.—C. A., jr.

A CYCLONE IN PERSPECTIVE.

Since 1907 Mr. Merton Leonard Fuller, Local Forecaster at the Weather Bureau office in Peoria, Ill., has been using a very graphic representation of a cyclone passing over the United States, to help his classes in meteorology gain a livelier idea of the processes of our weather. This perspective view he has recently published privately elsewhere,[1] and now permits us to reproduce in the accompanying figure for the benefit of others who also may find the device useful in teaching.

The storm represented here is one that moved from southern California northeastward across Nebraska to the valley of the St. Lawrence River between December 4 and 6, 1906. (See this REVIEW, December, 1906, Chart III, track III.) While the diagram does not show the track, but represents horizontal and vertical conditions as they probably appeared at 8 a. m., December 5, 1906, the course would have appeared as a slightly curved line from about where stands the "F" of "Pacific" to the center of the isobar of 29.6 inches as shown. Of course, every reader of the figure will always bear in mind that the vertical scale is greatly exaggerated and that the storm is very much thinner than as here shown.

[1] *Barber, F. D., & others.* First course in general science. New York, 1916. 8°. p. 263, figure 188.

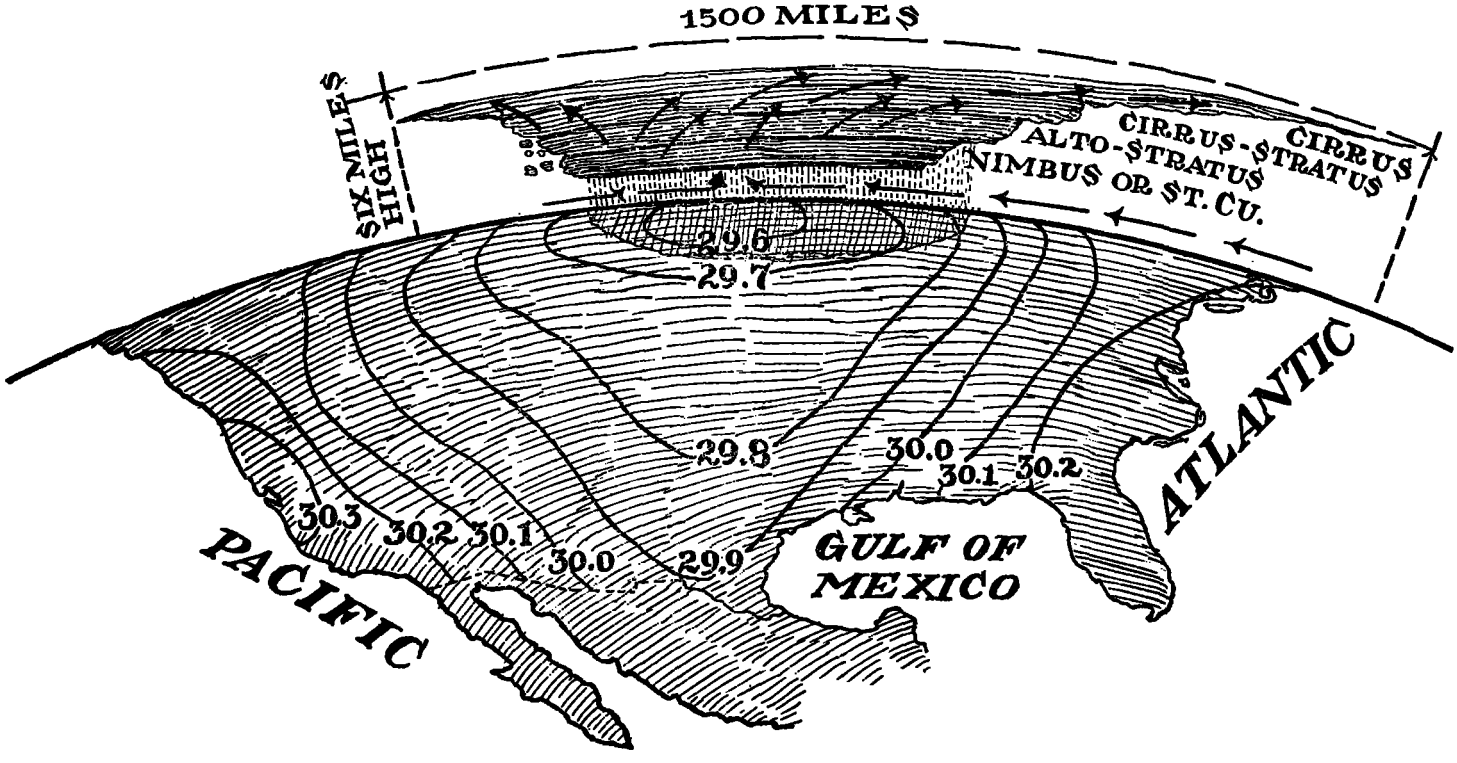

FIG. 1.—Perspective and cross section of the storm of December 4–6, 1906, when central at about Omaha, Nebr., 8 a. m. (75th mer.), on December 5. (M. L. Fuller.)