foreign nations, and such order may be modified from time to time.

SEC. 2. That within the respective zones created under the authority hereof the standard time of the zone shall govern the movement of all common carriers engaged in commerce between the several States or between a State and any of the Territories of the United States, or between a State or the Territory of Alaska and any of the insular possessions of the United States or any foreign country. In all statutes, orders, rules, and regulations relating to the time of performance of any act by any officer or department of the United States, whether in the legislative, executive, or judicial branches of the Government, or relating to the time within which any rights shall accrue or determine, or within which any act shall or shall not be performed by any person subject to the jurisdiction of the United States, it shall be understood and intended that the time shall be the United States standard time of the zone within which the act is to be performed.

SEC. 3. That at two o'clock antemeridian of the last Sunday in March of each year the standard time of each zone shall be advanced one hour, and at two o'clock antemeridian of the last Sunday in October in each year the standard time of each zone shall, by the retarding of one hour, be returned to the mean astronomical time of the degree of longitude governing said zone, so that between the last Sunday in March at two o'clock antemeridian and the last Sunday in October at two o'clock antemeridian in each year the standard time in each zone shall be one hour in advance of the mean astronomical time of the degree of longitude governing each zone, respectively.[1]

SEC. 4. That the standard time of the first zone shall be known and designated as United States Standard Eastern Time; that of the second zone shall be known and designated as United States Standard Central Time; that of the third zone shall be known and designated as United States Standard Mountain Time; that of the fourth zone shall be known and designated as United States Standard Pacific Time; and that of the fifth zone shall be known and designated as United States Standard Alaska Time.

SEC. 5. That all acts and parts of acts in conflict herewith are hereby repealed.

Approved, March 19, 1918.

DIAGRAMS SHOWING CONDITIONS AND EFFECTS OF THE DAYLIGHT-SAVING ACT.

By CHARLES F. MARVIN, Chief.

[Weather Bureau, Washington, Apr. 3, 1918.]

Charts XLVI–19 to XLVI–21 of this issue of the REVIEW show the hours of darkness and daylight, including twilight, for selected latitudes from 30° to 60° N., at intervals of 6°. The shaded blocks in the period of daylight show the ordinary hours of industrial labor as advanced and retarded by the operation of the daylight-saving act printed above.

The increasing number of daylight hours during the summer portion of the year for the more northern as compared with the southern latitudes, is a striking and significant feature of the diagrams. The corresponding shortness of daylight during the northern winters is also conspicuous.

The states and countries immediately adjacent to the selected latitudes are indicated on the diagram and the greater advantage resulting from the daylight-saving act, even in the countries north of the extreme northern boundary of the United States, is quite apparent.

It is important to remember that the diagrams are drawn on the basis of *mean solar time*. Accordingly, on the diagrams the hours of labor, etc., are depicted correctly with relation to local sunrise and sunset only for places whose geographic locations fall on or close to the standard meridian governing the time for any particular zone; that is, the diagrams may be assumed to represent true conditions on the 75th, 90th, and other standard-time meridians. However, since each zone comprises a full hour of difference of time, it necessarily results that the saving of daylight effected by the act is increased over that shown in the diagram for the more western portions of the zone up to half an hour, or thereabouts, and is correspondingly reduced in the eastern portions of each zone by an amount which becomes as great as half an hour, or thereabouts.

In connection with a study of the effects graphically set out in the diagrams, and a consideration of the grave doubts surrounding the chronology and history of events resulting from the arbitrary advancement and retardation of clocks involved in any scheme of this sort, it may be well to consider whether it would not ultimately be better, in the history of mankind, to arbitrarily advance the time of each zone a fixed amount—one-half hour or possibly one hour—which would remain the same throughout the year and continuously thereafter, thus seemingly more effectually avoiding the perpetual confusion in fixing the exact time of events that is hardly separable from the alternation between summer and winter. This scheme would always give to mankind the advantages of relatively longer daylight in the afternoons.

[1] The "mean astronomical time" here mentioned is understood to be the time called "mean solar time" by astronomers and meteorologists. It is determined by applying the "equation of time" to the sun's observed position.

These puzzling differences in the kinds of time are explained in "The American Ephemeris and Nautical Almanac for 1918," p. 713-714, and in Todd's "New Astronomy," Chapter VI.—C. A., jr.

"SUMMER TIME" AND THE BRITISH METEOROLOGICAL OFFICE.

By Sir NAPIER SHAW.

[*From the* Twelfth Annual Report of the Meteorological Committee for the year ended 31st March, 1917 (sixty-second year of the Meteorological Office).]

Some addition to the work of the Divisions for Forecasts and Statistics was entailed by the adoption of "Summer-time" from May 21 until the end of September, 1916. The diurnal variations of weather are controlled by the sun, and for climatological purposes the fundamental principle of meteorological work is to note the conditions day by day at the same interval before or after true noon throughout the year. Local apparent time is therefore the proper time for observers to keep for climatological purposes; allowing a certain latitude, local mean time is prescribed in the books of instructions for climatological stations and suitable allowance can be made if Greenwich time is used; *but there is no means of dealing with observations which are an hour further from or nearer to noon in summer than in winter.*[1] As regards the Daily Weather Service, strenuous and very largely successful efforts have been made during the past 50 years to get the contributing stations of all countries of the region extending from Spitsbergen to Algeria and

[1] Italics ours.—EDITOR.

from the Azores to the Ural Mountains, to observe at the same point of time in spite of differences of longitude and consequently of local time, in order that there may be no dawdling in the central offices about the reception of the telegraphic reports. Into this international arrangement any change of practice in time keeping introduces confusion. For these reasons the Meteorological Office obtained permission under the [Summer-Time] act to retain Greenwich time for the hours of observation at its observatories and stations, but by doing so its reports were belated *nominally* by an hour and too late for the regular hours of delivery and postage. Special advance copies of an abbreviated report were manifolded and distributed. With the new hours at post-offices it became impossible to communicate the results of the evening observations except to privileged offices, and it was equally impossible to maintain the evening reports from the health resorts at the usual hour. They had to be made an hour earlier.[2]

Two points raised by the experience of Summer-time are brought out, added to other experiences of work for the war. One is of very general bearing, namely, the considerations that have led the associated countries to select a morning hour like 7h, G.M.T., for the chief meteorological effort of the day. It is not quite early enough for our [British] "evening" papers, and yet it is an uncomfortable hour in winter for office work. Now that the place of meteorological work in the life of the community is well established, the question might be reconsidered by the countries which are associated in meteorological work, after the war.

The other is of a more domestic character. The necessity for keeping the whole number of observers informed as to what action should be taken in regard to the change of clocks resolved itself into the need of regular opportunity of communication. Such communication is obviously a useful agency in the organization of a system which includes many hundreds of independent but cooperating observers distributed over the three kingdoms and associated only through the Office. In consequence, a four-page monthly circular has been set on foot for the purpose and has been found useful in many ways.[3]

"SUMMER TIME" OR DAYLIGHT SAVING IN OTHER COUNTRIES.

On another page appear quotations from the Annual Report of the Meteorological Committee of Great Britain setting forth the opinions and experience of the Meteorological Office during 1916–17 with "summer time" in Great Britain.

The British Secretary of State for the Home Department appointed, on September 20, 1916, a committee "to inquire into the social and economic results of the Summer Time act, 1916, and to consider (1) whether it is advisable that Summer Time should be reintroduced in 1917." This committee submitted its report on February 22, 1917 (London, 1917), and from a copy available at the central office the following extracts of special interest to the Weather Bureau are reprinted. The original numbering for the paragraphs has been retained.

Meteorological Work.

70. The operation of Summer Time last year [1916–17] appears to have introduced some elements of uncertainty and difficulty into the work of the Meteorological Office. Sir Napier Shaw, the Director of the Office, supplied us with an interesting statement on the subject, the most important features of which we give below.

71. The work of the Meteorological Office, we are informed, has to be regarded from two points of view, viz:

(1) The *current daily work* of collecting information by telegraph from about 100 observatories and stations in the United Kingdom, on the Continent and the Atlantic Islands, and distributing reports, storm warnings, etc., based on this information, to various quarters; and

(2) The *public record*, which involves collection by the week or the month of (mostly voluntary) observations from 500 stations, in addition to the 100 official stations above mentioned.

72. The *current daily work* was continued at the same hours as previously, by Greenwich time, in accordance with the proviso in Section I (5) of the Summer-Time act. Consequently, as the messages from the stations were always telegraphed at the last possible moment before the closing of the post offices, the hour for sending them had to be changed, thus spoiling the continuity of the records.

Moreover the whole daily output of the office's reports, forecasts and storm warnings was nominally an hour late. So far as storm warnings are concerned the delay of an hour would have been fatal, since the country post offices were closed before the reports could be prepared and the hoisting stations could not therefore have been reached by telegraph.

No inconvenience, however, actually resulted in this respect in 1916 because, by request of the Admiralty, the general issue of warnings to coast stations had already been suspended on other grounds.

The distribution of the daily weather reports by early post (1:30 p. m. at the G. P. O.) had to be abandoned.

The opinion of the French Service was taken as to *the possibility of accelerating the whole service permanently* by an hour, but the proposal was not favorably received.

However, summing up the general effect of Summer Time on the current daily work, Sir Napier Shaw observes that "the inconveniences were as far as possible overcome without serious complaint from the services or the various naval and military establishments for which the information was collected."

73. As regards *the public record*, Sir Napier Shaw remarks that it is too soon to form an official opinion. In spite of very careful instructions a great deal of confusion arose with the observers as regards the hours at which the observations were made, and the continuity of many series of observations has been interrupted. "My impression is," he says, "that there is now no possibility of placing beyond dispute the exact time of any event, except those dealt with by telegraph, which occurred between May 21 and September 30. A future historian may find it impossible to fix the exact hour of the battle of Jutland. How many discontinuities, intentional or unintentional, there are in the records, will only be known when we summarize the results for the year, and

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[2] For an account of the organization of the Meteorological Office, see MONTHLY WEATHER REVIEW, 1915, **43**: 449, ffg.—C. A. jr.,

[3] *Great Britain. Meteorological Office Circular.* The attentive reader will have noticed several quotations from this circular in recent issues of the MONTHLY WEATHER REVIEW. The circular is of the page size of our own Bureau Topics and Personnel.

Beside the advices necessary for the cooperative observers and the various notes relating to Meteorological Office personnel, the circular usually contains several paragraphs on selected interesting current observations and frequently abstracts some publication of interest to the force. The value of the circular justifies a slightly higher grade of paper than that now employed, thereby insuring greater durability of the interesting records it carries.—C. A., jr.