

**DEPARTMENT OF INDUSTRY AND COMMERCE
METEOROLOGICAL SERVICE**

TECHNICAL NOTE No. 13



**THE POTATO BLIGHT WEATHER WARNING SERVICE
IN IRELAND IN 1952**

BY

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CHAPTER 1

INTRODUCTION AND DEFINITIONS

INTRODUCTION

During the 1952 potato growing season in Ireland, periodic radio warnings of weather favourable to the onset and spread of Potato Blight (*Phytophthora infestans*) were included in a "Special Weather Bulletin for Farmers", which was broadcast nightly from Radio Eireann at the end of the 10.10 p.m. News programme.

The objectives of the Blight Warning Service may be defined as follows:-

- (a) to detect favourable humid spells immediately after they have occurred, and so, taking advantage of the incubation period, to deduce the first appearance and subsequent spread of the disease several days before this is visible in the fields;
- (b) to forecast favourable humid spells before they occur, and thus to forecast the onset and spread of the disease and to deduce the most favourable periods to spray;
- (c) in the later growing season, but before the potato foliage had withered, to forecast periods of marked activity of the blight fungus during which it would be unwise to dig potatoes without prior removal of the haulms.

Objective (c) is regarded as of lesser importance, more particularly since, in many cases, it is usual to remove the foliage by mechanical or chemical means prior to digging. Both (b) and (c) require a study of the different kinds of synoptic weather situation as they affect "blight-weather."

The purpose of the present Note is to assess, on the basis of reports of the course of potato blight in Ireland in 1952, the accuracy of the warnings which were issued, and the validity of the "Irish rules" on which they were founded.

THE IRISH RULES FOR IDENTIFYING WEATHER FAVOURABLE TO POTATO BLIGHT

The "Irish rules" for the recognition of weather favourable to the spread of potato blight make use of standard hourly meteorological reports, and require, as a minimum:-

- (a) A 'humid period' covering at least twelve consecutive hourly reports in which the dry-bulb temperature is equal to, or greater than 50.0°F and the relative humidity is equal to, or greater than 90%.
- (b) Free moisture on the foliage for a subsequent period of at least four hours. If there is not adequate precipitation, the alternative requirement is a further four hours, beyond the initial twelve, with relative humidity at least 90%.

A period which fulfils these requirements is referred to as a "Blight-weather spell". A spell is regarded as terminated whenever even a single hour occurs at which the temperature or humidity falls below the required values, and any subsequent sequence of humid weather is regarded as part of a new spell.

For assessing the relative importance of blight-weather spells of different lengths, account is taken of the "effective period" in hours, which is defined as the total number of consecutive hourly observations in the spell, less eleven in the cases accompanied by adequate precipitation, or less fifteen in "dry" cases. Consecutive blight-weather spells which are separated by five hourly reports or less are coalesced in calculating the "effective period", i.e. only one deduction, of 11 or 15 hours as appropriate, is made from the total duration of the consecutive periods.

The present Note does not deal with the phytopathological basis of the Irish rules, which is discussed in Technical Note No.12. A popular account was published in "The Irish Farmer's Journal" of June 14th, 1952 (Vol.3, No.23).

THE ENGLISH RULES FOR IDENTIFYING WEATHER FAVOURABLE TO POTATO BLIGHT

In a paper published in 1947 in the "Transactions of the British Mycological Society" (Vol. 31, page 45), Mr. A. Beaumont suggested the following criteria, which are here referred to as the "English rules":-

- (a) Minimum temperature not less than 50°F
 - (b) Relative humidity not below 75%
- } two days

Using standard hourly meteorological reports, a "Beaumont period", i.e. a critical spell under the English rules, is considered to have occurred if, in a sequence of fortyeight consecutive hourly observations, the temperature does not fall below 50°F nor the relative humidity below 75%.

The English rules were not used in the operation of the Blight Weather Warning Service in Ireland in 1952, but, in the post-season check a list was made of the Beaumont periods which occurred and this has been included in Appendix III. Some notes on the relative effectiveness of the two sets of rules in Ireland in the 1952 season will be found in Chapter 6.

CHAPTER 2

THE ORGANISATION OF THE BLIGHT WEATHER WARNING SERVICE

Observing Stations

The Irish rules are drawn up for use with hourly observations from ordinary meteorological observing stations; consequently no special observing posts are required nor, if the standard meteorological reporting code made provision for reporting relative humidity, would any special information be required at the central office other than that contained in routine hourly reports. As this is not so, arrangements were made for the issue by the participating reporting stations of special reports, under the key-word 'HUMIDOR', when blight weather spells occurred.

The observing stations taking part in the scheme during 1952 were Valentia Observatory, Midleton, Claremorris and Dublin Airport. The observations from three other stations which make hourly weather reports - Shannon Airport, Clones and Mullingar - were used in the post-season review. The positions and heights of all seven stations are given in Appendix II.

To facilitate the observation of blight-weather spells, each of the four participating reporting stations plotted the observed temperature and humidity each hour on special forms, and, whenever these elements satisfied the criteria of the Irish rules, entered a cross in red ink in the station circle. As soon as twelve consecutive plotted reports had been so marked, a 'HUMIDOR ONE' message indicating a minimum spell, was sent to the Central station i.e. the Forecast Office at Dublin Airport. Subsequent messages ('HUMIDOR TWO', 'HUMIDOR THREE' etc.) were issued as required at six-hourly intervals until the spell had ended. The original plotted forms from the observing stations were later used in the post-season review and in other researches.

Moisture on Potato Foliage

The presence of free moisture on the foliage at a certain stage is critical for the spread of potato blight. To assist the central office in deciding this point in doubtful cases and to provide some information on the difficult question of the wetting of potato foliage under different conditions, small plots of potatoes were grown in 1952 at the three "out-stations" (Valentia, Midleton and Claremorris) and hourly observations were recorded in respect of moisture on the leaves. The observations indicated whether the foliage was dry, wet with dew, or wet because of drizzle or rain (or cause uncertain). The notation used was based on the Beaufort letters, using 'w' for dew and 'p' for precipitation i.e. drizzle or rain. Thus, for example, "iw₀" was used to record the fact that there was slight dew on some potato leaves, whilst others were dry. A summary of the relevant observations on state of foliage was included in HUMIDOR messages passed to the Central Office.

Procedure at the Central Office

At the Forecast Office at Dublin Airport, the HUMIDOR messages were used primarily as alerting signals, warning of the presence of a blight-weather spell. Each case was examined in the light of the causing agency in the current weather situation, and a map was drawn to show the probable limits of the area affected and the effective duration of the favourable weather in different parts of the area. Charts 1 to 29 in Appendix IV cover all cases which occurred in the period May 1st-September 30th, 1952. The effective

durations in hours are shown for the different observing stations. Weather maps illustrating the causing agency are included in Charts 1 to 12.

Graphs of effective duration of blight-weather were also maintained for each of the reporting stations, for comparison with these of previous years.

In interpreting the charts and graphs in terms of probable development of blight the following factors were kept in mind:-

- (1) The Irish rules are devised to represent the minimum favourable conditions i.e. an effective period of one hour merely marks the beginning of the spread of the fungus. An effective period of the order of ten hours is required to give rise to fairly numerous sporangia of the disease.
- (2) There are upwards of 20,000 potato plants in each acre sown. A limited number of slightly affected plants can very readily escape detection. Thus the disease has normally made some progress before it first comes to notice.
- (3) Some early humid spells in May will prove ineffective if the potato foliage is not developed. This may be very important in years when planting is late due to unfavourable spring weather. In any case, earlier humid spells are usually less effective than later ones because both the amount of inoculum and the area of foliage are relatively small. Caution is necessary in warning of an early attack, not only for this reason, but because premature alarm might prejudice the whole scheme. Conversely, when the first visible attack does not occur until relatively late, a quite short humid spell may suffice to set off visible infection.
- (4) Bright and sustained sunshine after a favourable period tends to counteract its effect. Dull and sunless weather is favourable to the disease.
- (5) For wetting, sustained drizzly weather is believed to be more effective than short spells of heavy rain which tend to leave potato foliage relatively dry.
- (6) Early morning dew can, by itself, have little effect in spreading blight since, without rain, some 16 hours of humid conditions are a minimum requirement.
- (7) The first visible attacks of blight usually occur in the West, South or Southwest. The East coast often remains free of blight longer than much of the rest of the country.
- (8) A visible attack which might have been confidently expected may be negated if timely spraying took place in the area concerned.
- (9) In a number of recognised bad blight years in Ireland (1924, 1931, 1936, 1943), substantial periods of blight weather occurred in the first half of June.

Forecasting Blight-weather

For forecasting blight-weather, it had been found, in an analysis of previous years, that the following types of

weather situation may favour the development of blight:-

- (a) Broad warm sectors, particularly with further wave development following.
- (b) Depressions and/or fronts, quasistationary over the country, and giving lengthy periods of wet and cloudy weather. Thundery troughs and lows can represent a sub-division of this type.
- (c) Westerly sequence of weather, with quick succession of frontal troughs, uninterrupted by direct cold air outbreaks from the Arctic, so that overcast weather is virtually continuous and rainy spells are frequent.
- (d) Persistent fog, and in particular inland penetrations of wet sea fog.

CHAPTER 3

THE POTATO CROP DURING THE 1952 GROWING SEASON IN IRELAND

The area under potatoes in Ireland in 1952 was 310,017 acres, or about 2.8% of the total arable land (i.e. of that under crops and pasture). There was no part of the country in which a substantial acreage of potatoes was not grown. The highest percentage of land was devoted to the crop in Counties Donegal, Monaghan, Mayo, Louth and Cavan, and the least in Counties Kildare, Limerick, Kilkenny, Meath and Tipperary.

The weather in the early part of the year was very favourable for ploughing and Spring sowing. Tillage work was correspondingly well advanced and the planting of the potato crop was virtually completed by the end of April. All crops made good growth and some early potatoes were being marketed during the latter half of May.

The main feature of the weather during the growing season was the comparative drought, which affected many parts of the country and which, by August, had induced early ripening of main crop varieties. Chart 33 shows the distribution of total rainfall over Ireland during the period May-August, 1952.

There were an unusually high number of late frosts. On the night of June 15th, in particular, a severe and widespread ground-frost caused considerable damage to potato foliage, particularly in bog-land areas. Possibly for this reason, some of the blight cases reported immediately subsequently took the form mainly of stem attacks. A further damaging ground-frost occurred on the night of July 15th.

Protective spraying was in progress generally by the end of June. Most crops received at least two sprayings during the season.

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CHAPTER 4

POTATO BLIGHT IN IRELAND IN 1952

No systematic plant disease survey is carried out in Ireland. Thanks, however, to the cooperation of the staff of the Department of Agriculture, regular reports on the onset and progress of potato blight in the Twenty-six County Area in 1952 were furnished by thirty-four potato inspectors, as listed in Appendix I. The duties of these officers are centered mainly in areas in which certified seed potatoes are grown; consequently the reports do not cover the whole of the country. It is particularly regrettable that no reliable information on the course of the disease was available for Co. Kerry, where Valentia Observatory is situated, or for West Galway, in which the first outbreaks of blight were observed in many earlier years (e.g. 1912, 1914, 1916, 1917, 1918) during the period when Dr. Pethybridge had a field laboratory in Clifden.

Earliest Cases

Rather unusually, the first group of field attacks of potato blight occurred, not in the West of Ireland, but in the South-Eastern corner:-

<u>Date</u>	<u>County</u>	<u>Variety</u>	<u>Remarks</u>
May 20th	Waterford	Epicure	Had spread considerably by May 22nd
May 23rd	Wexford	Epicure and British Queen	Severe
May 31st	Cork	British Queen	Fairly severe

Lull

There followed an interval of about three weeks, in which the only fresh reports were of a few affected plants in house gardens in Co. Offaly on June 2nd and 9th respectively and in Co. Sligo on June 12th. From Wexford, it was reported that there was little further spread noticed, except in early crops in coastal areas, where an extension of the disease occurred in the week ending June 9th.

Resumption of Outbreaks

A considerable spread in early crops and some extension to maincrops was reported from the South-East as occurring on June 19th. This was followed by first reports of the disease in field crops in the West, as follows:-

<u>Date</u>	<u>County</u>	<u>Variety</u>	<u>Remarks</u>
June 20th	Clare	Kerr's Pink	Single plant
June 24th	Westmeath	British Queen	Two severe cases, attributed by observer to weather prior to June 19th
June 25th	Galway	Epicure and British Queen	Rather severe
June 25th	Clare	Arran Banner	Single plant

Commencement of Widespread Attacks

Numerous reports of widespread and at times severe attacks were received in respect of the period June 30th-July 12th. On June 30th, an unsprayed crop of Duke of York

potatoes in Co. Offaly (Banagher) had up to 75% foliage destruction in places. On July 1st, fresh cases were reported from Counties Galway, Offaly, Clare, Limerick, Dublin and Donegal.

In Co. Galway (Athenry), the crop of British Queens had been sprayed on June 27th; despite this, the attack was described as severe, with some plants already completely destroyed. Here there was an old potato pit a short distance away. In Co. Dublin (Skerries), the crop of Epicures and British Queens was sprayed on June 24th and no disease was visible two days later. By July 1st, about one acre was affected and the attack was spreading.

In the immediately following days reports of fresh attacks were received from Counties Donegal, Roscommon, Sligo, Westmeath, Offaly, Louth, Tipperary and Cork. From the South East, it was reported that most of the badly blighted early crops, which in some cases contained a big number of blighted tubers, had been dug out and sold by early July; nevertheless the gradual spread of the disease continued, particularly in early varieties, some of which were completely out away by blight.

The picture on July 18th, then, was of widespread attacks by the disease, severe in some cases and poised for a damaging attack, graded favourable conditions. Apart from the Cooley peninsula in Co. Louth, the disease was reported from all areas in which there were observers. Spraying operations, which in some cases had been delayed, were taken up intensively.

Later Progress of the Disease

The situation in mid-July turned out to be the crisis in the progress of the disease in 1952. During the remainder of July the outbreak was reported as quiescent except in the West and North-West and in scattered areas such as Co. Laois and Co. Cork, where the attack, mainly in a mild form, became noticeably more extensive during the last week of the month.

In August the disease was, in the main, well held, its spread being mainly slow and gradual. The Donegal and N.W. area generally was the most markedly affected, the spread which started late in July continuing into August, tho' mostly in mild form. Many areas reported a noticeable increase in intensity from about mid-August. This was dated about August 10th in the South and South East, about the 15th in the Midlands and about 20th in the North-West.

By early September, most crops had ripened off because of the combined effects of the dry season and of blight and it was difficult, in the scarcity of green foliage, to distinguish the progress of the disease. In the greater part of the country no spread or increase in intensity was observed during the month. In the North-West, however, late crops were fairly severely attacked in the week ending September 27th. In Co. Mayo (Crossmolina), for instance, crops of the variety Kerr's Pink, which had been sprayed two or three times, and which heretofore were almost free of disease, were rather heavily attacked during this period.

Summary

The incidence of blight during 1952 was variable. The Midlands and parts of the North-East coast escaped very lightly; for instance in the Birr district (Co. Offaly) it was considered that there was less foliage blight than in any

of the previous twenty years. In Donegal, on the other hand, the attack was fairly severe. Elsewhere the disease was very widespread but in general mild, particularly in its late season manifestations.

The earliest attacks occurred in the latter part of May in the South East. Scattered attacks a month later in the West heralded a widespread attack early in July, which, in many areas, showed the disease in the severest form which it manifested during the season. A situation which was apparently menacing at this time did not develop to any great extent and the spread of the disease was generally slow, except for a period in mid-August. A further spread in the West in late September came at a period when most of the crop had lost its foliage. The percentage of blighted tubers appears to have been small.

CHAPTER 5

RADIO WARNINGS ISSUED DURING 1952

1. In agreement with the agricultural authorities, it was decided that warnings of the very earliest expected attacks should not be issued by radio, mainly lest premature alarms should prejudice the value of the scheme. It was also decided that negative bulletins (i.e. those treating exclusively of weather spells unfavourable to Blight) should not be issued, lest they discourage precautionary spraying that might otherwise be undertaken.

As far as possible, observations and forecasts would form the combined basis for warnings, i.e. in the ideal case, a warning would be issued after some Blight weather had already occurred and when further appreciable spells were expected. Indications would be added to early season warnings, where appropriate, of whether weather conditions, in respect of precipitation and wind, were expected to be suitable for protective spraying in the following days.

2. There were few spells of favourable weather for Blight over most of Ireland in May. The impact of the first two cases (Charts 1 and 2) was mainly on the SE and S coasts. It was considered, on May 15th, that the first appearance of Blight for 1952 might be visible about May 19th in coastal areas of Wexford, Waterford and Cork. In agreement with the policy outlined above, no radio warning was issued. The first reports of outbreaks of the disease were in excellent agreement with expectations.

3. The next three spells (Charts 3, 4 and 5) were confined mainly to the West and South. Although none were of long duration, it was considered, on June 6th, that their cumulative effect, in combination with further spells which were expected during the following week, would lead to first visible outbreaks in the West about mid-June.

The following warning was broadcast on Friday, June 6th:-

"Warning of Weather Favourable to Potato Blight

Weather this year has so far been unfavourable for potato blight over most of Ireland. Some short favourable spells have occurred along the South and West coasts. Conditions have been most favourable in the Wexford-Waterford area where some spread of Blight may be noticed early next week. The general weather situation is expected to favour the first appearance of blight in the West and South about June 14th."

Similar warnings were broadcast on the following nights and weather suitable for spraying was correctly forecast for June 10th-12th.

The spell of favourable weather on June 8th (Chart 6) was less widespread than expected, due to a more southward track of a depression than had been forecast. However, other areas were affected on June 12th and 14th (Charts 7 and 8).

There is ample evidence that spraying in the West and South, based on the warning, would have been well-timed. In Wexford, some spread of the disease was noticed by June 9th, and further appreciable extension from June 19th. The group of reports from the West Midlands (June 20th-25th) included some severe cases which may be ante-dated. Spraying which took place in Athenry (Co. Galway) on June 27th was too late to prevent a severe attack which was confirmed on July 1st.

It seems safe to assume, from the other reports, that Blight had made its appearance by mid-June in the extreme West, in areas such as Co. Kerry, and West Galway in which no observers were operating.

4. As shown in Chart 9, the first spell affecting the entire country occurred on June 21st-22nd.

The following warning was broadcast on Monday, June 23rd:-

"Warning of Weather Favourable to Potato Blight"

Weather suitable for the spread of potato blight occurred over most of the country on Saturday last and conditions were particularly favourable in the west. Blight weather is expected to recur again in the west and northwest during the remainder of this week. The effect on the potato leaves may be visible from Wednesday next onwards. Weather during which spraying against blight will be possible will occur at intervals during the next few days."

Chart 10 shows that the expected recurrence of Blight-weather duly took place. Further spells, affecting all areas at one time or another, took place on June 28th-July 2nd (Chart 11).

Widespread attacks of blight were observed on July 1st and the days immediately following.

5. Two warnings were issued during July:-

(a) On Tuesday, July 8th:-

"Favourable weather for the spread of potato blight occurred over most of the country during the past week-end and is expected to recur again during the next few days. A serious spread of blight is likely in unsprayed crops this week. Weather conditions in the next few days should be such as to permit spraying to take place in most areas"

(b) On Friday, July 18th:-

"Short spells of weather favourable for the spread of potato blight occurred over the western half of the country during the past few days. Similar short spells are likely to occur over this week-end. Weather, however, will be quite suitable for spraying."

Warning (a) was in the nature of a 'final notice' to all with unsprayed crops. The depression which was forecast to give rise to a recurrence of blight-weather appears to the West of Ireland on the weather map in Chart 12. The spell which followed (Chart 13) was not as extensive as expected, but the preceding thundery spell (Chart 12) caused noticeable spread in several areas, despite widespread spraying. The period of noticeable extension was given at various dates between July 12th and July 19th.

Warning (b) was the last spraying warning issued and was directed at the West of Ireland. The expectation of a repeat spell in this area was fully justified (Chart 15). A considerable extension of the disease, though mostly in a mild form, was reported from the NW, especially in Donegal, during the period July 26th-August 2nd.

6. A further warning issued on August 22nd read as follows:-

"Weather favourable for the spread of potato blight occurred in extreme western districts during yesterday. Similar weather is likely to become more general in the next two or three days, but is unlikely to persist for very long in any one place."

This was not, of course, a spraying warning. The crop had, for the most part, ripened off at this stage. The bulletin was intended to discourage digging at a time when the spores of the disease were rampant on the remaining foliage. Charts 25 and 26 show that the forecast was well fulfilled.

CHAPTER 6

COMMENT

1. It would be unwise to draw any dogmatic conclusions from even the detailed analysis of a single year's data, particularly since reports of potato blight were not available for the entire country and since the course of the disease was unspectacular in the season under review. The following comments are therefore put forward with all due reserve.

2. The primary function of the Blight Weather Service, i.e. the issue of warnings in timely relation to spraying operations, was satisfactorily carried out. It is not known to what measure it influenced farmers in practice in deciding on spraying dates.

3. The occurrence of blight-weather, as defined in the Irish rules, proved to be in very good agreement with the subsequent course of the disease both in Ireland as a whole, and in particular districts from which representative reports were available (e.g. the extreme SE, and the extreme NW). The course of potato blight in 1952 has been described in Chapter 4 and may be compared with the individual blight-weather spells as listed in Appendix III and as depicted in Charts 1 to 29. Cases 12, 18 and 23 are of particular interest in view of the widespread popular belief that thundery weather favours potato blight.

The over-all distribution of blight-weather in time is depicted in Chart 31. This shows clearly the maximum which preceded the general appearance of the disease in the period July 1st-10th and also the main subsequent period of spread in the second half of August, as well as the lulls in mid-July and in most of September.

A feature that requires some consideration is the mildness of the great majority of manifestations of the disease subsequent to mid-July. It may be significant that the only spells of blight-weather which affected the entire country during the growing season were those on June 21st-22nd and June 29th-July 2nd (Charts 9 and 11). The effects of protective measures in holding the disease in check must also be taken into account, for spraying was thoroughly carried out in most areas from late June onwards, and the majority of maincrop potatoes received at least two applications of spray.

A further factor tending towards moderating the effect of the disease may have been the comparative drought during the growing season. In this connection it is of interest to compare chart 32 showing the geographical distribution of total number of hours of blight-weather with Chart 33 showing the corresponding rainfall. One notes, inter alia, that in Donegal, where the impact of blight was most severe amongst those areas from which reports were available, the rainfall was almost normal and the blight-weather duration was relatively high. In the south Midlands where the disease was light, the drought was most marked and the duration of blight-weather was at a minimum.

4. In connection with Chart 32, it may be of interest to quote total blight-weather duration for some of the stations for which hourly records are available for the corresponding period in previous years:-

	<u>Valentia</u>	<u>Middleton</u>	<u>Dublin</u>
1949	185 hours	179 hours	114 hours
1950	324 "	241 "	47 "
1951	187 "	132 "	46 "
1952	262 "	146 "	56 "

The general impact of blight in Ireland was below average in 1949, slightly above average in 1950, and very slight in 1951.

5. Before attempting to compare the effectiveness of the Irish and English rules as applied to the 1952 season, it should be noted that, by definition, a single lengthy effective period of blight-weather, of 37 hours or longer, must also give rise to a Beaumont Period.

What is remarkable is that, out of 47 Beaumont Periods which occurred in Ireland in 1952, all but one contained a period of blight-weather under the Irish rules. The exception was one of very dubious effectiveness occurring during a period of virtually no rainfall at Valentia on May 20th-22nd (see Appendix III). It is tempting to conclude that the effective agency within a Beaumont period is the internal period of blight-weather as defined in the Irish rules, and that the failure of the English rules on occasions to detect local blight epidemics arises from the fact that the majority of blight-weather spells are not straddled by a Beaumont Period.

Less controversially, it appears from the 1952 Irish data that the Beaumont Period, despite its attractive simplicity, is not a sufficiently precise concept on which to base a detailed analysis of the relationship between potato blight and the weather. No Beaumont Period whatever occurred at Dublin Airport during the entire season, although blight was by no means absent in the area. On the other hand 13 Beaumont Periods, totalling 1,205 hours were experienced at Valentia and one of these lasted for no less than ten consecutive days (July 16th-26th). The breakdown of this period under the Irish rules into a series of interrupted blight-weather spells, totalling 36 effective hours in all, gives a less formidable and apparently truer picture of the blight-promoting efficiency of the period.

Thus, though the Beaumont Periods indicated the dates of first important attacks simultaneously with the Irish rules, they tended to exaggerate the danger of intensification of the disease from mid-July onward.

The Irish rules, which break up the favourable weather into shorter and more manageable lengths, are better adapted to analysing the causing agency and to developing a technique for forecasting probable developments. Indeed, it would be difficult to apply the synoptic technique, which appears to be promising, without a more precise measuring-stick than is provided by the Beaumont Period. The Irish rules have the further advantage of making provision for "weighting" one period against another to determine their relative effectiveness.

A problem with the English rules is that one can scarcely neglect the "almost-Beaumont Periods." In one remarkable case (Mullingar: August 8th-12th) a single hourly humidity reading of 74% was so symmetrically placed in a series of 93 hourly values which otherwise met the English rules, that strictly no Beaumont Period occurred although 46 hours of one occurred immediately before, and again immediately after, the deficient hour. It is clear that such an "accidental" deficiency has no real significance to the effectiveness of the period. As the Irish rules represent minimum criteria, the rigorous application of them is less likely to lead to the elimination of significant weather spells.

CHAPTER 7

CONCLUSIONS

MODIFICATION OF THE IRISH RULES

The course of the 1952 Potato Blight season did not suggest that any major modification of the Irish rules was required. It tended to confirm that spells are to be regarded of lesser importance unless they attain an effective duration of ten hours or so, and indicated that drought might have an important inhibiting effect.

The analysis confirmed the importance of moisture on the foliage and suggested that, in cases where the meteorologist was uncertain whether the foliage was likely to be wetted, it was safer to assume it was not. This is consistent with the minimum-criterion character of the Irish rules.

Although special observations on foliage wetting are not an essential part of the scheme, it seems desirable that they should be continued for at least another season.

OBSERVING STATIONS

The recognised deficiency in the synoptic network caused by the absence of an observing station in the South-East of Ireland was also very noticeable in the operation of the Blight Weather Warning Service.

It seems desirable that Clones should be added to the observing stations participating in the Service during the 1953 season.

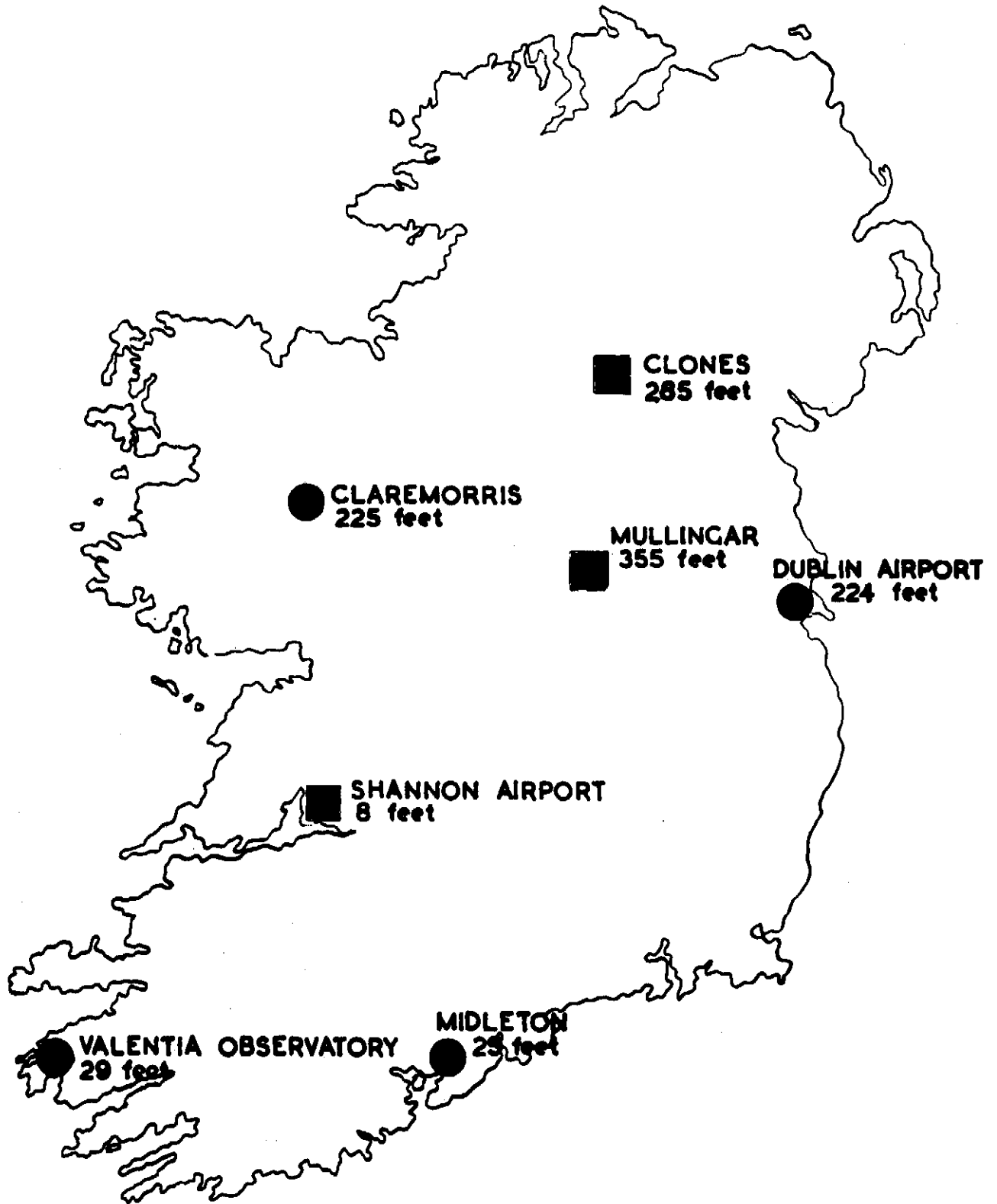
APPENDIX I

OBSERVERS OF POTATO BLIGHT

Grateful acknowledgment is made to the following Potato Inspectors of the Department of Agriculture, who furnished detailed reports of the onset and spread of potato blight in their districts throughout the growing season:-

<u>Observer</u>	<u>District or Headquarters</u>
H. McGleam	Waterford-Wexford
C.J. Cavanagh	Cork
M. O'Farrell	Dublin
T. Gleeson	Ardee, Co. Louth
H. McBride	Cooley, Co. Louth
S.J. Griffin	Monaghan
J.J. Bowen	Mountlath, Co. Laoighis
P. Minnock	Clare and Woodford
H.A. Dunlop	Birr, Co. Offaly
J.J. Campion	Bansagher, Co. Offaly
D.F. O'Grady	Tullamore, Co. Offaly
B. McLean	Athlone, Co. Westmeath
M.P. Timmons	Monlough, Co. Galway
J.J. Stack	Maniva, Co. Galway
J. Tully	Athenry, Co. Galway
T.L. O'Connell	E. Galway and Roscommon
F. Griffin	Ballina, Co. Mayo
P.F. Heavey	Turloughmore, Tuum
J. Rooney	Crossmelina, Co. Mayo
J. McGee	Manisrone Co. Mayo
F. Murphy	Clegheley, Co. Sligo
T.P. Brennan	Castlefin, Co. Donegal
E. Kelly	Ballybofey " "
P. Cullen	Stranorlar " "
N. Wilkinson	Lifford " "
J. McGinley	Raphoe " "
J. McBride	St. Johnstone, Co. Donegal
A. Egan	Letterkeney " "
J. McDermagh	Manerocunningham " "
F. Henderson	Newtowncunningham " "
E. Jacob	Ramelton " "
W.J. O'Neill	Burnfeet " "
M. Bracken	Creealough " "
J. Horan	Fenan " "

APPENDIX II
LOCATION AND HEIGHTS OF WEATHER OBSERVING STATIONS



- STATIONS PARTICIPATING IN ALERTING PROGRAMME
- STATIONS USED IN POST-SEASON CHECK

APPENDIX III

BLIGHT-WEATHER IN IRELAND IN 1952

Notes:-

1. In Columns 2 and 3, CLR = Claremorris, CLN = Clones, DEN = Dublin Airport, MID = Middleton, MUL = Mullingar, SHN = Shannon Airport, VAL = Valentia Observatory.
2. In Columns 2 and 3, use is made of the date-time group, DDGG, where DD is the date and GG the hour (Greenwich Mean Time).
3. Length of 'effective periods' of blight weather, in hours, is shown in brackets in Column 2.
4. The date on which a blight-weather period is considered to begin is that of the end of the first twelve hour humid period i.e. the date of first formation of the sporangia of the fungus.
5. Duration of Beaumont Periods, in hours, is shown in brackets in Column 3.

(1) DATE	(2) BLIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
May 4th	MID 0316-0405(3)	-	Slow Northward movement of old front associated with low to South of Ireland. Estimated period in South East, 10 hours. Temps. too low inland.	1
May 14th-15th	CLR 1320-1411(5) MID 1318-1411; 1417-1511(26) VAL 1314-1410 (10)	MID 1306-1622(89) VAL 1300-1507(56)	Low with open warm sector and waves Most effective in South with much sea fog and drizzle. Little effect inland	2
May 18th-19th	CLN 1802-1813(1) MUL 1722-1813(5) SHN 1719-1806(1) VAL 1716-1806; 1820-1907(5)	VAL 2007-2213(55) (i.e. later than other spells)	Mainly in widespread fog in col, with little or no precipitation, apart from scattered slight drizzle from quasi-stationary front. Not an important case	3

(1) DATE	(2) BLIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
May 30th-31st	MID 2920-3007(1) SHN 3013-3107(8)	-	Small active wave on cold front over the South of Ireland. Maximum effectiveness along a narrow path from Shannon to Wexford. Temperatures too low to North of Wave	4
June 5th	MID 0418-0507(3)	-	Warm sector in the South with trailing front affecting South and South-East	5
June 8th	MID 0723-0812(3) VAL 0721-0815(8)	MID 0718-0920(51)	Broad warm sector affecting mainly the South of Ireland	6
June 12th-13th	CLN 1121-1212; 1217-1310(23) MUL 1120-1207(1)	Nil. MUL, however, had a sequence of 86 hours with temps above 50°F but with one central humidity falling to 74%	Col, with frontal effects in North. Main effectiveness centred around CLN, which unlike other stations, had persistent drizzle.	7
June 14th	CLR 1321-1408(1) DBN 1318-1408(7)	-	Slow Southward movement of cold front with tendency towards small waves. Main effect on East coast.	8
June 21st-22nd	CLR 2107-2207(14) CLN 2110-2206(10) DBN 2118-2208(4) MID 2110-2206(10) MUL 2112-2207(9) SHN 2109-2209(14) VAL 2104-2210(20)	CLR 1920-2207(60) MUL 2006-2209(52) SHN 1916-2210(67) VAL 1917-2214(70) CLN had 45 hours of a Beaumont period	Open warm sector of active depression with slow-moving trailing cold front. Persistent drizzle and much sea fog. This was the first occasion in which blight weather was experienced over the entire country	9

(1) DATE	(2) SLIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
June 25th- 26th	CLR 2416-2509(7) CLN 2418-2607(27) MUL 2420-2511(5) SHN 2419-2610(29) VAL 2502-2610(22)	CLR 2317-2609(65) CLN 2319-2610(64) MUL 2319-2612(66) SHN 2317-2611(67) VAL 2316-2710(91)	Open warm sector. Weak warm front followed by trailing cold front giving lengthy periods in the North-west and West	10
June 28th- July 2nd	CLR 2812-2906; 2917-3004(9) CLN 2815-2908; 2920-3008; 0117-0205 (11) DEN 2820-2913(7) MID 2818-2910(6) MUL 2818-2910; 2921-3009; 0117-0208(13) SHN 2818-2911; 2919-3010; 3021-0109(13) VAL 2812-3013; 3015-0116(65)	CLR 2720-3009(62) MUL 2816-0114(71) SHN 2815-0209(91) VAL 2712-0207(116)	New low with open warm sector, followed by wave. Frontal loop stationary over country for lengthy period. Entire country affected at one time or another during four-day period.	11
July 6th- 8th	CLR 0720-0807(1) DEN 0615-0708; 0714-0808(26) MID 0609-0715(20) MUL 0715-0806(5) SHN 0720-0807(1) VAL 0520-0609; 0720-0809(6)	CLR 0618-1111(114) MID 0609-0813(53) MUL 0616-0914(71) SHN 0519-0816(70)	Thundery low moved up from the South. No well-marked fronts. Low was centred over Southern Ireland on 7th	12
July 9th- 10th	CLR 0920-1011(4) VAL 0817-0910; 0920-1008(9)	VAL 0816-1116(73) See also CLR above	Warm and cold fronts of an open low, affecting West coast only.	13
July 17th- 18th	CLR 1620-1709; 1719-1809(7) CLN 1618-1710; 1720-1810(10) MUL 1621-1711; 1720-1811(9) SHN 1622-1709; 1722-1810(3) VAL 1620-1707; 1720-1810(5)	CLR 1716-2313(142) CLN 1616-2311(164) MUL 1618-2310(161) VAL 1611-2609(239)	Low with open warm sector and wave, moving in from WNW. The main impact was in the North-west of Ireland.	14

(1) DATE	(2) BLIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
July 19th- 22nd	CLR 1818-1907; 1922-2009 2018-2106; 2121-2209(8) CLN 1820-1907(1) DBN 2021-2108(1) MUL 1822-1911; 1920-2009, 2120-2208(8) SHN 1818-1909; 2001-2012; 2015-2106; 2121-2208(22) VAL 1818-1910; 2000-2111(31)	SHN 1917-2214(60) See also CLR, CLN MUL and VAL above.	Broad warm sector weather continued for several days, until the building up of a ridge on 23rd displaced the moist air Northwards. Favourable spells were mostly short and spasmodic except in extreme West and Southwest	15
July 30th- 31st	CLN 3020-3109(3) MID 3018-3106(2) MUL 2920-3007; 3019-3107(3) VAL 2921-3106(20)	CLN 2814-3111(70) MUL 2902-3107(54) VAL 2819-0110(88)	Open warm sector from WNW, combined with slow cold front passage, to give favourable spells in the Northwest and West, with scattered spots elsewhere.	16
Aug. 2nd	CLN 0120-0207(1)	-	Small closed polar low; neither widespread nor effective	17
Aug. 4th	CLN 0316-0409(7) MUL 0318-0409(5)	CLN 0306-0510(53) MUL 0306-0512(55)	Thundery trough affecting Northern part of Ireland.	18
Aug. 6th- 7th	CLR 0622-0709(1) CLN 0623-0710(1) DBN 0621-0713(6) MID 0519-0706(25) MUL 0622-0710(2)	MID 0413-0713(73)	Wave depression on 5th affected Southeast of country appreciably and was followed by an occlusion coming from the West. This was the first favourable spell in the Southeast for a month	19
Aug. 8th	CLR 0722-0809(1) CLN 0719-0811(6)	-	Spasmodic rain in an unstable current, with a stationary low to the West of Ireland	20

(1) DATE	(2) BLIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
Aug. 9th	CLN 0821-0916(9) DEN 0901-0914(3) MID 0819-0908(3) MUL 0821-0911(4)	CLN 0817-1210(90) MUL had almost a period, a series of 93 hourly values having one (the 47th) with humidity 74%	Depression affecting Eastern half of country to a slight degree.	21
Aug. 11th-12th	CLR 1105-1209(18) CLN 1018-1108(4) MID 1022-1116; 1119-1211(25) MUL 1021-1113; 1115-1208(24) VAL 1119-1213(8)	MID 1019-1312(66) VAL 1019-1310(64) See also CLN above	Open warm-sector of low from SW. Warm front affected South; tip of warm sector passed up West coast.	22
Aug. 13th-14th	CLR 1219-1308; 1318-1408(6) CLN 1216-1308; 1318-1409(11) MUL 1220-1307(1)	CLN 1215-1416(50)	On two successive evenings, a thundery trough gave scattered favourable periods inland.	23
Aug. 18th	MID 1716-1815(13) MUL 1722-1811(3)	-	An active low skirted the South coast before veering away to the Bay of Biscay. South coast mainly affected.	24
Aug. 21st-25th	CLR 2021-2108; 2220-2310 2321-2411(9) CLN 2420-2509(3) MID 2220-2310(4) MUL 2319-2409(4) SHN 2020-2109; 2117-2209; 2220-2309(8) VAL 2023-2111; 2116-2208; 2217-2309; 2319-2409(29)	CLR 2018-2522(125) CLN 2216-2603(84) MID 2217-2503(59) VAL 2216-2514(71)	New open warm sector came in from WNW on 20th. Warm front inactive. South Eastward movement of wave on 21st; quasi-stationary front on 22nd, and effect of main cold front on 24th-25th caused spasmodic favourable periods.	25

(1) DATE	(2) LIGHT-WEATHER SPELLS	(3) BEAUMONT PERIODS	(4) CAUSE AND NOTES	(5) CASE AND CHART NUMBER
Aug. 27th	CLR 2619-2710 (5) CLN 2620-2711 (5) MUL 2622-2712 (4) SEN 2621-2714 (7) VAL 2622-2722 (14)	VAL 2615-2911 (69)	Open warm sector gave good favourable conditions over all except the South and East of the country.	26
Aug. 29th-31st	CLR 2920-3008; 3016-3105 (3) CLN 2821-2908 (1) DEN 2919-3011 (2) MID 2821-2909 (2) MUL 2921-3009 (2) VAL 2816-2907; 2917-3008 (10)	See VAL above	Low from WNW with open warm sector and lagging cold front. Spells mainly confined to West and NW coasts	27
Sept. 3rd	CLR 0221-0311 (4) MUL 0220-0312 (6) SEN 0221-0311 (4) VAL 0215-0310 (9)	VAL 3118-0310 (66)	Depression with open warm sector moved in from the West.	28
Sept. 20th-24th	CLR 2319-2411 (6) CLN 2223-2311 (1) MUL 2019-2108; 2217-2315 (12) SEN 2000-2012; 2217-2310 (8) VAL 1921-2110; 2216-2310 (33)	CLR 2206-2413 (56) CLN 2208-2413 (54) MUL 2209-2415 (55) VAL 1901-2503 (147)	Two open warm sectors in quick succession. Warm front passages on 20th and 22nd; cold front passages on 21st and 24th. In most areas, the 23rd was the warmest day of the month.	29

APPENDIX IV

Charts of Blight-Weather and of Blight

Charts 1 to 29

Extent and Observed Effective Duration of Individual Blight Weather Spells in Ireland, May to September, 1952

- Notes (1) In the case of Charts 1 to 12, dealing with the earlier spells, the relevant synoptic weather situation is also illustrated.
- (2) The observed effective duration is shown not only (in circles) for stations participating in the alerting programme, but also (in squares) for the stations used in post-season checking.
- (3) Extra information regarding the weather spells is contained in Appendix III; the location and heights of the observing stations will be found in Appendix II.
- (4) The scale of the synoptic weather charts is 1 : 12,500,000, and of the maps of Ireland illustrating blight weather spells 1 : 5,000,000.

Chart 30

Location and Intensity of Potato Blight Attacks observed in Ireland in May-June, 1952

- Notes (1) Further information on the early appearances of Blight in Ireland in 1952 will be found in Chapter 4.
- (2) Attacks immediately after June 30th were widespread throughout the country.

Chart 31

Aggregate of Effective Blight-Weather Hours in Ten-day Periods, May-September, 1952

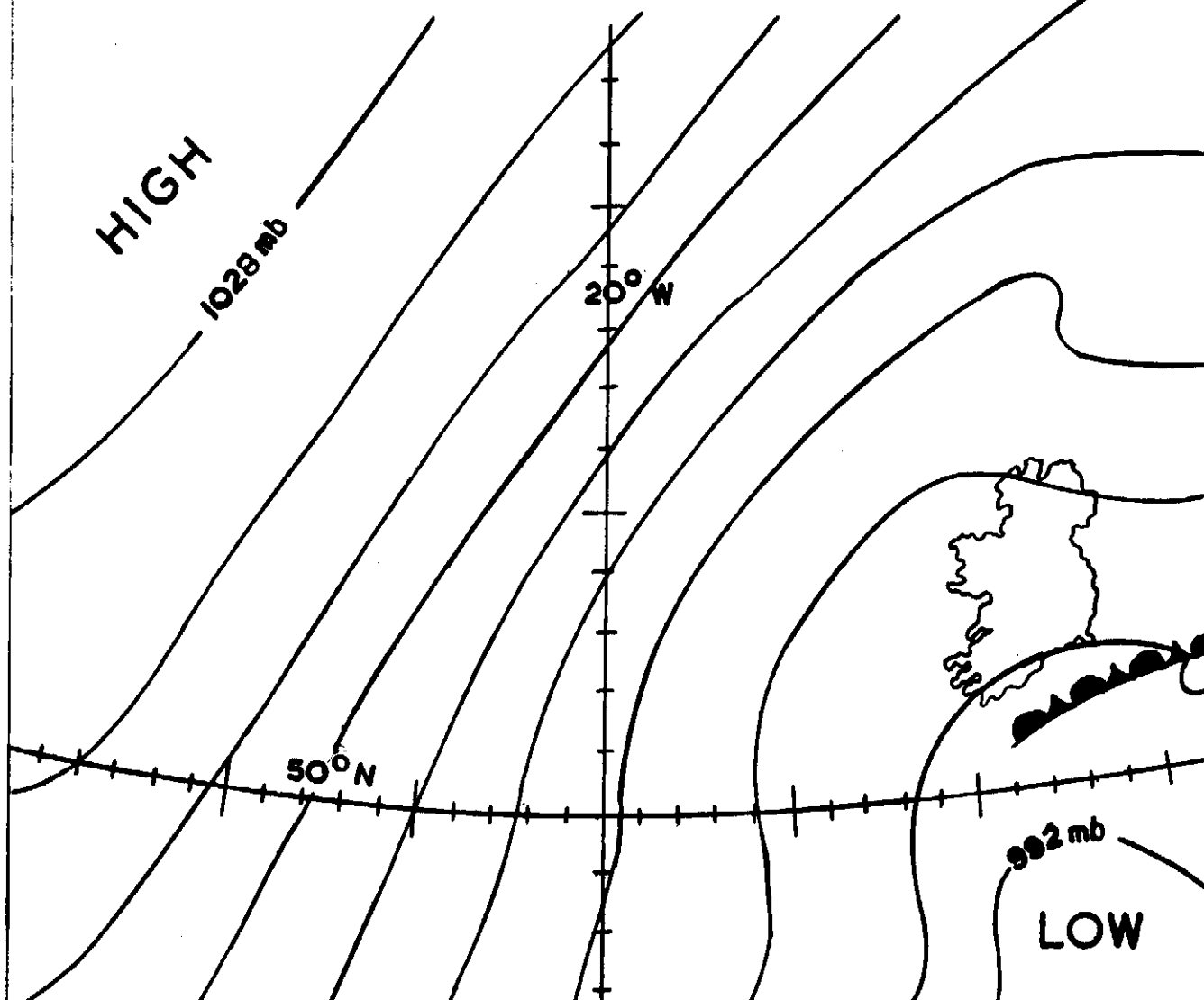
Chart 32

Isopleths of Total Number of Hours of Effective Blight Weather, May-August 1952

Chart 33

Total Rainfall in Ireland, May-August 1952

SURFACE MAP FOR 0000 GMT MAY 4TH 1952

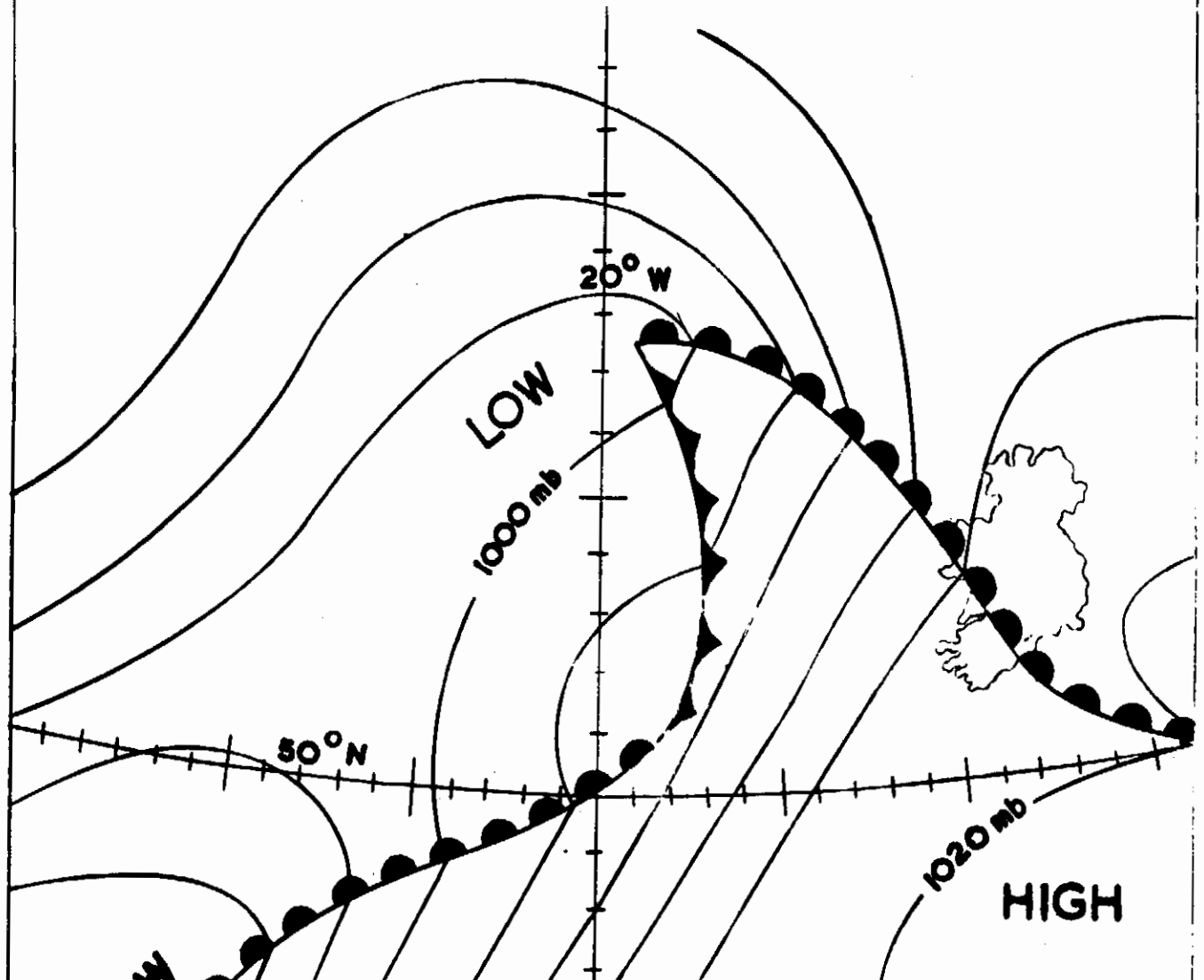


BLIGHT WEATHER MAY 4TH



CHART 1

SURFACE MAP FOR 0600 GMT MAY 13TH 1952



BLIGHT WEATHER MAY 14TH-15TH

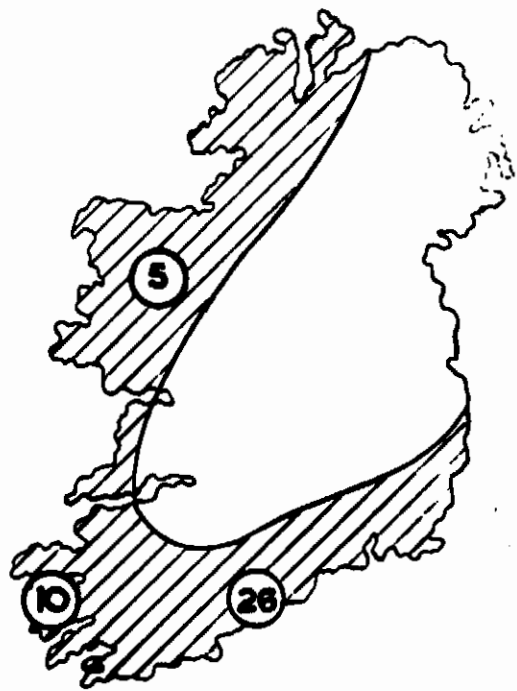


CHART 2

SURFACE MAP FOR 0000 GMT MAY 17TH 1952

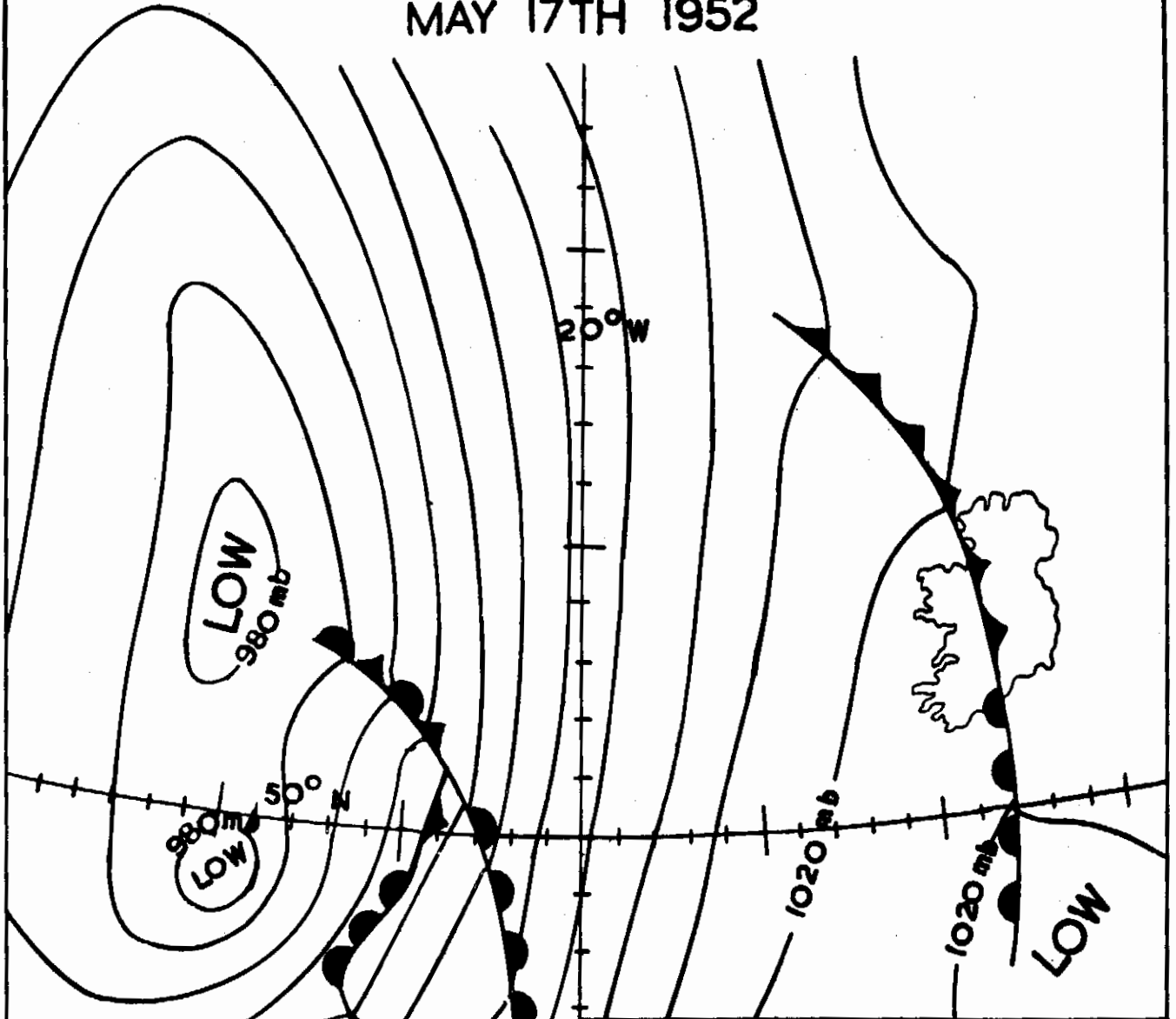
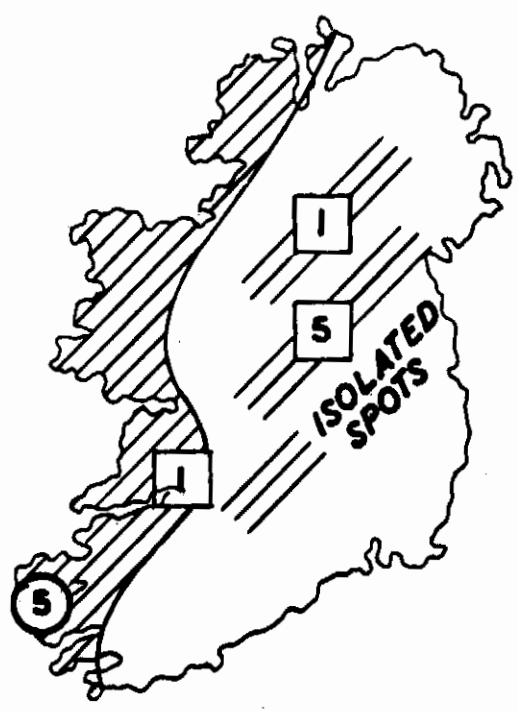
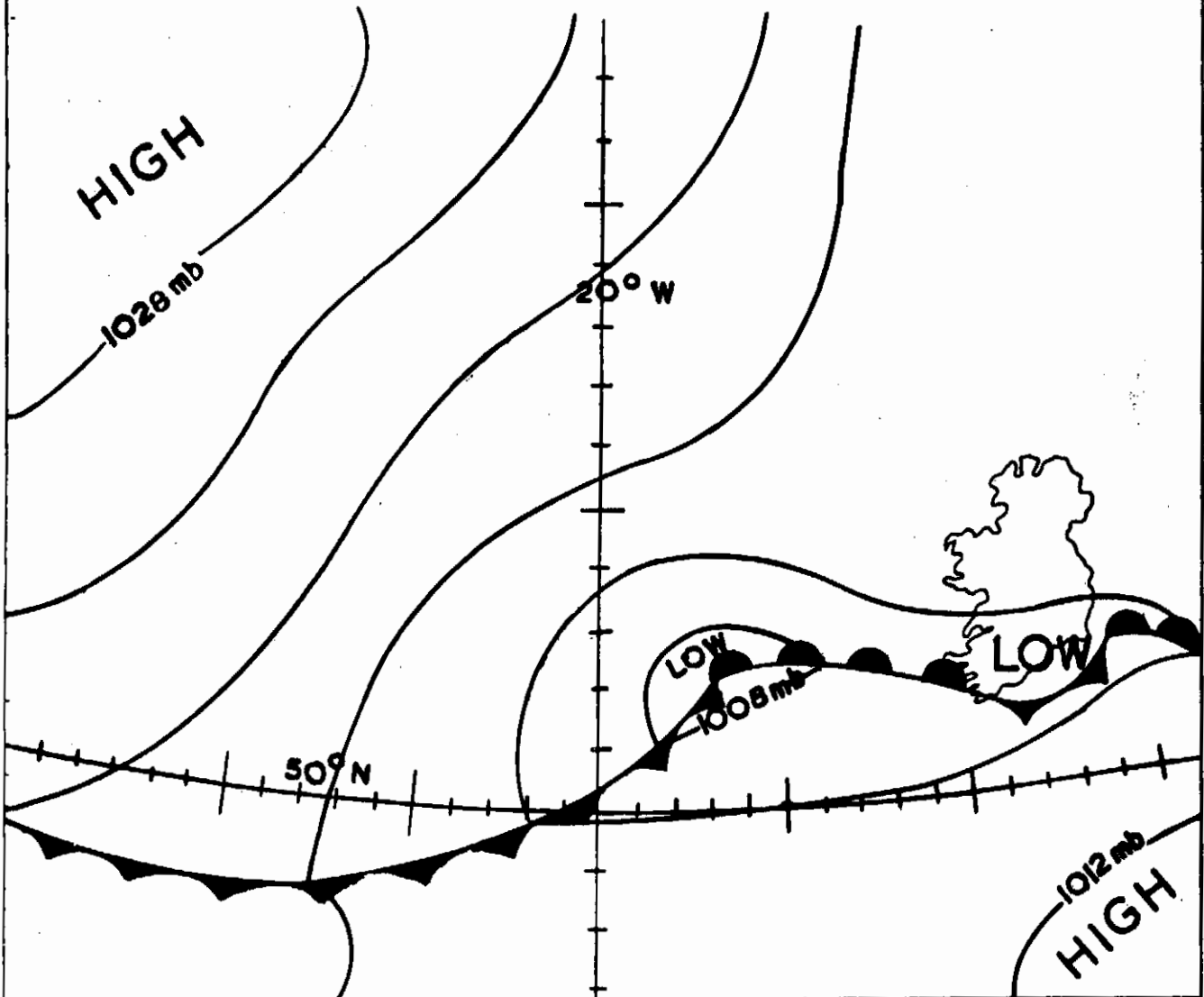


CHART 3

BLIGHT WEATHER MAY 18TH-19TH

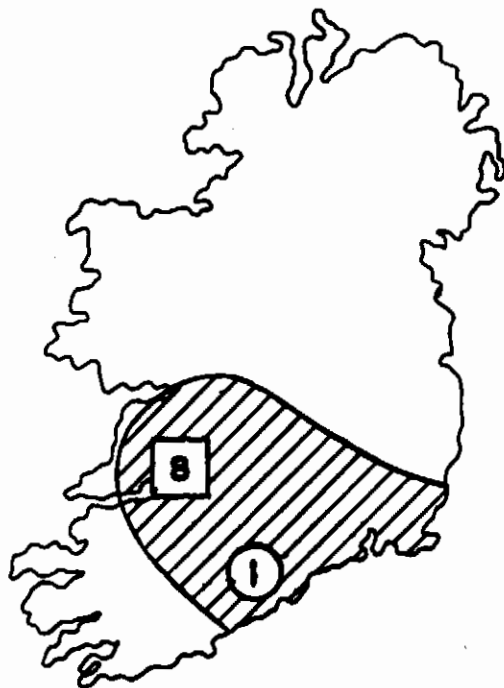


SURFACE MAP FOR 0600 GMT
MAY 30TH 1952

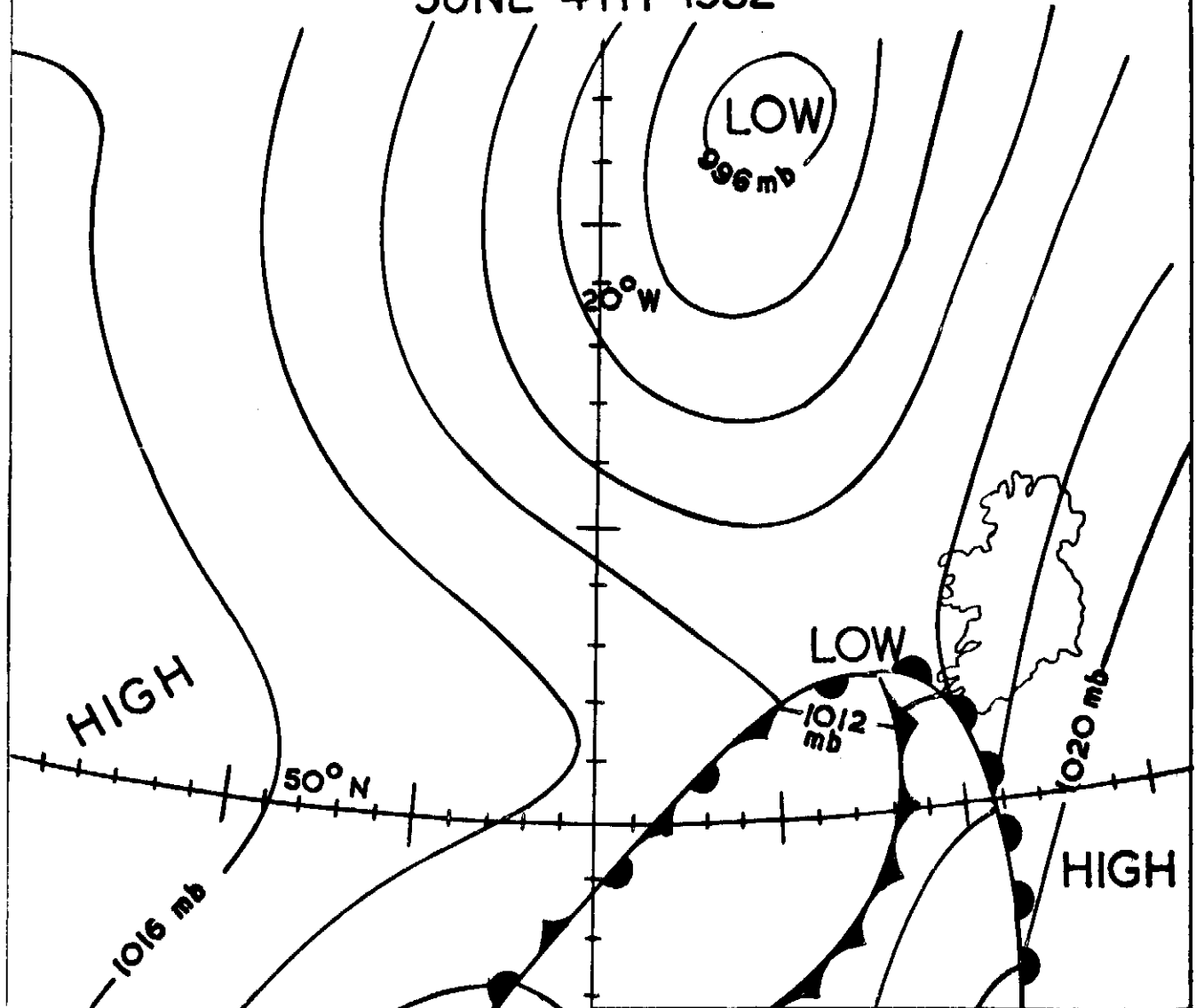


BLIGHT WEATHER MAY 30TH-31ST

CHART 4



SURFACE MAP FOR 1800 GMT JUNE 4TH 1952



BLIGHT WEATHER JUNE 5TH

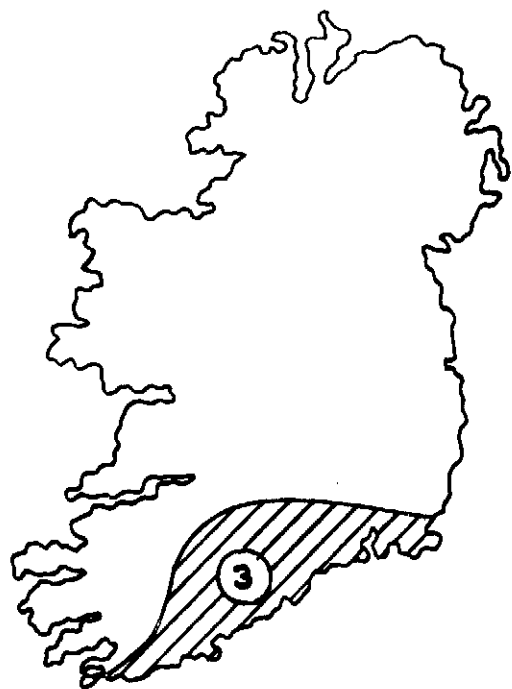
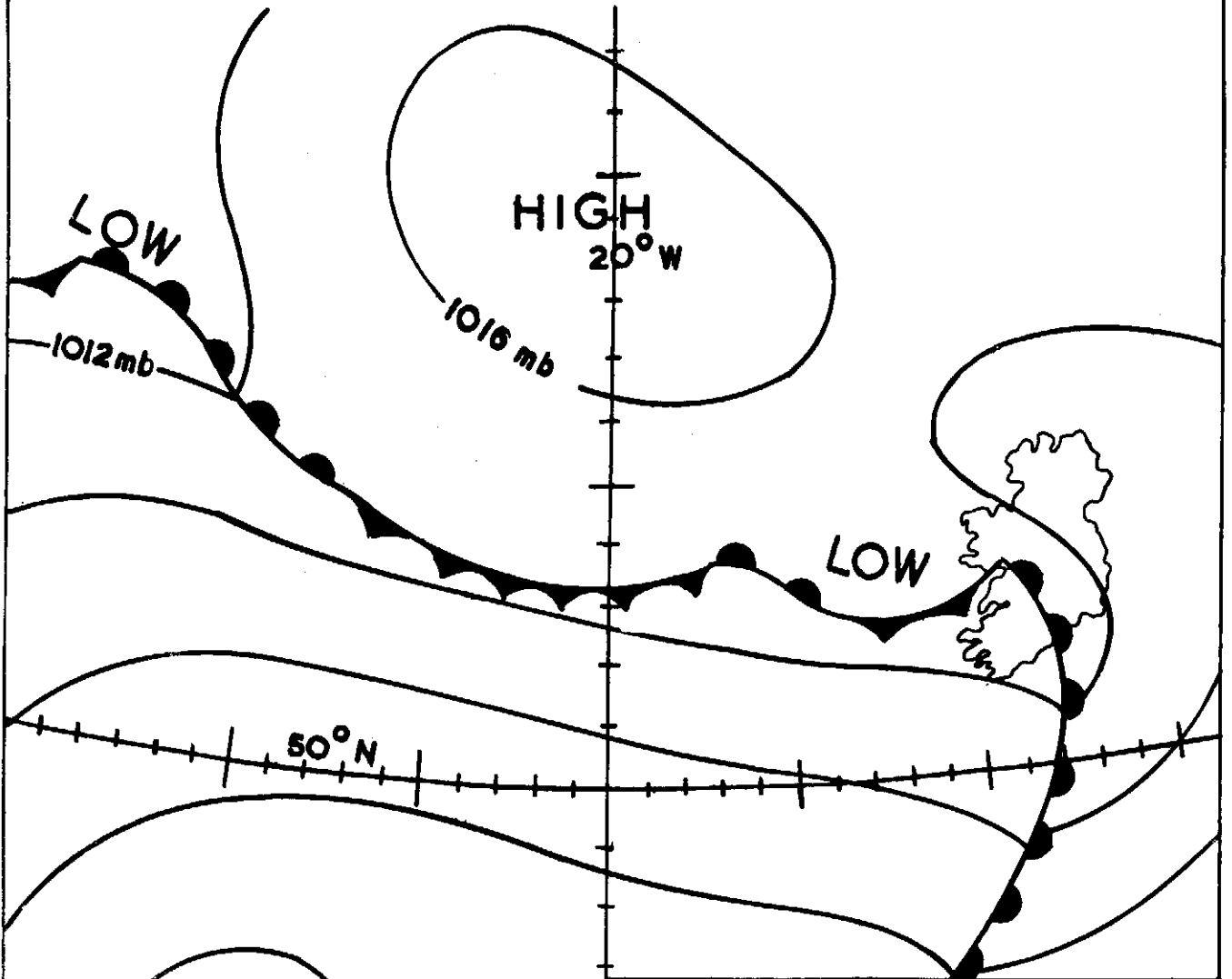


CHART 5

SURFACE MAP FOR 0600 GMT JUNE 8TH 1952



BLIGHT WEATHER JUNE 8TH

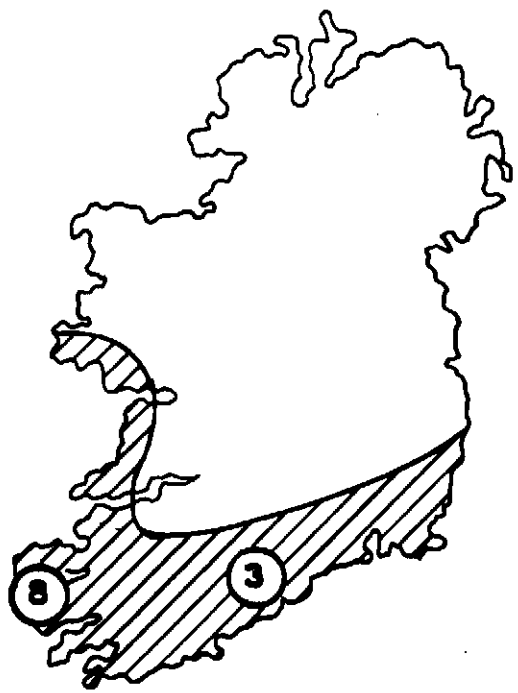
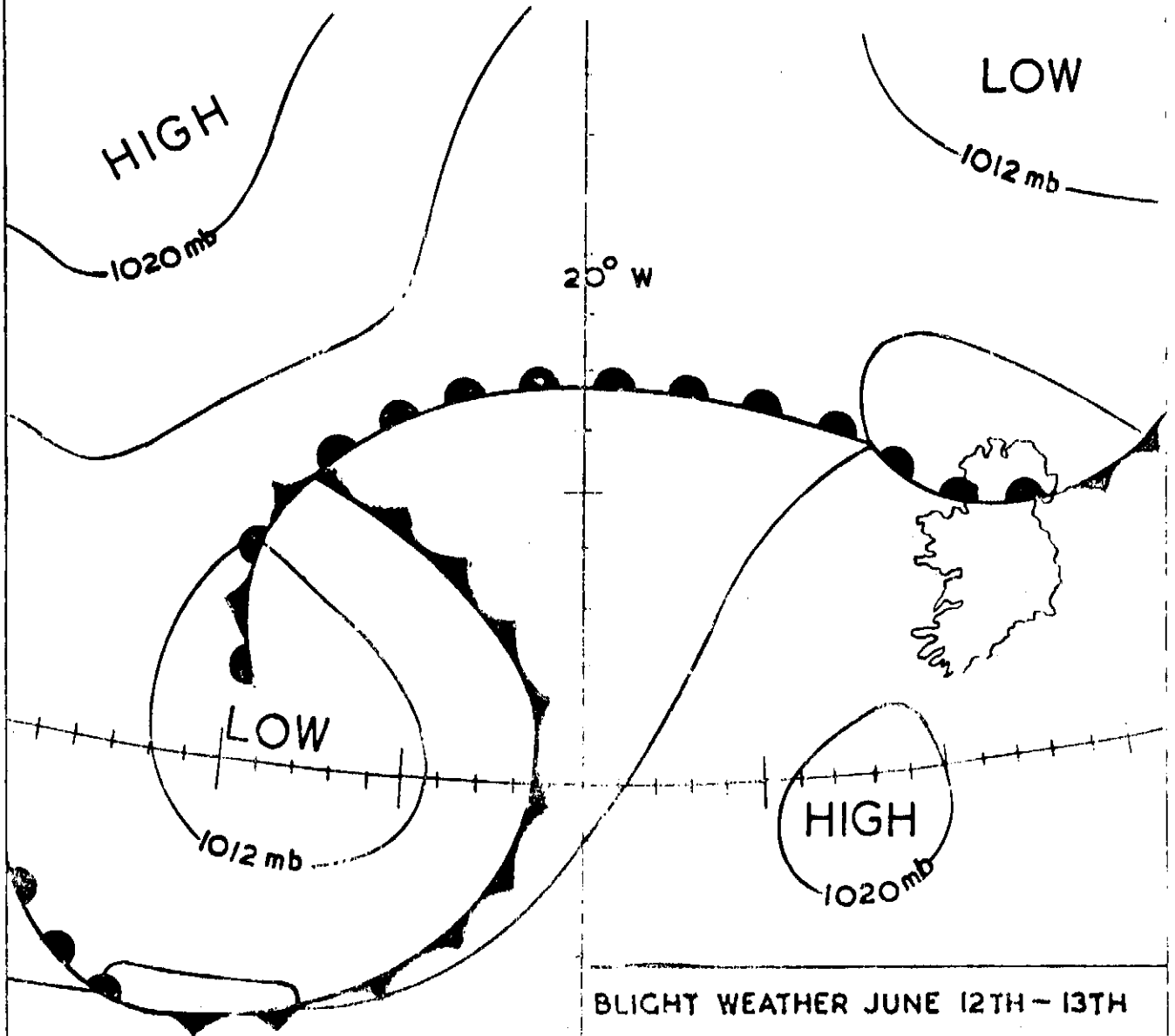


CHART 6

SURFACE MAP FOR 1200 GMT JUNE 12TH 1952



BLIGHT WEATHER JUNE 12TH - 13TH

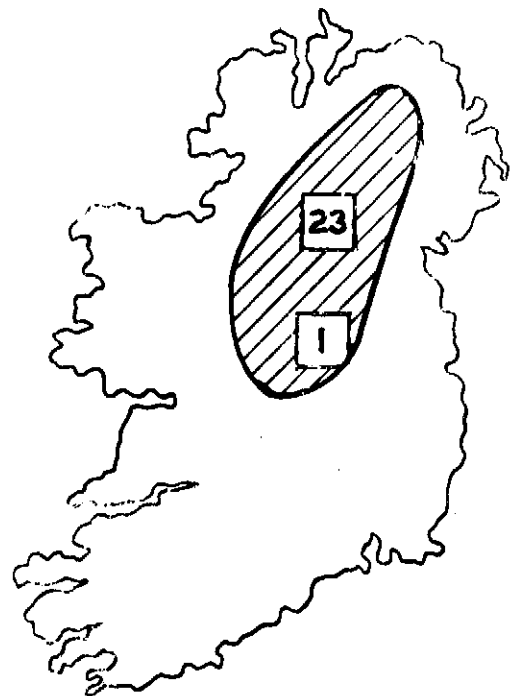
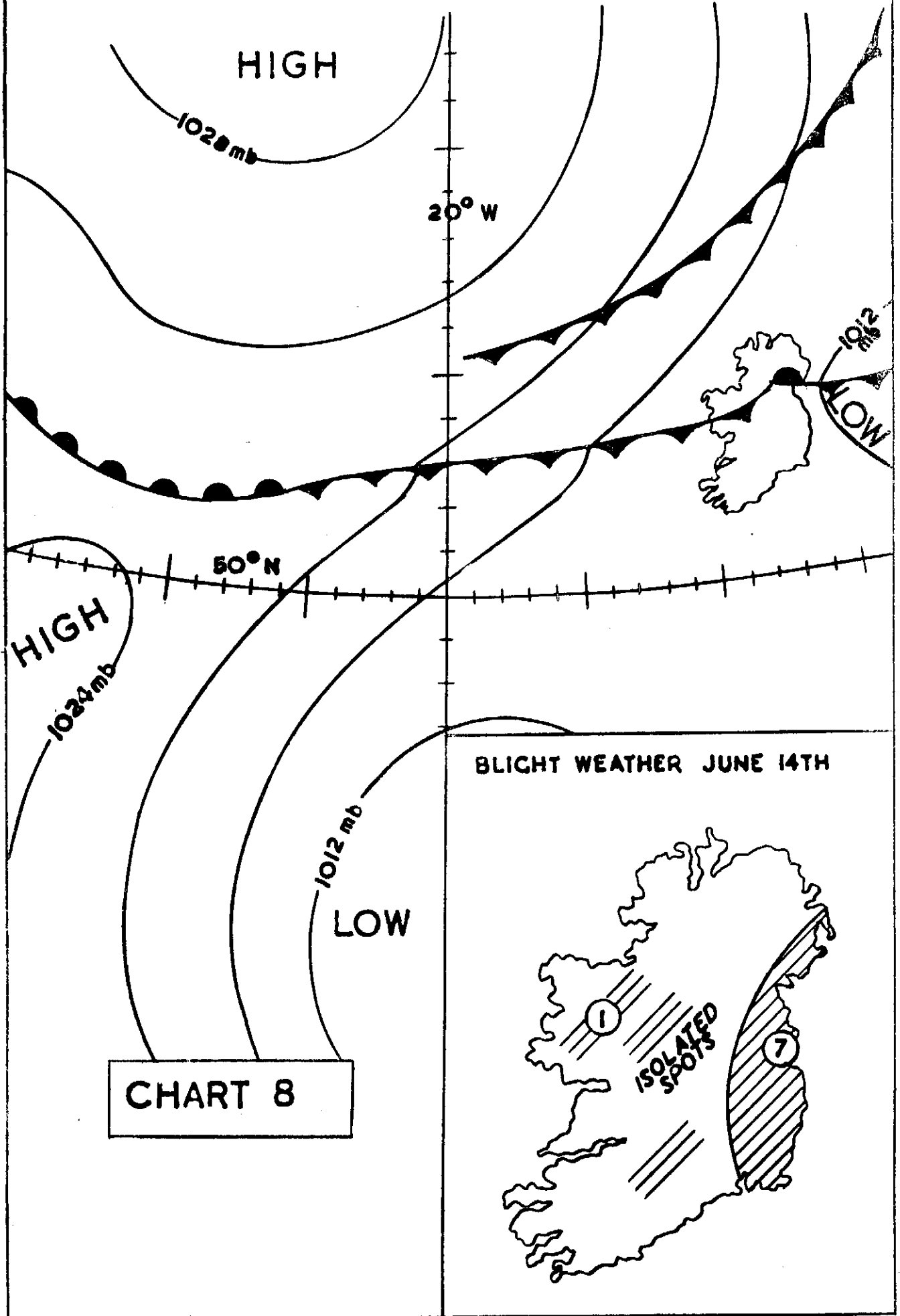
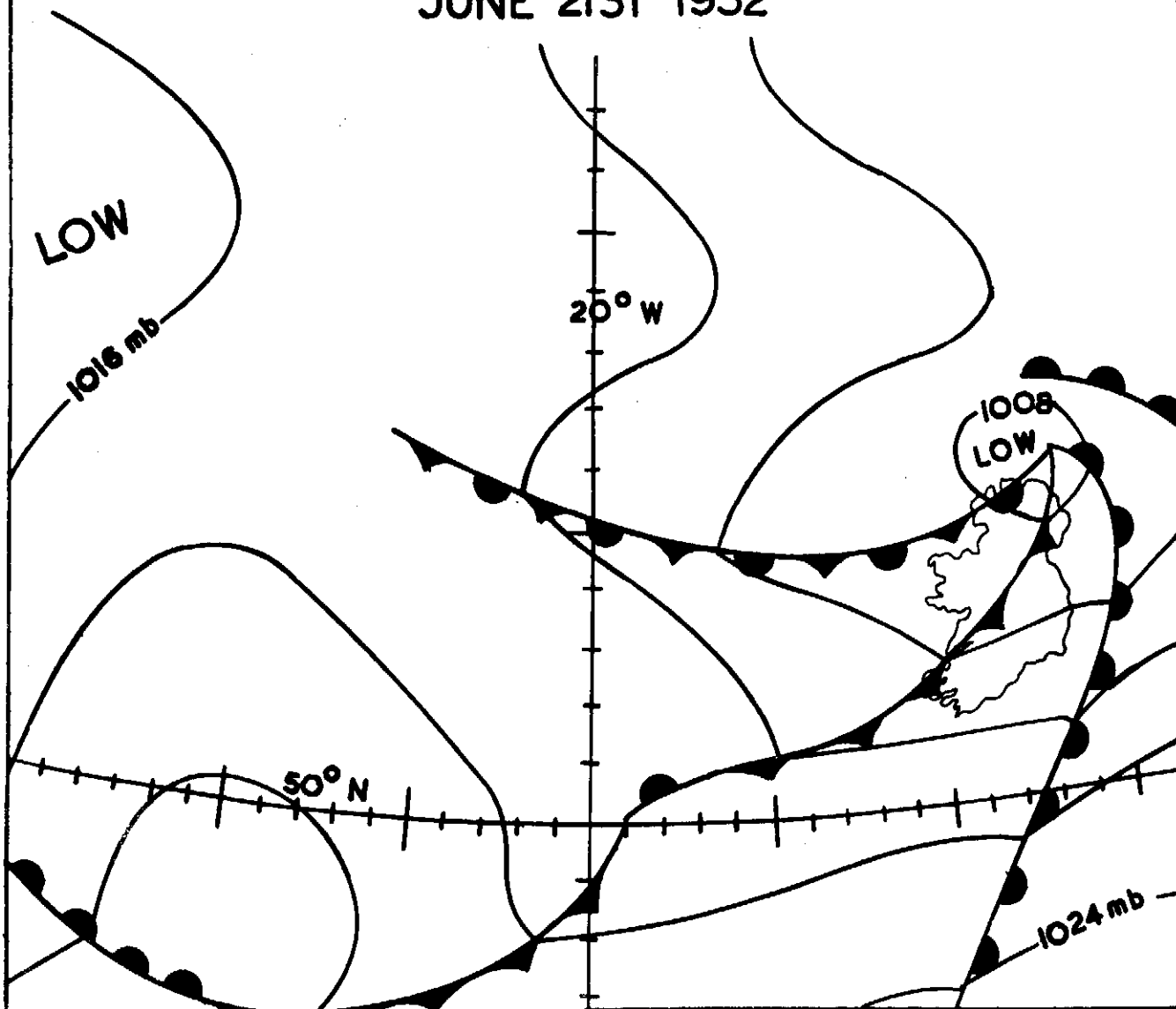


CHART 7

SURFACE MAP FOR 0000 GMT JUNE 14TH 1952



SURFACE MAP FOR 1800 GMT JUNE 21ST 1952



BLIGHT WEATHER JUNE 21ST - 22ND

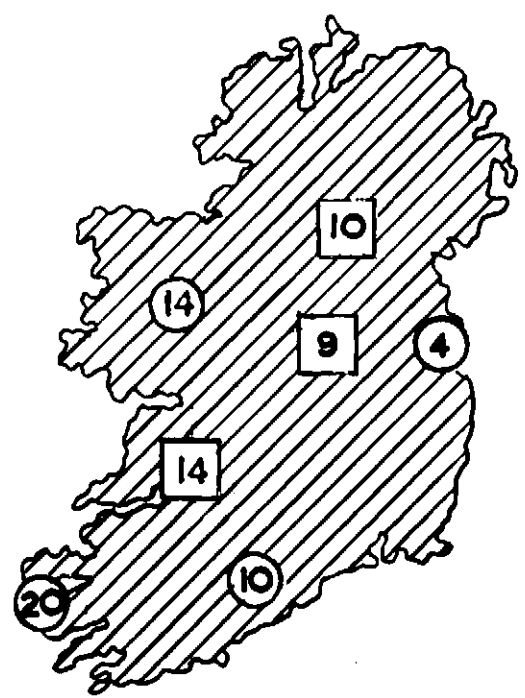
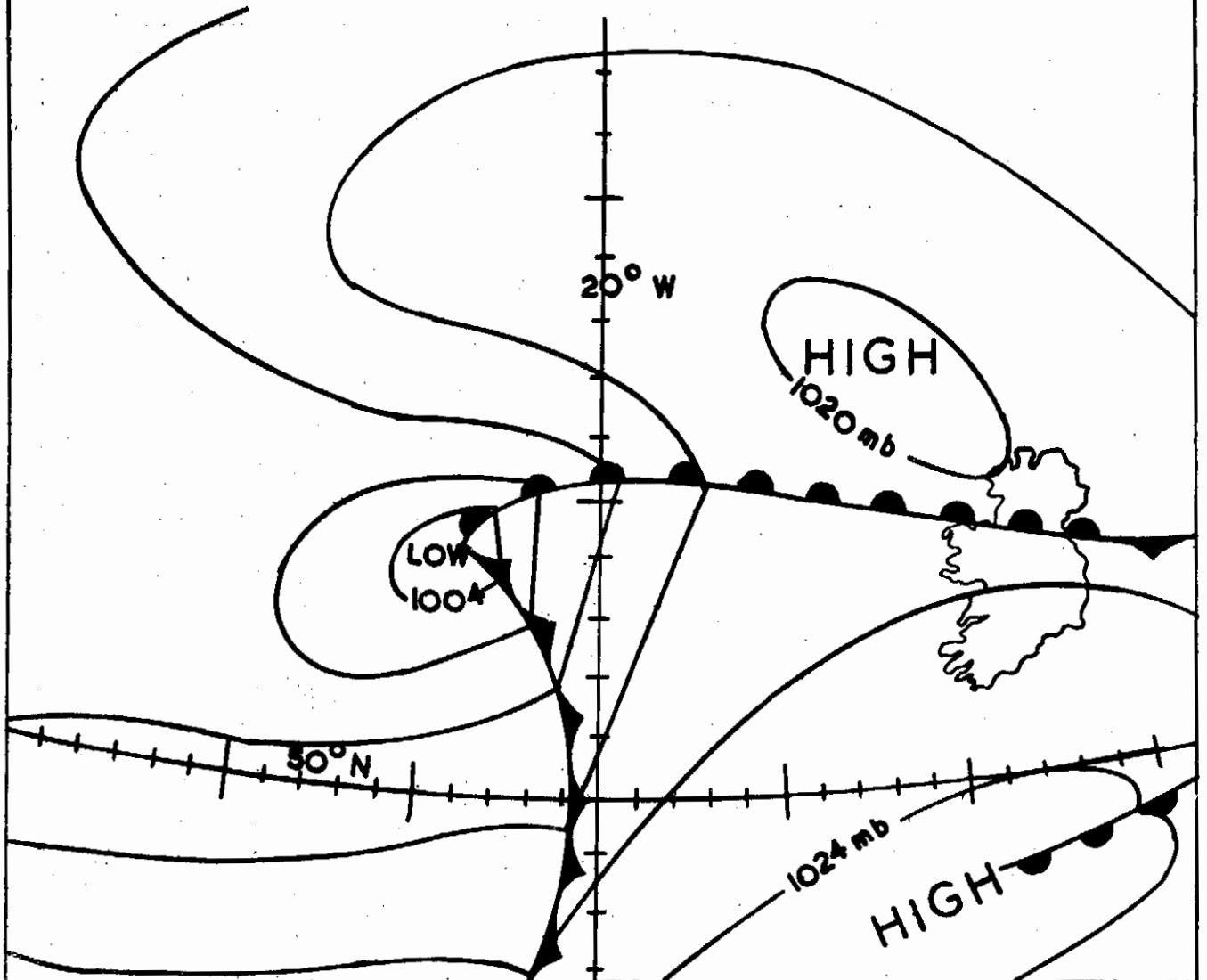


CHART 9

SURFACE MAP FOR 1200 GMT JUNE 25TH 1952



BLIGHT WEATHER JUNE 25TH - 26TH

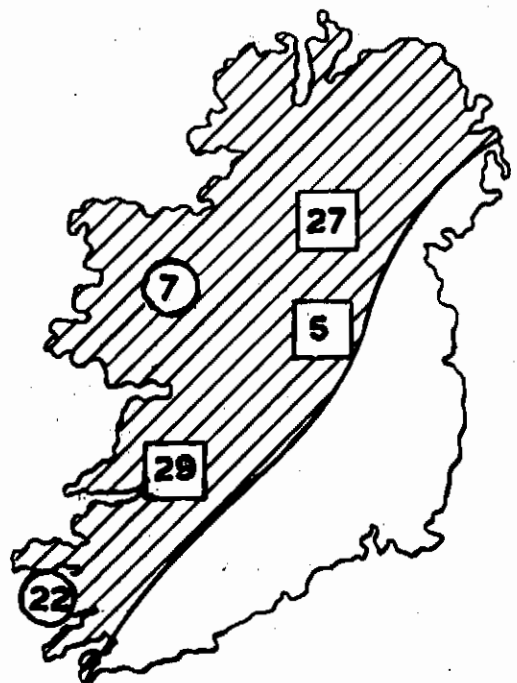
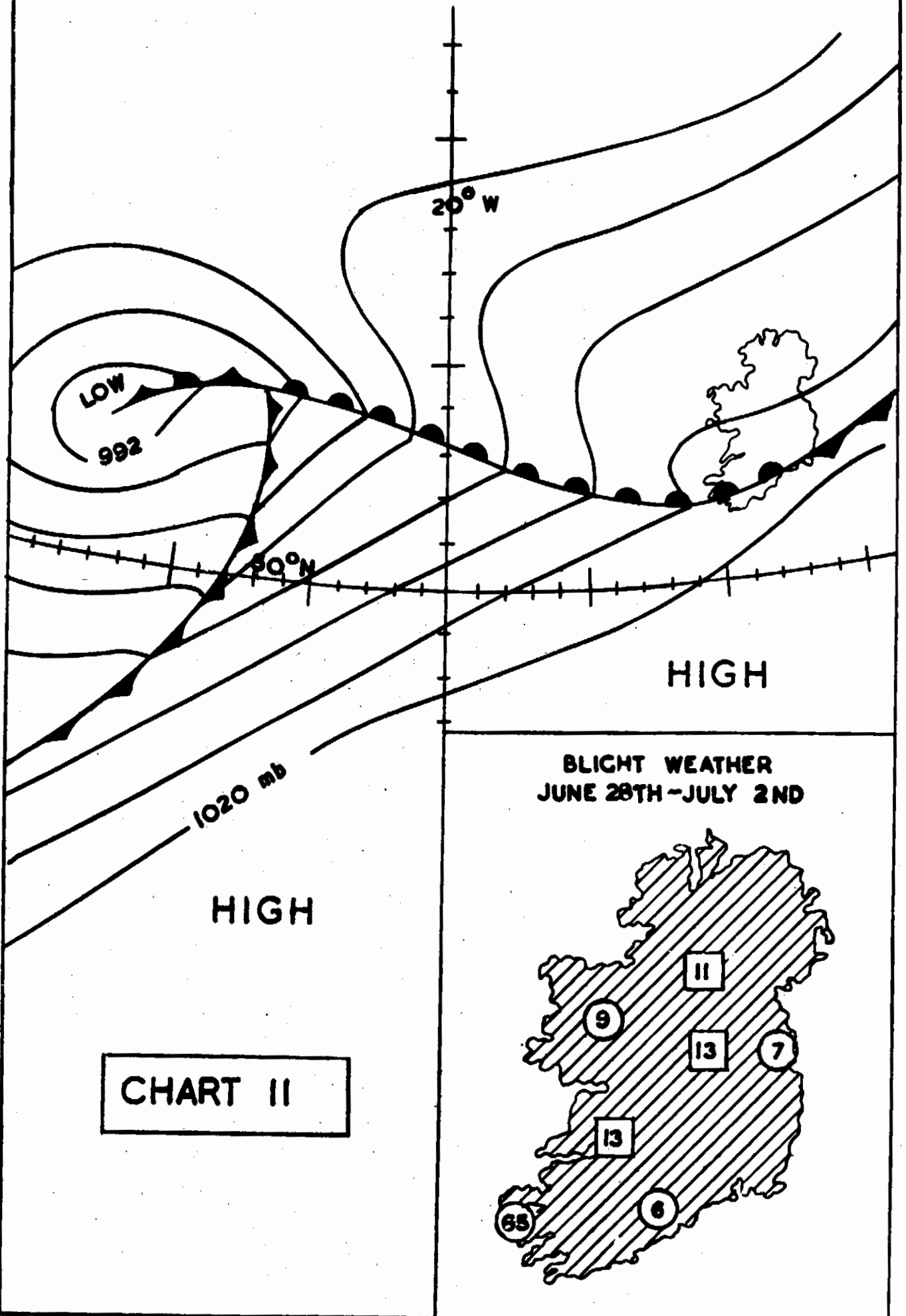


CHART 10

SURFACE MAP FOR 0600 GMT JUNE 29TH 1952



SURFACE MAP FOR 1800 GMT JULY 7TH 1952

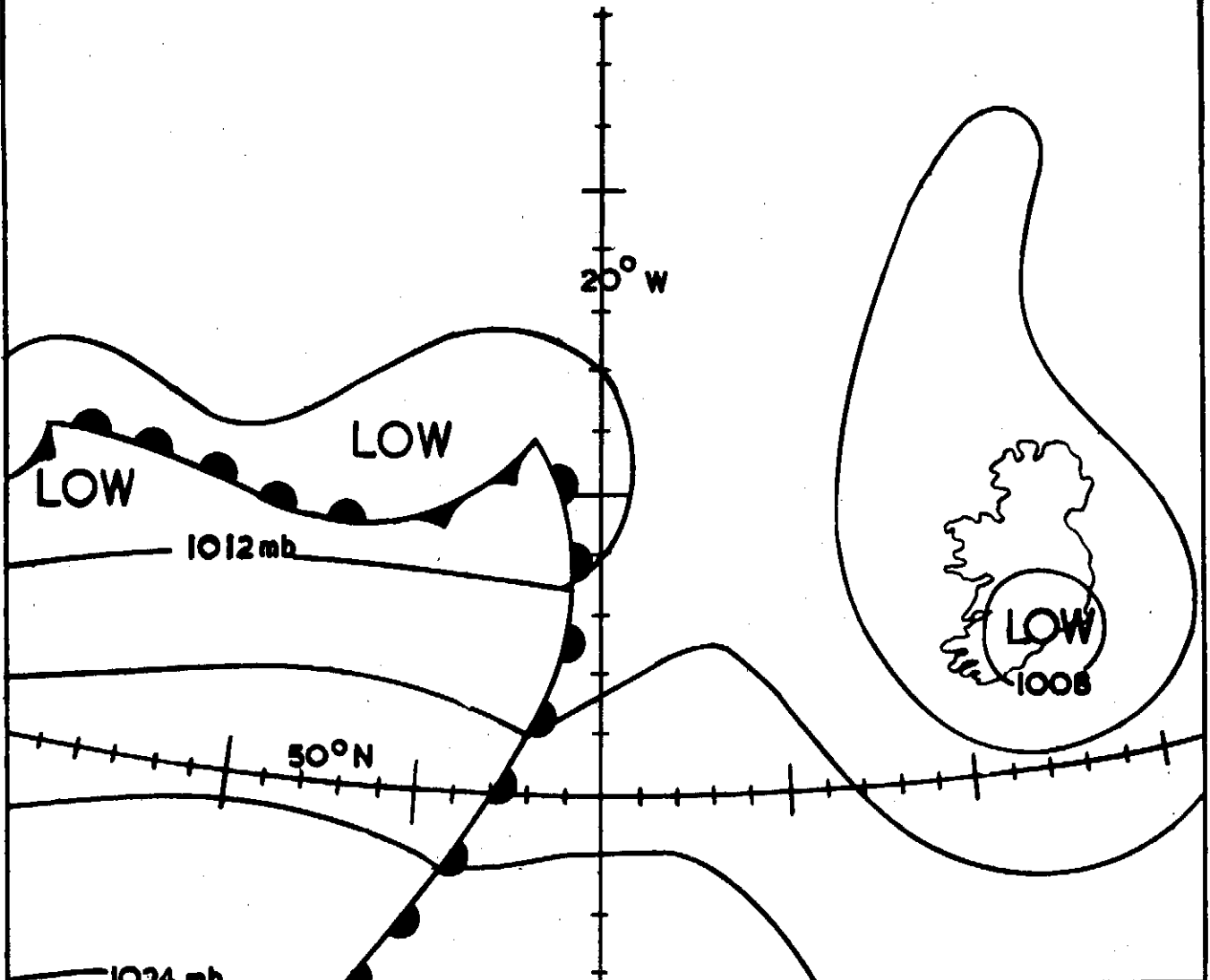


CHART 12

BLIGHT WEATHER JULY 6TH-7TH-8TH

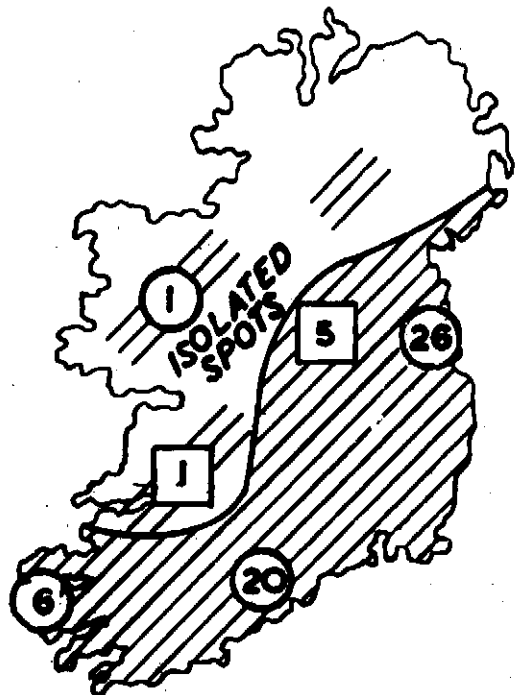
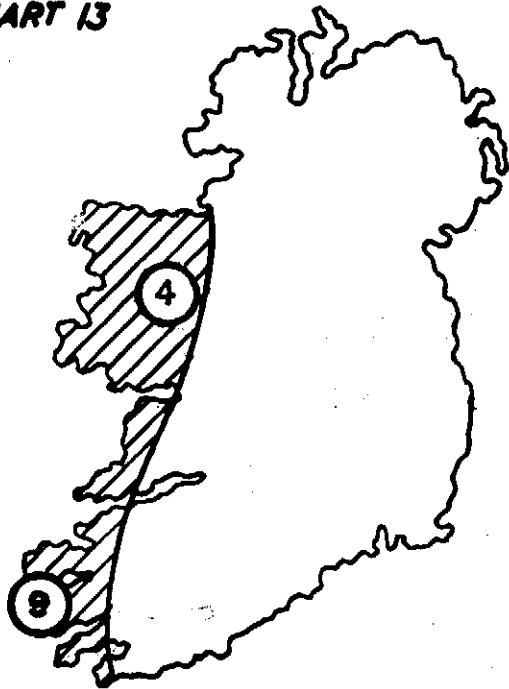
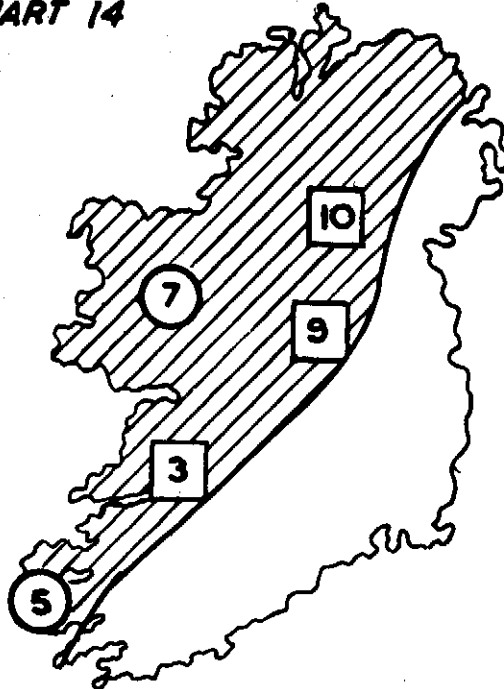


CHART 13



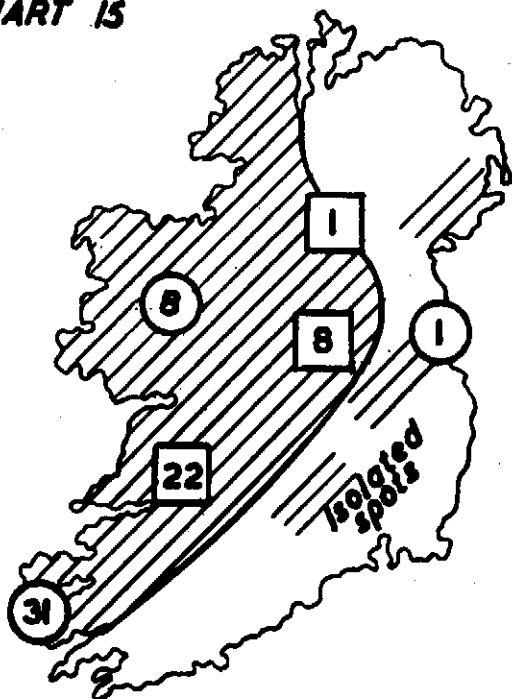
July 9th - 10th

CHART 14



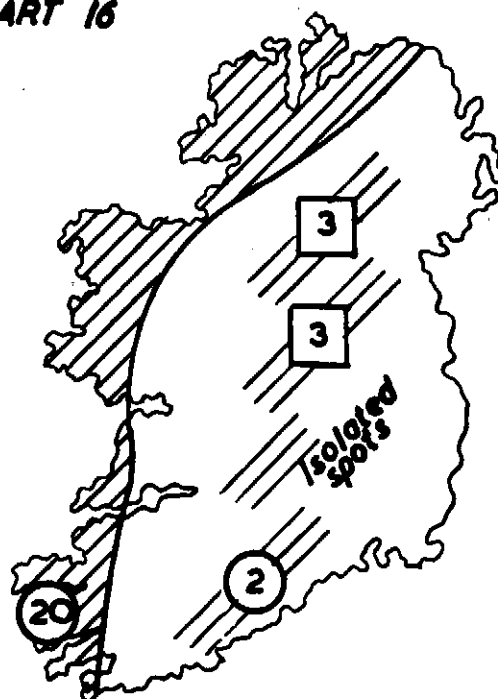
July 17th - 18th

CHART 15



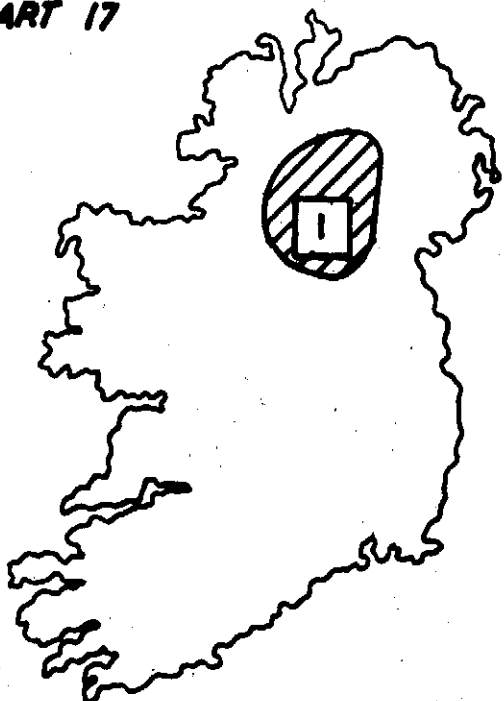
July 19th - 22nd

CHART 16



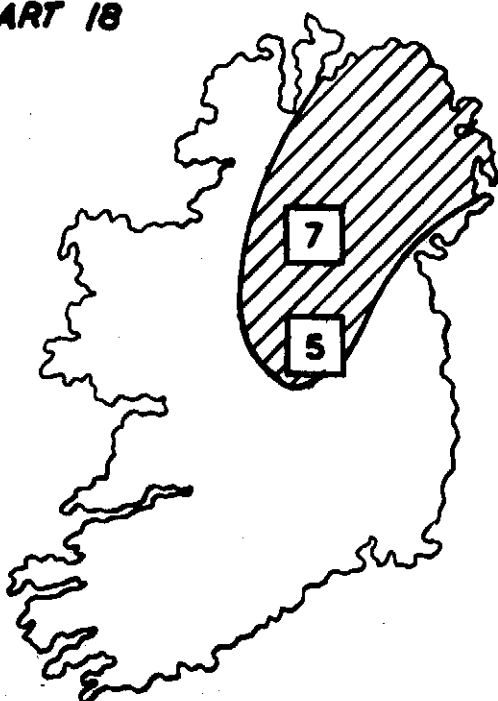
July 30th - 31st

CHART 17



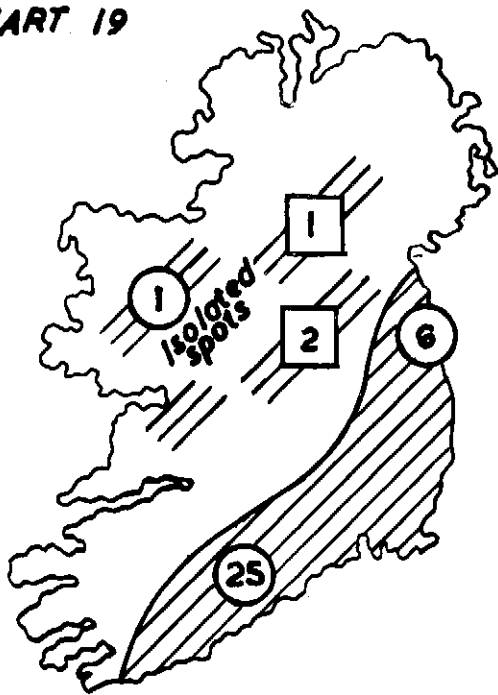
August 2nd

CHART 18



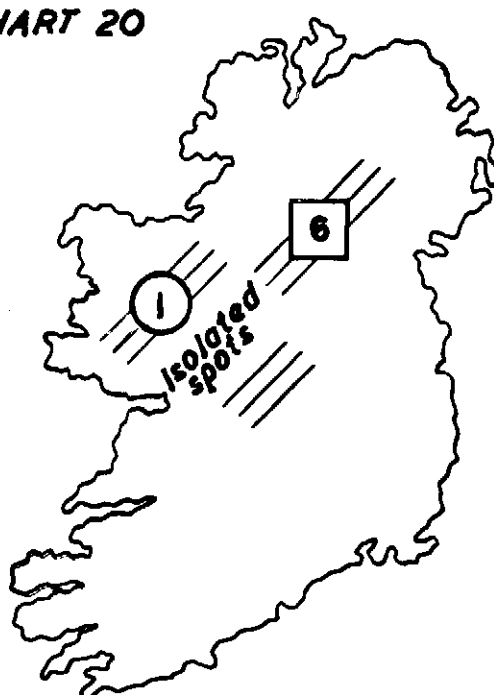
August 4th

CHART 19



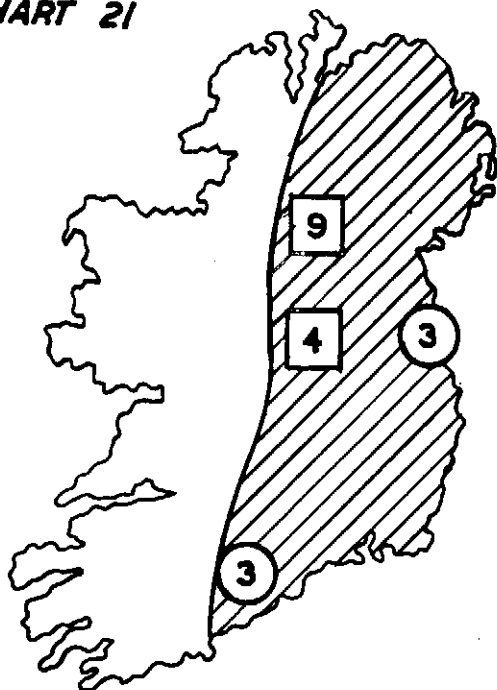
August 6th - 7th

CHART 20



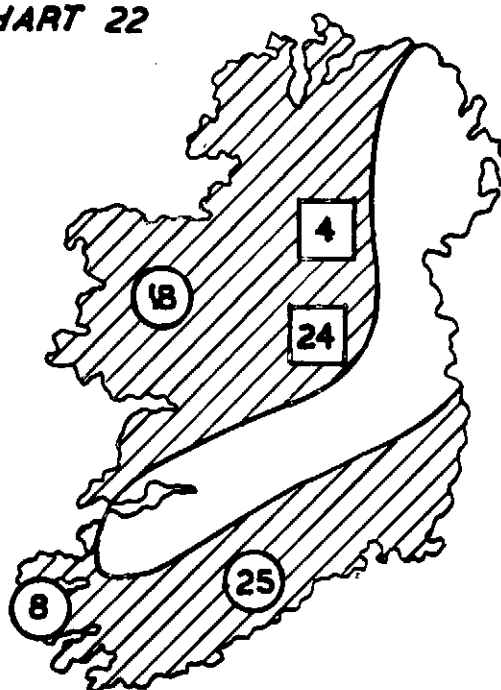
August 8th

CHART 21



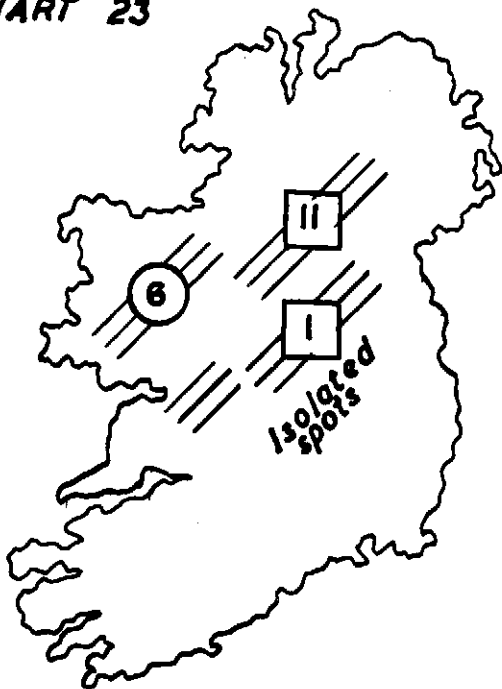
August 9th

CHART 22



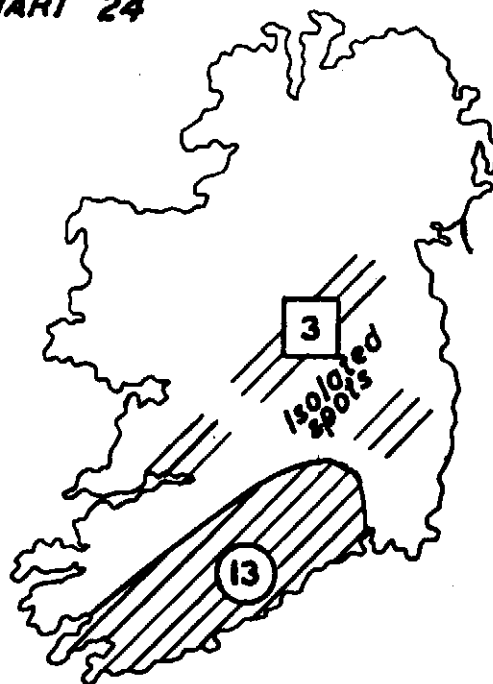
August 11th - 12th

CHART 23



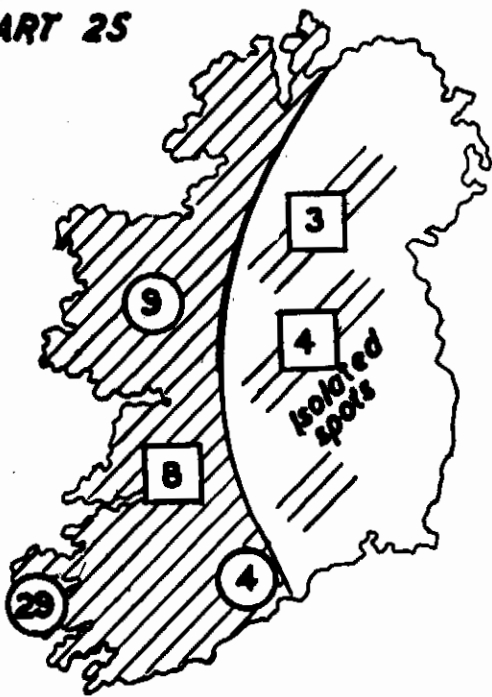
August 13th - 14th

CHART 24



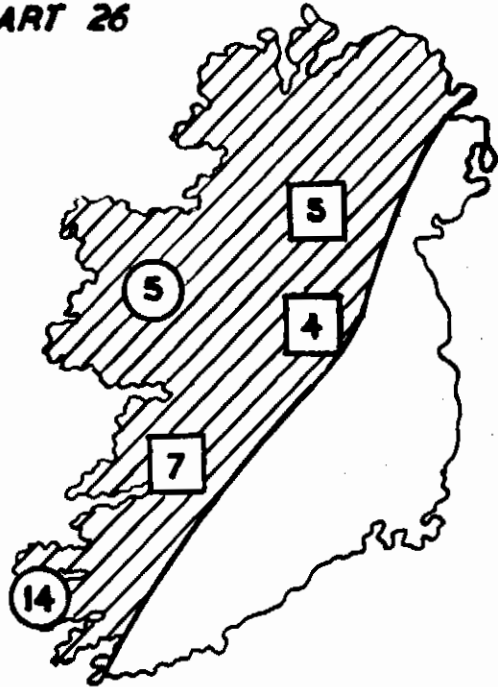
August 18

CHART 25



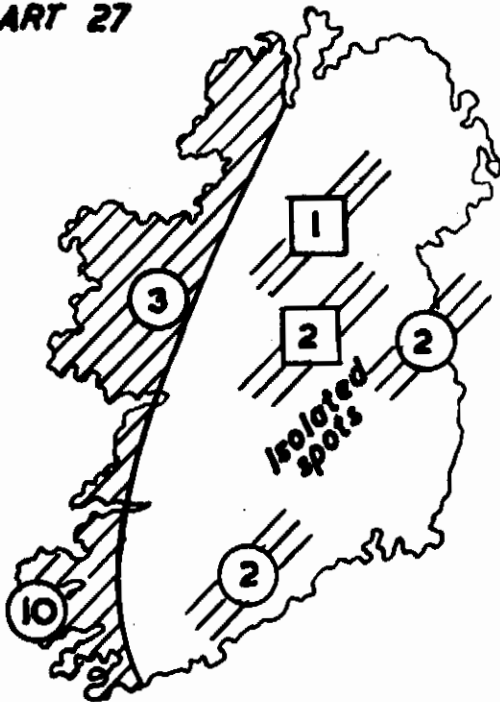
August 21st - 25th

CHART 26



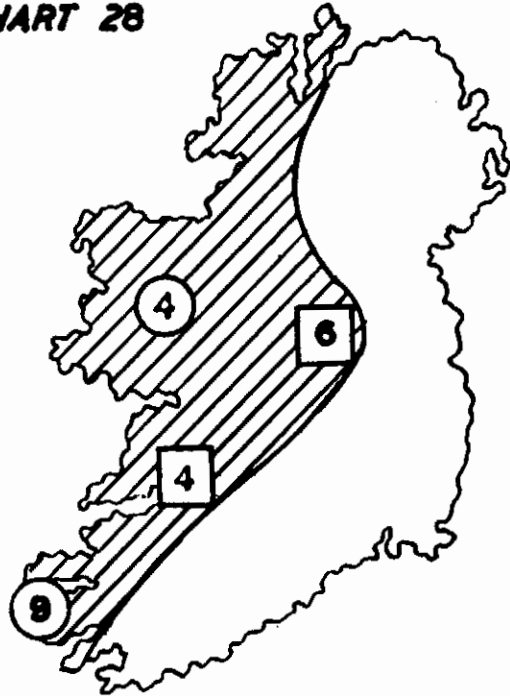
August 27th

CHART 27



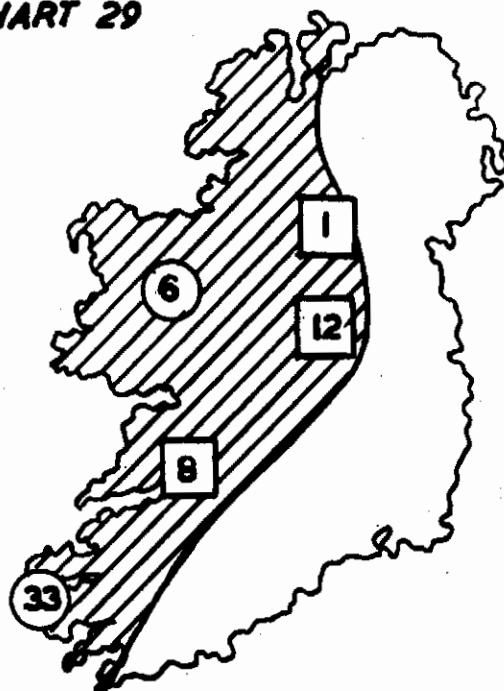
August 29th - 31st

CHART 28



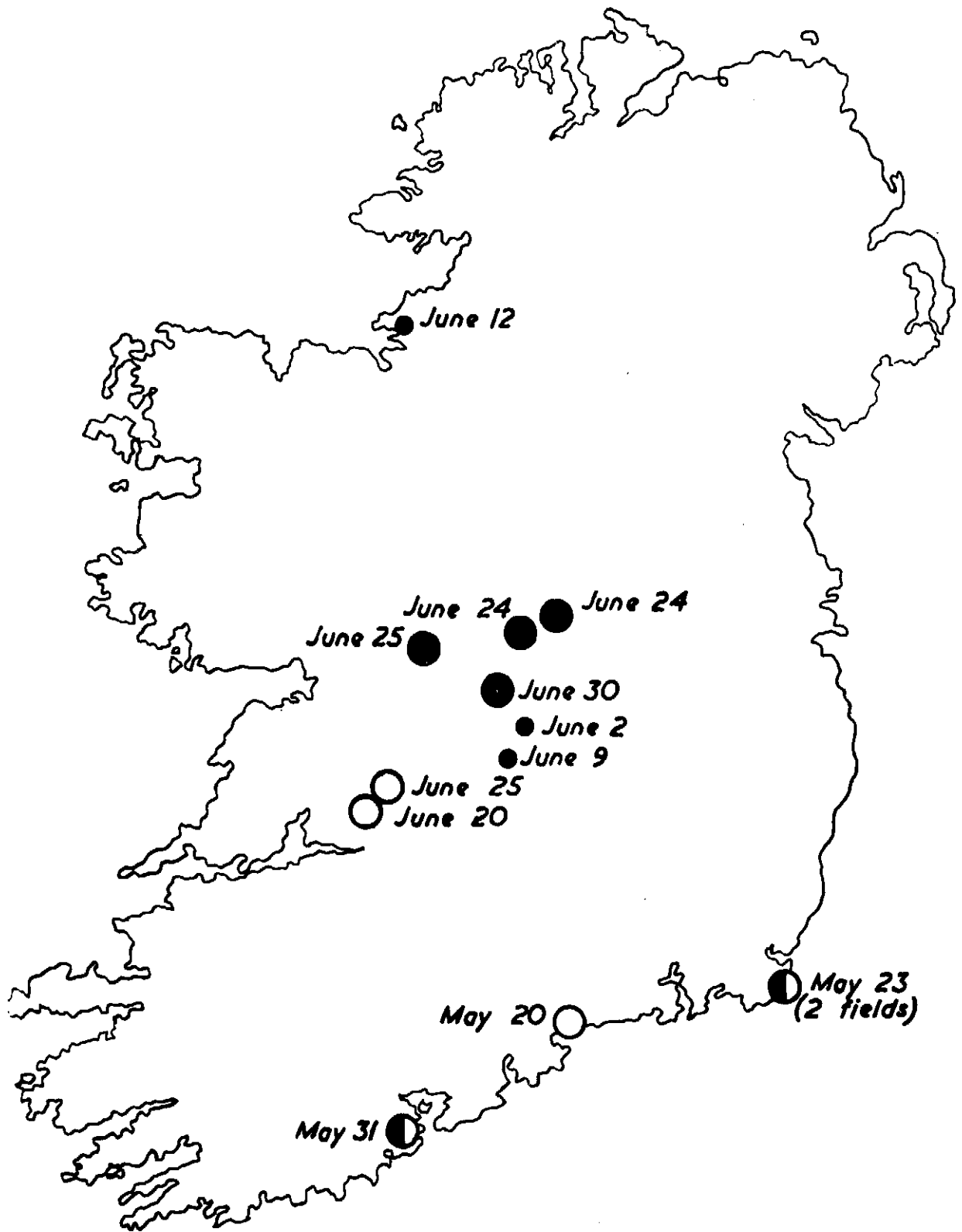
September 3rd

CHART 29

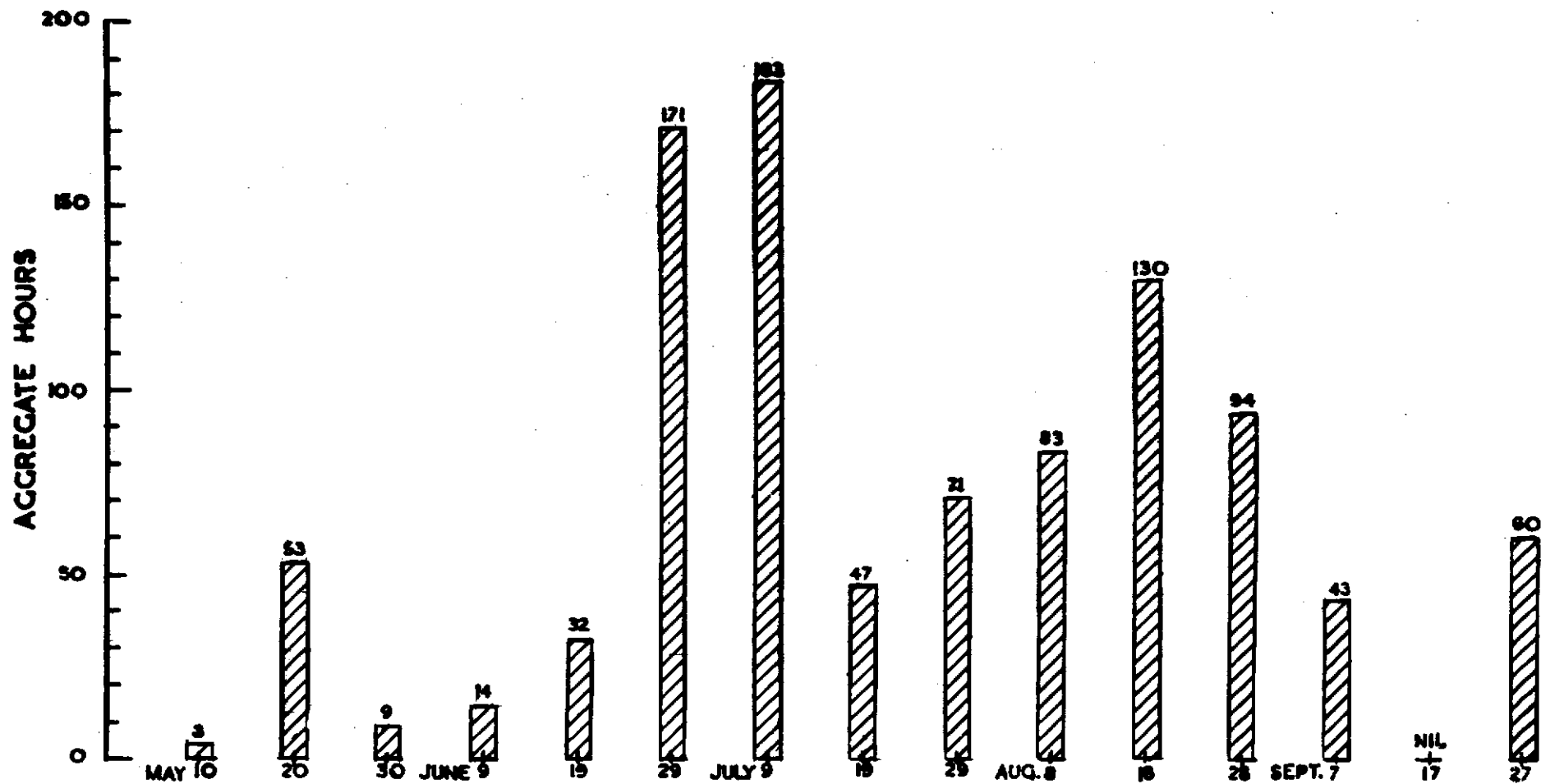


September 20th - 24th

CHART 30
LOCATION AND INTENSITY OF POTATO BLIGHT ATTACKS
OBSERVED UP TO JUNE 30TH, 1952



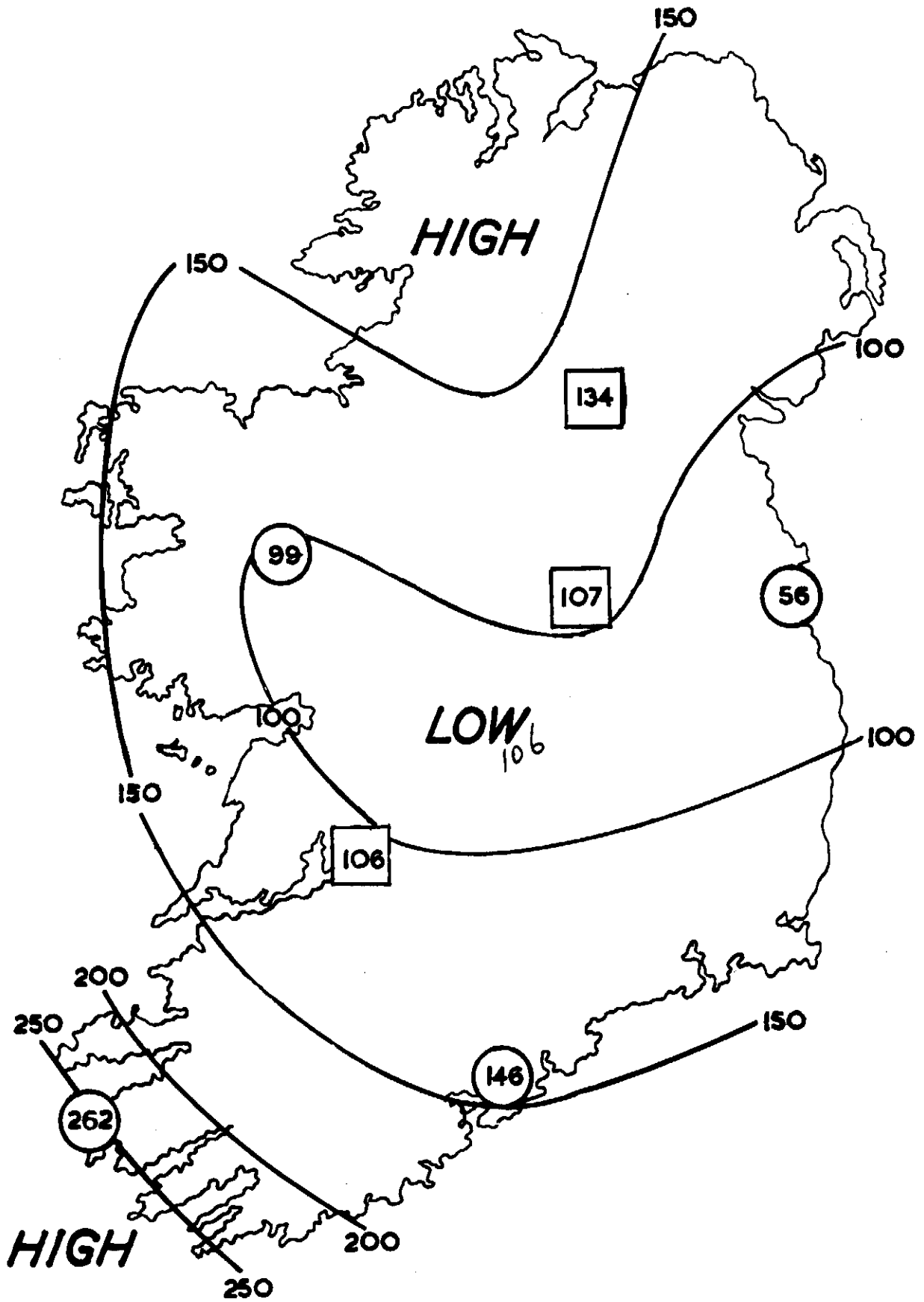
- Garden Outbreaks (all slight)
 - Slight
 - ◐ Moderate
 - Severe
- } Field Outbreaks



AGGREGATE OF EFFECTIVE BLIGHT - WEATHER HOURS IN TEN DAY PERIODS

The columns represent the total number of hours of blight-weather experienced at the seven observing stations in the ten-day periods ending on the date in 1952 shown at the foot of the column

TOTAL NUMBER OF HOURS OF EFFECTIVE BLIGHT WEATHER
(MAY - AUGUST, 1952)



TOTAL RAINFALL MAY - AUGUST 1952

