FROST Forecasting Indispensable in Orchard Heating Through extensive experimental work and actual practice in orchard heating in the Pacific Coast States, it has been determined that fruit in that section of the country can be successfully protected against injury by frost under practically any conditions of temperature that are likely to occur during the critical period of growth. The success of orchard heating, however, depends very largely on the careful and painstaking manner in which the work is performed and the adequacy of the equipment used. As an aid in this work, and in cooperation with fruit growers, the Weather Bureau maintains a corps of frost specialists during the danger period in both the citrus and deciduous fruit-growing sections of the far Western States.

The service performed by these specialists is of a twofold nature—making temperature surveys and forecasting the occurrence of temperatures low enough to require artificial heat in the orchards. The practice of orchard heating has become very extensive in recent years, nearly a million new heaters having been purchased by the citrus growers of California alone during the years from 1922 to 1925.

It is well known that local topography plays a very important part in the frost hazard of an orchard, especially on clear, calm nights, when by reason of radiation of heat from the ground the surface layers of air become considerably colder than those at some distance above and a down-slope drainage of the relatively cold surface air occurs. This results in an accumulation of dense, cold air in the near-by lower lands or depressions and makes the frost hazard greater than on the higher slopes. It often happens that very small variations in elevation and slope make a marked difference in the frost hazard at near-by points.

By reason of variations in topography some of the more favored localities of a region may require little or no protection, while in others near by heavy firing may be required to prevent loss or serious injury to the orchard or grove. It is important, whenever new plantings are to be made, to locate and chart these cold areas, so that advantage may be taken of the local differences in topography. The temperature-survey work of the Weather Bureau consists in the establishment of many temperature stations, usually 30 or 40, in a relatively small area, equipped with standard thermometers and thermographs properly exposed and operated by trained men. From the record of these the relative frost hazard of different places within an area is determined and the information made available to growers as a guide, both for future plantings and in the matter of distribution of equipment for protecting existing orchards.

Advance Preparations Required

Wherever orchard heating is practiced, advanced preparations, such as the placing of oil-filled heaters in the orchard, the convenient storing of a reserve supply of fuel, and many other preliminaries, are made before the frost-danger period arrives, so that when it becomes necessary, heating operations may be started on very short notice. When a frosty night impends, however, it is very necessary to know this during the afternoon of the preceding day, so that last-

minute details, such as getting help for lighting heaters, final preparations for lighting, instructions to workers, etc., may be arranged in readiness for the coming battle against "Jack Frost."

The margin between the "danger" and "no danger" temperature is very narrow and the descending mercury in the thermometer often approaches the danger mark without actually reaching it. In such cases, in the absence of dependable information as to just what is going to happen, growers often make unnecessary final preparations for, and actually begin, heating operations at considerable expense.

A system of special frost forecasting by experts of the Weather Bureau has been developed through which growers are advised very definitely as to just what degree of cold to expect during the ensuing night. When it is known that the temperature will remain well above the danger point, a forecast of "no danger" is made, but whenever freezing or lower is expected at any place in the district that fact is made known, together with a very definite statement as to the minimum temperature expected at a "key" station located at some cold place in the area. The forecaster advises as to what parts of the district will need protection and whether or not heavy firing will be required. These facts are widely distributed by telephone to the headquarters of the various fruit organizations for dissemination to individual members, published in the afternoon papers, and put on the air daily through the radio.

Confidence Gained from Results

The accuracy with which forecasts have been made for several years have given the growers complete confidence in them as a dependable basis for final preparations for firing operations. As previously stated, definite forecasts are made when the temperature is expected to go as low as 32° F. at any station in the district. Although this is not a damaging temperature, when it falls to freezing there is usually uneasiness on the part of the growers as to just how much lower it may go, and definite information is desired.

J. B. KINCER.

FOREIGN Trade Index Number for Foodstuffs

By net foreign trade is meant the excess of exports over imports or the reverse. The index number of net foreign trade in foodstuffs is an attempt to measure the fluctuation in the net contribution of the United States to the food supply of all other countries. To this end imports of foodstuffs, each commodity with an assumed fixed weight, are deducted from exports and the difference in each year expressed in relation to the average excess of exports over imports in the five years ended June 30, 1914.

The weights assumed for the purposes of this index number are the average unit prices of various food products in the base period. By multiplying the volume of exports in each year by these fixed weights abstract aggregates are obtained which can be added together or subtracted one from another. But since the weights remain constant the fluctuations in the aggregates from year to year represent changes in volume of trade. The index number obtained by this method is an index number of the difference in volume between