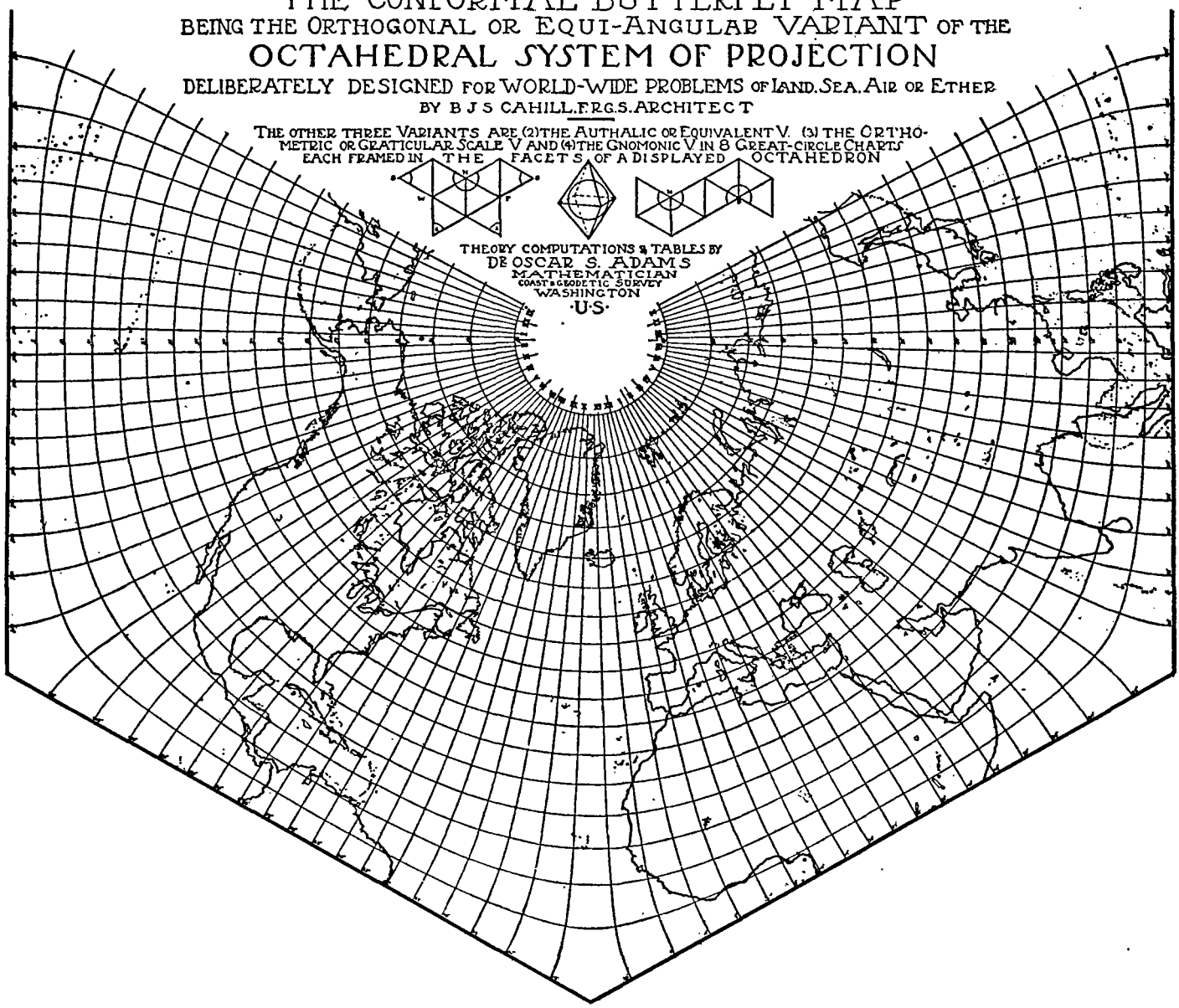
A NEW MAP FOR METEOROLOGISTS

EQUALLY SUITABLE FOR SMALL AREAS, CONTINENTS, HEMISPHERES OR THE ENTIRE WORLD

Designed for International Meteorology and Long Range Forecasting



BY SUBSTITUTING RECTANGLES TAKEN BODILY FROM THIS MAP TO COVER THE SMALLER LOCAL AND NATIONAL CHARTS, FOR THE ONES NOW IN USE (WHICH HAVE NO AGREEMENT WITH EACH OTHER) WE GET THE SURPRISING RESULT THAT THESE SEVERAL LOCAL MAPS CAN BE PIECED TOGETHER TO MAKE A MAP OF ANY DIMENSIONS DESIRED INCLUDING THE ENTIRE WORLD. THUS IT WOULD COME ABOUT THAT A DAILY WORLD WEATHER MAP WOULD COME INTO BEING AUTOMATICALLY BY THE MERE SUBSTITUTION AT NO EXTRA COST, OF DAILY SYNOPTIC CHARTS SLIGHTLY DIFFERING FROM THE ONES NOW IN USE.

FIGURE 1a.—The conformal butterfly map for the two hemispheres

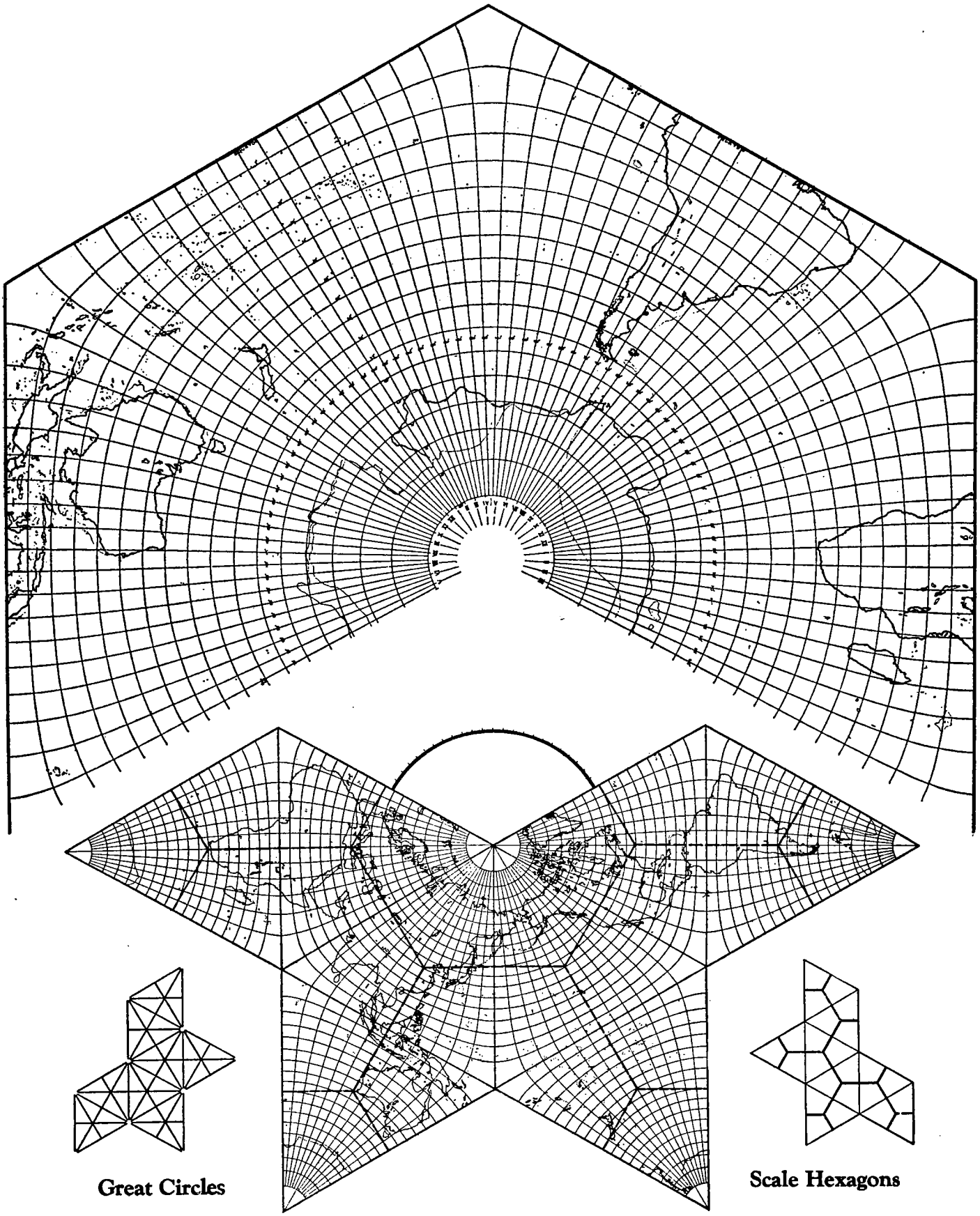


FIGURE 1b.—The conformal butterfly map for the two hemispheres

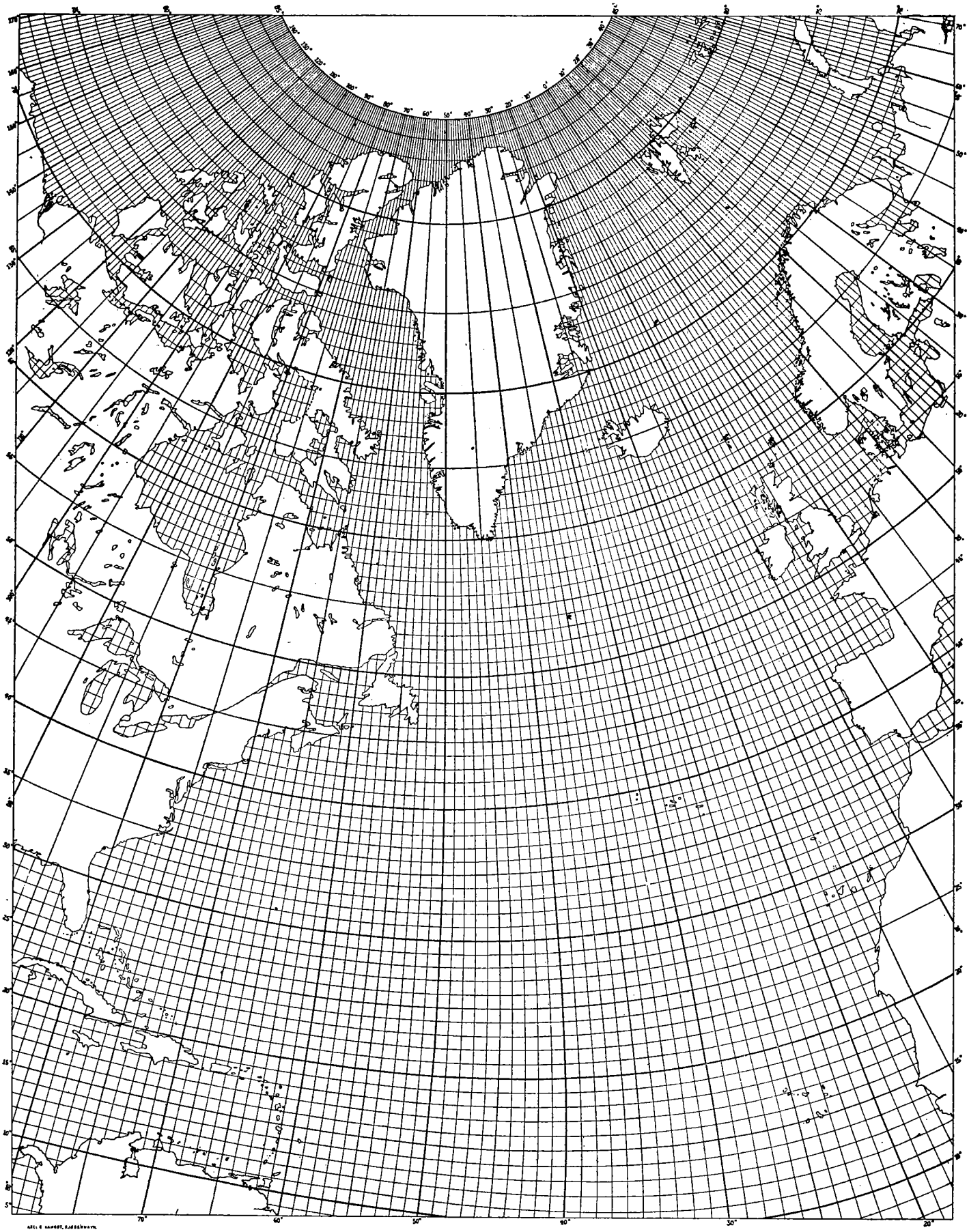


FIGURE 2.—The North Atlantic drawn on the octahedral projection conformal variant

by the Weather Bureau to the scale of 1:20,000,000, a corresponding rectangle cut from the butterfly map looks so similar that only an expert can tell the difference. When it comes to a regional map of very large scope such as the whole of Asia a rectangle cut from this world map gives a *better* representation than can be found in any atlas.

I have now before me about a score of national or local synoptic charts from the various national weather services of the world. Naturally, they are drawn to the most suitable projection for each particular country. Yet rectangles cut from the butterfly map are so nearly identical to these local regional maps that if some fine morning the latter blanks were substituted in any observatory for the former, it is doubtful whether the office force would be aware of the change.

If therefore rectangles of the right scope from the new map were gradually substituted in all weather bureaus (with the reforms and unifications much needed in many particulars), a very notable twofold result would thus be achieved at one stroke with very little cost or trouble.

First, would be the much needed international standardization as to symbols, scale, projection, printing, paper, and technique generally which at present show the utmost diversity.

Secondly, the astonishing result consequent on this substitution—namely, that all the recorded charts no matter what the scope or where the locality would, when pieced together according to the dates, form *a series of world maps for every day in the year*, or oftener as time goes on and the services of the world extend the network of observations.

To carry out this splendid program all that is necessary is to get the leading observatories to replace the local charts now in use with charts taken from the new map. The original cartoon should be executed to the scale of 1:10,000,000 with a reduction by photolithography to 1:20,000,000 for large countries or groups and a further reduction to a scale of 1:40,000,000 for insets. No other size or scale need be used.

With regard to the rectangles selected for local synoptic charts, and to select these with some definite system it is to be noted that, starting with meridian 22½° west of Greenwich every forty-fifth meridian therefrom around the world (eight in number) is a straight line from pole to pole about which the other meridians are symmetrically grouped in curves alternately convex and concave. The new national synoptic charts might well be inclosed in rectangles whose sides were successively parallel to these eight axial meridians. But the axial meridian need by no means necessarily be in the center of each rectangular synoptic chart.

Those here shown to the scale of 1:40,000,000 are slected on this principle but somewhat to one side of the vertical or central meridian.

As for the upper and lower borders, these also can be extended ad lib. to cover whatever area is needed.

In conclusion let me point out that the graticular internal weave of the conformal variant of the butterfly map belongs to the rhombic type of projection and that its details have been computed and its theory expounded by Dr. Oscar S. Adams of the United States Coast and Geodetic Survey, the foremost exponent of this, the very last word, in mathematical cartography.

I am not urging its adoption as a world map in competition with any existing program of the Comité International Meteorologique. However, learning from Professor Van Everdingen and Doctor La Cour that there is no move on foot to reorganize the national synoptic charts now in use, and that "each nation is perfectly free to adopt any map it chooses for local purposes." I hereby strongly urge the substitution of similar charts cut from this map to replace those now in use. To this end, if the United States took the initiative, I feel sure the other nations of the world could be persuaded to follow suit in view of the consequent advantages. It would then be in order to appoint a subcommission of the international committee to reorganize the whole subject of synoptic charts with a view to international cooperation and uniformity, resulting finally in daily weather records for the whole world, each on a single map of the whole world, in accord with the aims of the Pomona resolution.[1]

I present below as Figure 2 the rectangle "cut" from the butterfly map that was selected by Doctor La Cour and drawn in Copenhagen. Regarding this chart Doctor La Cour expressed himself in a letter to the author in the following words:

> My interest in your world map is so far limited that my duty only consists in the construction of weather charts over the North Atlantic and the adjacent coasts. Intentionally I have refused to elaborate charts for other parts of the world, but to meet the wishes of meteorologists and to facilitate for them the construction of supplementary charts, I am inclined to consider it expedient to use for the Atlantic, charts on a scale allowing other people to make use of your butterfly charts for other parts of the world.
>
> Much might be said in favor of the continuation of the projection used for more than 30 years for our file of North Atlantic weather charts. On the other hand the possibility for any one to augment the charts with other butterfly charts is of considerable interest. Wherefore, I have now made a trial in that direction and I send you under separate cover a copy of such chart over the North Atlantic.

98 (084.3)

A NEW PROJECTION FOR THE WORLD MAP

THE POLAR EQUAL AREA [2]

By J. PAUL GOODE, University of Chicago

The need of an equal area projection for the world map which would show true space relations across the North Pole, and for all the continental lobes across the Equator as well, was the necessity which was the mother of an invention of a new projection here presented. Last July Mr. George Findlay Simmons, curator in ornithology in the Natural History Museum of Cleveland, Ohio, wrote me asking for such a projection. He is studying the hunting falcons. These birds, with an apparent center of dispersal in western Siberia, show progressive differentiation covering the lands about the Arctic Ocean, and along lines of dispersal from these high latitudes over all the continental lobes to the south and across the Equator to the limits of the land.

Reluctantly I answered him that there was no such projection. There are projections which show true space relations across the North Pole; and all the ordinary

[1] At the Pomona College meeting of the American Meteorological Society in June, 1928, the following resolution was put and carried:

"Whereas the progress of meteorology and the science of weather forecasting are handicapped by the nonavailability of world-wide weather charts incorporating data for all parts of the globe from which observations are now procurable, and

"Whereas the various national meteorological services publish weather charts on base maps, the scales and projections of which do not conform to any agreed standard, therefore be it

"*Resolved*, That the council of the American Meteorological Society be requested to place before the Chief of the United States Weather Bureau the matter of securing an agreement among the several national weather services to the publication of weather charts of a standard scale and projection, so that those interested in the study of meteorology and weather forecasting may be able to fit the various individual maps together and thus have at their disposal a composite synoptic weather chart for any or all areas of the world from which meteorological observations are obtainable.

[2] A paper read before the Association of American Geographers at the New York meeting Dec. 28, 1928.