M.O. 452

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APRIL, 1940

NOTICES

It is requested that Books for Review and Communications for the Editor be addressed to the Director, Meteorological Office, Air Ministry, London, W.C.2, and marked "for Meteorological Magazine".

The responsibility for facts and opinions expressed in the signed articles and letters published in this Magazine rests with their respective authors.

THE METEOROLOGICAL MAGAZINE

M.O. 452

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Vol. 75 APRIL, 1940 No. 891

SNOWFALL IN THE BRITISH ISLES

By Gordon Manley, M.A., M.Sc.

The occurrences of snow or sleet in the British Isles may, broadly, be divided into two types. The first, general snow or sleet lasting for some hours over a considerable area, is likely to occur whenever the temperature of the cold air-supply, in a vigorous depression moving on a southerly track, is sufficiently low. This is most commonly associated with continental-arctic or continental-polar air, and heavy snowfalls from December to mid-March arise, more often than not, in connexion with depressions moving from north-west to south-east or west to east at this season. Hence, in southern Britain, heavy snowfall usually occurs on an east or south-east wind. The warming effect of the North Sea is, however, noteworthy especially in the earlier winter months, when cold rain or sleet often falls in the immediate neighbourhood of the east coast, turning to snow a few miles inland. The warming effect of the Irish Sea is also to be observed close to the east coast of Ireland. It is clear that snowfalls of this type are likely to be heavier and more frequent on the east side of the country, and that even quite small hills are likely to receive a decidedly increased fall for orographic reasons. Further, as Scotland is likely to remain in the cold sector of many depressions crossing England on more northerly tracks, the frequency of " continuous snowfalls " of this type may be expected to increase somewhat with latitude, although at low levels this is

offset to some degree by the greater breadth of the North Sea. In late winter and early spring, however, continuous snowfall may occur in eastern Scotland not only with continental air but also when Arctic-maritime air spreads behind a deepening depression in the North Sea, often with a north-east wind at the surface.

Heavy and continuous snowfall, or sleet-fall, is less common in the west of the British Isles, especially in regions which are orographically sheltered from the east. But one cause of snowfalls—the polar-air depression—is capable, on occasion, of affecting very large areas even in the milder districts (cf. February, 1933, April, 1917 and May, 1935) and the suggestion has been made by Mr. Bonacina (*British Rainfall,* 1936) that there is a tendency for such depressions to develop in these milder western regions of Great Britain. It is clear that no part of these islands is altogether free from the possibility of a heavy fall of snow, although such falls appear to be particularly rare in extreme south-west Ireland, more so than in Cornwall, for example.

Apart from " continuous snowfall " many minor falls of sleet or snow are due to scattered showers on the edge of a depression. Further, the British Isles are very liable to coastal " instability showers " due to the frequency with which cold air reaches us over a warm sea. In maritime-Arctic air these " north-wind showers " are very frequent on all coasts facing north and north-east, especially where the ground rises sharply as in Buchan, East Lothian and Cleveland; and in winter, continental air crossing the North Sea frequently becomes unstable and gives showers on the north-east coasts, while south-east England remains free. Often, indeed, the amount of snow in these showers is quite sufficient to give a persistent cover and the estimates of snow-cover made elsewhere by the present writer (*Q.J. Roy. Met. S.*, January, 1939) allow for this near the coasts. The effect is also notable toward the north coast of north Wales (average at Bidston, 16·2 days with snow; Southport, 10·4). It is chiefly on account of these passing showers that the number of days with snow at low levels

in Scotland is so much greater than in England, although the mean winter temperatures are much the same.

As British winter temperatures are so often between 35° and 40° on low ground, the frequency of snow or sleet, rather than rain, increases sharply with altitude and in late winter even maritime-polar air gives sleet or snow on higher ground in the North. The snow-dusted hills of Galloway or Cumberland, on a bright February morning with a fresh west wind, are very characteristic.

The comparison of observations

Statistics of the number of days of snowfall are among the first to be demanded in temperate climates. In the British Isles, however, records were not widely kept until 1912, since when observers have been instructed to note as " a day with snow," any day on which snow or sleet is observed to fall between midnight and midnight. From 1912 onward an increasingly consistent series of records is available. The widespread provision of aerodromes during and after the last war, with regular meteorological observations, led to a most valuable addition to the somewhat scattered and variable records kept during the first few years 1912–20; further, the continuity of many records was more or less broken during this period.

Records of the frequency of snowfall thus depend primarily upon eye observation and are therefore particularly dependent on the extent to which continuous watch may be kept. The keenest amateur observer may often find himself in difficulty when he has to decide whether a shower which passed during the night, or even during the day in his absence, was of rain or sleet. Elsewhere, especially on the coast, observers may find it difficult to decide whether a slight wintry shower, largely composed of soft hail, should be counted as snow.

With continuous precipitation and a lapse-rate approaching that for saturated air, a pedestrian out-of-doors will probably observe flakes of wet snow visible in the rain when the surface temperature is 37°; but a

motorist is likely to catch sight of some melting flakes on his windscreen with the temperature 38°, and a keen watcher behind the windows of his observatory may do the same. It is easily perceived therefore that numerous occasions will arise when two neighbouring observers at the same level will differ in their decision whether snow is or is not to be recorded. There is, too, the problem of the " occasional flakes " which commonly drift down almost imperceptibly from an overcast sky in cold weather. Such occurrences indeed should be strictly counted towards " a day of snow " according to the definition, but are often likely to be overlooked as " insignificant "; quite a justifiable attitude from the practical standpoint.

For a variety of reasons, therefore, marked differences arise in some years with regard to the total number of days with snow between, for example, a first-class observatory, a neighbouring aerodrome and a third-order climatological station making a single daily observation. Careful analysis and comparison, however, show that a high standard of observation is maintained at such places as lighthouses, aerodromes and " telegraphic " stations. While the standard does not generally rise as high as that maintained at the " first-class observatories " which are able to keep strict account of occasional flakes and the like, we may regard the number of days of snow recorded at such stations as representing, for any given district, the days with significant snow- or sleet-fall which would be generally observed at that level by day and night watchers. This " high standard of observation " has been used in the plotting of the accompanying map. Shorter-period records have been used with some care and adjusted as far as possible to the period 1912–1938. About 155 stations have been used and, while the averages for individual stations may at times differ a little from those given by the map, the difference rarely becomes notable.

Hence, it should be stated that the average number of days with snow recorded at the first-class observatories, and also by at least two amateur observers whose

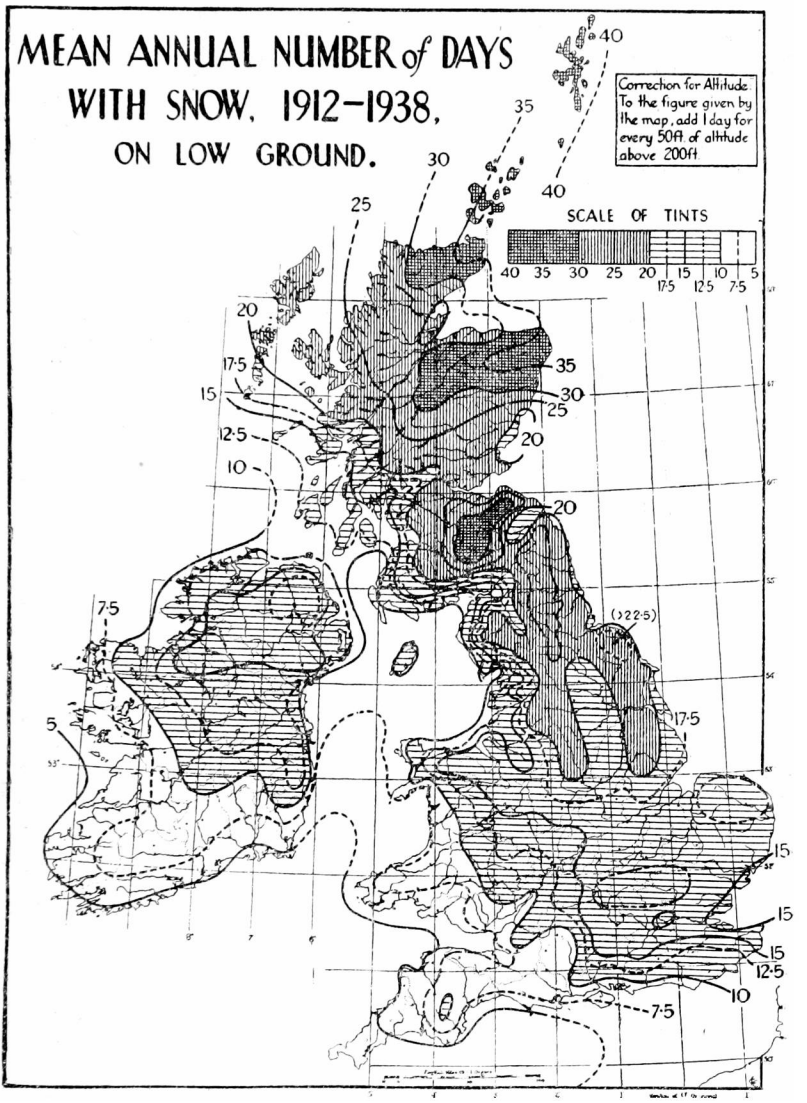

FIG. 1

exceptional keenness is known to the writer, is generally from 10 per cent. to 25 per cent. greater than the figure given by "good standard observation". Similarly, the third-order stations generally, though not invariably, give averages a little below those at neighbouring stations, e.g. lighthouses, at which a night watch is more easily kept.

Broadly therefore the map, which is the first of its

kind for these islands represents, with regard to low ground, the average annual number of days of " significant " or " generally observed " snowfall, including sleet, over the period 1912–1938. It brings out very well the effect of latitude, and of proximity to the colder air-supplies of winter [cf. Scilly 3·5, Stornoway 23·6 days; Valentia 5·4, Felixstowe 12·9 days].

The Altitude Correction, and the Effect of Relief.

It was found that the averages for coastal and lowland stations were in general agreement, up to 200 feet. Above this, analysis of several groups of records at different altitudes in the same district (e.g. valleys in the eastern Pennines) indicated that the annual total of days increased, roughly, by one for every sixty feet of altitude above the sea. The annual total can however be more conveniently reckoned, without serious error, by adding one day for every fifty feet above 200 feet.

All the totals from high-level stations were therefore " corrected to low ground " on this basis.

The map however still shows, when this correction is applied, that certain areas show a decided increase in number of days with snow, quite apart from any question of altitude; this we may very largely attribute to the effect of orography, in giving rise to showers on many days when the lowlands are free. We may instance the rapid rise in the annual total between the Firth of Forth and the Lammermuirs, even without the additional effect of fall of temperature due to altitude. The orographically-sheltered shores of Morecambe Bay are decidedly free from snowfall, while increases are noteworthy on the Lincolnshire Wolds and those of Yorkshire with, again, a well-defined diminution over the southern Vale of York. The greater frequency of " instability showers ", even on low-lying shores, is well shown in north Norfolk. In Scotland the difference between the north of Buchan and the more sheltered Kincardine–Fife coast is paralleled on a smaller scale between north and south Sutherland, and between the Lammermuirs and the Merse.

Some features of the map suggest that passage of air over a long stretch of snowy upland may at times lead to snow being recorded rather than rain at stations immediately in the lee of the upland. It is for example noteworthy that over the same series of years the number of snowy days in Manchester regularly exceeds that at Sealand (20, against 14). This appears also to be borne out by the well-defined increase in the south Midlands as compared with the Fens (Oxford 18, Cambridge 14) and there is some reason to believe that the increase in the south Midlands may be rather greater than the map shows, although records are rather scanty in some areas.

The diminution in the annual totals in inner London is well marked (Camden Square 10, Kensington 11, Kew 15, Greenwich 18, taken to whole numbers). Elsewhere one may note a well-defined decrease in the average annual total on Salisbury Plain when compared with high Hampshire. The lowest totals come from south-west Cornwall where the chance of snow (about 3 days annually) is definitely lower than in either the Channel Isles or any part, so far as we know, of the Irish coast, although nearly approached in extreme south-east Ireland near Waterford. In the far north the rapid increase from Barra to the Shetlands is noteworthy, and in relation to temperature the frequency of snow or sleet in the Shetlands is undoubtedly high, although it lies as a rule for only short periods.

The isopleths for Ireland have in many places been drawn somewhat tentatively in view of the lack of stations. Northern Ireland compares well with south-east England, and there is evidence for a sharp increase in the totals with distance from the sea, near the east coast.

Indeed, the map brings out the effect of several factors and when in addition the altitude correction is applied it is to be observed that the uplands of Banffshire at 1,200 feet may expect snow or sleet in significant amounts on as many as 55 days yearly. The northern Pennine valleys at 1,500 feet may expect between 50 and

55 days, in the highest inhabited region in the British Isles; and the higher farms in Peeblesshire may expect almost as many.

The map may also be correlated with the general impression of " snowiness " which we have with regard to different districts; it appears also to bear out that really heavy falls of snow in our western districts are associated with polar-air depressions moving on abnormal tracks.

Average Monthly Number of Days with Snow.

In the course of this investigation the number of days with snow for each month has been taken out for a certain number of stations. While there is not space here for an extensive discussion, some outstanding features may be mentioned. It is still true that April as a rule gives slightly higher totals than November, while the chance of snow in May is about equal to that in October. January, February and March have in most places nearly equal numbers of days; March however slightly exceeds January and February over the greater part of our eastern coastlands and in Ireland. Inland stations and those to the west and south of hilly districts have commonly a maximum in January or February. There is, however, no marked difference in the figures in most places and we may make the generalisation that, of every twenty days with snow in these islands, one occurs in November, three in December, four in each of the months January—February—March and two in April. One of the remaining two days is also divided between the three months January to March, and one is divided between October and May in most districts, other than the mild south-west.

The problems involved in the cartographical representation of snow-cover in these islands are of another order; the mapping of this element however is also nearing completion. It is hoped that the two maps will serve for some time all those who are interested in this aspect of the British climate.

LETTERS TO THE EDITOR

Upward Discharge of Lightning from Cloud

In the first of the two letters which appeared on page 178 of this Magazine for July, 1939, Mr. C. J. P. Cave asked whether any discharge between a cloud and the upper atmosphere had actually been observed. My friend, Mr. J. A. McHowden, with whom I have been associated for some years in Nigeria in combating the effects of lightning on the transmission lines of an extensive electric power system, informed me on April 21st, 1933, on his arrival from that country, that he had seen such

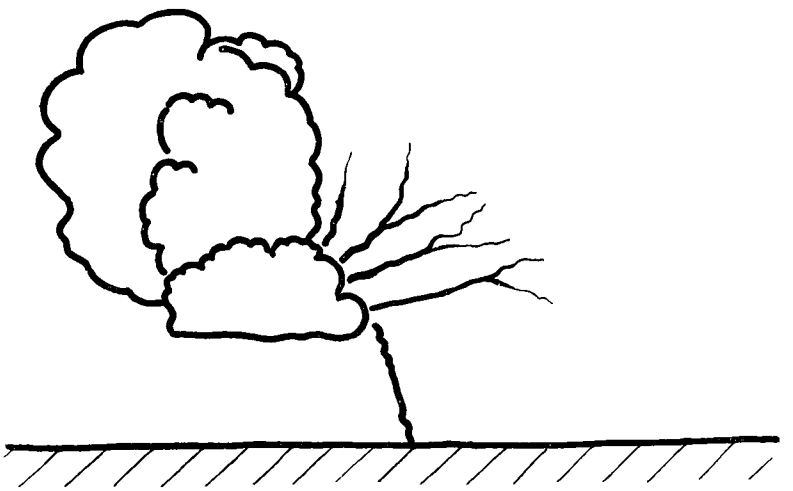

FIG 1

a discharge and made a sketch, which I append. He said that the cloud first discharged an ordinary flash between the cloud and the ground, and two minutes afterwards produced a series of purple flashes, which ended in the clear sky. These events occurred on a bare plateau at 4,000 feet altitude in a season when "tornadoes" are prevalent. These are violent line squalls and herald the wet season.

I may say that I met Mr. McHowden first in 1925 and I arranged with him to keep me informed of any unusual lightning phenomena.

JOHN F. SHIPLEY.

Royal Meteorological Society,
49, Cromwell Road, London, S.W.7.
January 23rd, 1940.

One Aspect of the Great Freeze-up

In the early hours of January 20th, the cold spell tightened with extra vigour to penetrate sixteen inches of soil and so freeze the water in the supply pipes connecting the main to houses in our village. Nature completed her handiwork by laying a thick carpet of snow, which, though protecting the ground somewhat from further frost, also effectively insulated the frost already established below the surface. Days passed without any sign of change in the weather. It was generally agreed that, even if warmer air did come along, the pipes below the surface would remain frozen until the top covering of snow and ice had disappeared. Nature decreed otherwise, however. On January 31st, while the earth still lay under its mantle of snow and the air temperature remained below freezing point, water once again flowed through the pipes underground. What nature was unable to do from above she did from below—for obviously the thaw had crept upwards.

WM. JAMES.

Wyton.
February 10th, 1940.

Sun Pillar and Mock Sun observed at Exeter, Devon

At 6h. 40m. G.M.T. on March 9th, 1940, a fairly well formed sun pillar with mock sun was observed before the sun itself came into view over nearby hills. At the lower end, the pillar appeared to come from behind a lenticular patch of altocumulus and extended through the mock sun, which was about 20° in height and slightly brighter

than the pillar, finally tailing off indefinitely in an area of striated cirrus about 30° above the horizon.

The pillar was faintly yellowish-white in appearance and showed no glittering, while the mock sun was more white and somewhat hazy in outline. No portion of the mock sun ring could be identified. At 6h. 50m. G.M.T. the mock sun had assumed the form of an oval, light patch with the upper portion of the pillar still faintly discernible, while by 6h. 55m. G.M.T. the whole sun, deep red in appearance, had come into view and was rapidly outshining the preceding phenomena.

As a point of interest it may be mentioned that during the early afternoon of the same day, at 13h. 40m. G.M.T. and for some considerable time afterwards, the solar halo of 22° was observed, this showing some development of the inner red coloration.

W. N. LAVIS.

5, Mayfield Road, Heavitree,
Exeter, Devon.
March 9th, 1940.

Fog Bow observed in Sussex

An excellent example of a fog bow was observed at Waldron, East Sussex between 8h. and 8h. 30m. G.M.T. on March 16th, 1940. A faint red and blue coloration was noticed on the outside and inside of the bow respectively. The fog droplets were very plainly visible if viewed against the sun. Visibility at the time was 110 yards and the sky above the fog cloudless. The readings of the dry and wet bulb thermometer at 7h. were respectively 30·8° F. and 30·5° F., relative humidity 97 per cent. The fog cleared at 8h. 40m.

A. E. MOON.

The Furnace, Horam, East Sussex.
March 18th, 1940.

NOTES AND NEWS

Auroral Notes, November 1939 to January 1940.

There was little auroral activity during November and December 1939 but the phenomenon was observed at some Scottish stations on 6 and 8 nights respectively. On none of these occasions was it of more than moderate intensity.

In January aurora was seen on 18 nights, and at several places displays of unusual intensity were reported. On the 1st and 2nd it was seen at four widely separated stations, viz. Wick, Duntuilm in Skye, St. Abbs Head and Peterborough. Mr. G. E. D. Alcock who observed the display at Peterborough on the 1st, noted a greenish glow between northwest and north-east at 17h. 45m. reaching up to 10 degrees of altitude. The aurora brightened considerably throughout the evening and at 22h. the glow was very bright and covered the whole northern sky with a greenish light up to 40 degrees of altitude in the NNW. An auroral band of the same greenish colour was seen at Peterborough in the southeastern sky at 0h. 20m. on January 3rd. The band varied from 3 to 5 degrees in width, and at one time was distinctly bent at one point. Observation ceased at 01h. 15m. At Lerwick, on the 3rd, aurora appeared at 17h. 40m. in the shape of a horseshoe, about 10 degrees in radius and centred 40 degrees above the south horizon. The inner edge was sharp, the outer edge diffuse. There was the semblance of a halo at times until the formation of angles gave it a hexagonal shape. The display, which lasted for nearly three hours, varied considerably in intensity. It was brightest about 20h. 5m. when bands with ray structure appeared in the north-east at an elevation of 10 degrees, and again at 20h. 30m. when there was an active arc with ray structure above the north horizon to an elevation of 10 degrees. Fortrose, Nairn and Edinburgh also reported aurora on the 3rd. A display on the 4th was seen at

Wick, Fortrose, Nairn, St. Abbs Head and Eskdalemuir. Lerwick reported aurora on the 5th and 6th. An auroral glow was seen at Foynes, County Limerick, on the latter evening, and again on the 7th. At Peterborough, on the 9th, a brilliant cone of green light was visible in the east after 21h. 10m. The cone rose to an altitude of 40 degrees. About 22h. it began to fade and retreat northwards and was last seen 45 minutes later. On the 10th aurora was observed at Lerwick, Kirkwall, Wick and Nairn.

On the 11th it was seen at many places in Scotland and as far south as Waddington (Lincolnshire), Peterborough and Foynes. At Waddington, Mr. L. G. Hall observed it at 21h. 15m. when it extended through about 60 degrees of arc. He writes: "The horizon was light; there was a dark horizontal band, with another light band above. This upper light band diffused gradually into the starry sky and the total vertical extent of the aurora was variable, the maximum being, perhaps, 10 degrees of elevation . . . . . By 22h. 15m. the aurora attained maximum brightness and considerable streamer effects were seen. At 22h. 20m. a light swept across the sky from east to west, like a distant line of searchlights coming into operation one at a time. After this, there was considerable variation in intensity and the aurora gradually faded until it became indistinguishable by 01h." At Peterborough, Mr. Alcock observed a very fine display on the northwest horizon at 18h. 15m. The light was of a beautiful golden colour. At 19h. 45m. a brilliant arch of light arose above the horizon, and golden luminous clouds drifted eastwards above it. This maximum brilliancy lasted but a few minutes but the arch remained steady and prominent until 21h. 45m. when there was another outburst; detached clouds and vertical streamers were then visible for some time moving eastwards. It had begun to fade at 23h. 15m. and disappeared rapidly. Mr. F. E. Dixon at Foynes observed the phenomenon at 22h. 5m. as a homogeneous arc, the maximum elevation of the base being 7 degrees. Five minutes later he

noted rays to 20 degrees, chiefly from azimuth 355 degrees to 20 degrees. The arc became faint and faded about 22h. 30m.

Aurora was seen at Lerwick and St. Abbs Head on the 12th. Reports were also received from Lerwick of its occurrence on the 16th, 18th and 24th, from Kirkwall on the 17th, and from Wick, Braemar and Oban on the 18th. Mr. Donald McNaughton observed the display at Oban at 17h. 35m. as a pencil of faint white light dancing in the northern sky. As dusk came on a whole " curtain " of light, pale green in colour, was discerned extending from approximately NW to NNE. The base of this curtain was largely obscured by cloud but appeared to be about 20 degrees above the horizon. It was at its brightest between 17h. 45m. and 18h. 5m. during which time its higher parts assumed a dull brick-red hue. It faded slowly and by 18h. 30m. had almost disappeared. Lerwick also reported very bright and active curtains between north-north-west and east-north-east around 17h. 55m. on that evening. Their elevations varied from 15 to 20 degrees.

At Nairn aurora was observed on the 29th, 30th and 31st. The display on the last night of the month was also seen at Gordonstoun and at Duntuilm in Skye. At the latter place the display appears to have been a brilliant one. Mr. Seton Gordon observed it at 20h. 30m. as a very bright and broad ray of light spanning the heavens from west to east. It was like a searchlight, faintly tinged with red, and quite distinct from the lesser greenish rays which, at the same time, were rising from the northern horizon.

H. E. C.

The freezing of a Tidal River.

The river Parrett at Bridgwater was frozen over for some days in January, 1940. The frost began on January 9th and lasted until the 24th, being most intense on the morning of January 21st. The river tides vary from about 18 feet to about 6 feet at the neap high tide in January. At low tide there may be a good depth of water in a wet time, but on this occasion we only had about 0·16 of rain between January 1st and 24th so that at low tide there was very little water in the river. The freezing commences with nearly circular cakes of ice averaging about a yard across with turned up edges owing to collisions. These float up and down with the tide. Not until the neap tide approaches can these cakes coalesce and the interstices close up. For several days the river in Bridgwater was quite frozen, excepting perhaps for a small pool, possibly kept open by the flocks of black-headed gulls. I am not aware that anyone skated on the river on this occasion as they did in 1895, but people crossed on the ice, and there was a fairly large patch good enough for skating upon. I think it was upon January 23rd that a tide of 10 feet was expected. I understood that the water flowed up under the ice, lifting it and breaking it up, and within a few hours the fragments were again floating up and down with the tide.

The higher tides come up with a Bore of about 18 inches, often with about four breaking waves a few feet apart. The tide then rushes up with great rapidity, with high water in about an hour and a half. However, its force is so great that it " over-shoots the mark " and the level falls about a foot while the tide is still running up-stream, and the fall is quite gradual to low tide.

In 1895 the freezing of the river was about February 18th when bonfires were lit on the ice. The rainfall here for February, 1895 was only 0·16 so that, as on the present occasion, very little water was flowing down the river. There is still a legend that an ox was roasted on the ice. If so, it was before the writer came to Bridgwater

in 1887 and it must have been after the blizzard of January 18th, 1881.

The accompanying photograph which is reproduced by courtesy of Messrs. Basker, shows the ice after the tide had broken it up.

HENRY CORDER.

Mr. J. Durward.

We have pleasure in announcing that Mr. J. Durward has been awarded the Order of Rafidain (4th Class, Civil) by the Iraq Government for services rendered to the country in the development of a meteorological Service.

General Rainfall, March, 1940.

	Per cent.
England and Wales	123
Scotland	118
Ireland	133
British Isles	124

Sunshine, March 1940

The distribution of bright sunshine for the month was as follows:—

	Total hrs.	Diff. from average hrs.		Total hrs.	Diff. from average hrs.
Stornoway	78	−31	Chester	121	+ 7
Aberdeen	107	— 2	Ross-on-Wye	122	+ 6
Dublin	94	−21	Falmouth	142	+ 6
Birr Castle	99	−12	Gorleston	123	− 5
Valentia	119	+ 3	Kew	121	+13

Kew temp., mean, 43.7° F. diff. from average − 0·2° F.

CORRIGENDA

Captain Frankcom referring to his letter on " The Severn Bore " (page 26 in the March number) points out that the time of high water at King Road was at 8h. 36m. G.M.T. *not* 9h. 36m. G.M.T.

Climatological Table for the British Empire, August 1939, page 40.

Sydney N.S.W. Absolute Min. *For* 58 *insert*—
It is hoped to give a correct value later.

Photograph by Messrs. Basker, Bridgwater

THE RIVER PARRETT AT BRIDGWATER, JANUARY, 1940

Facing page 56

REVIEW

One day telleth another, by Stephen and Margaret Ionides, $8\frac{1}{2}$-in. × $5\frac{1}{4}$-in., pp. xii + 324 *illustrations,* London, Edward Arnold & Co., 1939. 10/6 net.

Although this book is not directly concerned with meteorology, it contains a miscellany of pleasantly told facts and anecdotes about seasons, the calendar and related topics not without interest to meteorologists in their leisure hours. As the authors point out in their first chapter, " Time," man's early interest in the seasons and thereby in astronomy arose directly from seasonal changes of weather; it was in effect the first essay in long-range forecasting. But the first attempts went sadly astray because the phases of the errant moon refuse to fit in with the solar year. " In the end the harassed calculators cast the moon out," but other confusions in the calendar, such as the unfair discrimination against February, and the absence of any word other than " day " for the whole period of 24 hours, remain to bother us.

Anyone reading the chapters on the Sun, Moon, Eclipses, etc. will absorb without tears a great deal of sound astronomical information, and the student of climatic changes cannot do without a knowledge of " Precession."

The later chapters of the book give the history of the practical application of astronomy to Navigation and Geography, and its misapplication in Astrology, while the final chapter on Cosmology is an interesting essay on man's progression from mythology to exact knowledge.

The dish is pleasantly garnished with a wealth of historical anecdote, some of it very much to the point, and a final word must be given to the numerous illustrations, including a great wealth of handsome photographic plates.

C.E.P.B.

Rainfall: March, 1940: England and Wales

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Lond'n	Camden Square.....	3·51	192	*Warw*	Alcester, Ragley Hall.	2·10	122
Surrey	Reigate, Wray Pk. Rd.	3·28	140	,,	Birminghm, Edgbaston	1·64	86
Kent	Tenterden, Ashenden.	2·92	130	*Leics*	Thornton Reservoir...	2·14	116
,,	Folkestone, I. Hospital	2·54	..	,,	Belvoir Castle.....	2·09	115
,,	Margate, Cliftonville..	2·54	160	*Rutl'd*	Ridlington	..	..
,,	Edenb'dg.,Falconhurst	3·17	128	*Lincs*	Boston, Skirbeck.....	1·57	101
Sussex	Compton, Compton Ho	4·26	154	,,	Cranwell Aerodrome..	1·69	121
,,	Patching Farm.....	4·13	192	,,	Skegness, Marine Gdns	..	..
,,	Eastbourne, Wil. Sq..	2·85	120	,,	Louth, Westgate.....	1·90	90
Hants	Ventnor, Roy.Nat.Hos.	3·61	176	,,	Brigg, Wrawby St....	1·58	..
,,	Southampton, East Pk	3·20	140	*Notts*	Mansfield, Carr Bank..	1·97	94
,,	Ovington Rectory....	3·19	123	*Derby*	Derby, The Arboretum	3·37	211
,,	Sherborne St. John...	3·08	137	,,	Buxton, Terrace Slopes	3·56	86
Herts	Royston, Therfield Rec	3·09	169	*Ches*	Bidston Obsy.....	2·25	118
Bucks	Slough, Upton.....	2·80	159	*Lancs*	Manchester, Whit. Pk.	2·78	123
Oxford	Oxford, Radcliffe.....	2·54	154	,,	Stonyhurst College...	3·84	104
N'hant	Wellingboro,Swanspool	2·32	130	,,	Southport, Bedford Pk	2·04	91
,,	Oundle	..	..	,,	Ulverston, Poaka Beck	5·12	132
Beds	Woburn, Exptl. Farm.	2·93	170	,,	Morecambe.....	3·59	128
Cambs	Cambridge, Bot. Gdns.	2·94	200	,,	Blackpool.....	2·70	113
,,	March	2·04	129	*Yorks*	Wath-upon-Dearne...	1·56	90
Essex	Shoeburyness.....	2·75	204	,,	Wakefield,Clarence Pk.	2·03	113
,,	Lexden Hill House....	2·75	..	,,	Oughtershaw Hall....	6·10	..
Suff	Haughley House.....	2·72	..	,,	Harrog'te,HarlowMoor	1·93	83
,,	Campsea Ashe, High Ho	2·67	159	,,	Hull, Pearson Park...	1·70	93
,,	Lowestoft Sec. School.	2·78	173	,,	Holme-on-Spalding...	1·82	101
,,	Bury St. Ed.,WestleyH	3·86	204	,,	Felixkirk, Mt. St. John	2·03	103
Norf.	Wells, Holkham Hall.	1·66	102	,,	York, Museum.....	1·75	104
,,	Thetford W. W.....	2·88	..	,,	Scarborough.....	2·01	112
Wilts	Porton, W.D. Exp'lStn	2·52	127	,,	Middlesbrough.....	2·02	129
,,	Bishops Cannings	2·28	101	,,	Baldersdale, Hury Res.	3·67	118
Dorset	Weymouth, Westham.	3·10	150	*Durhm*	Ushaw College.....	1·98	90
,,	Beaminster, East St ..	3·54	121	*Norl'd*	Newcastle, Leazes Pk.	1·91	93
,,	Shaftesbury	2·65	..	,,	Bellingham, Highgreen	4·16	141
Devon	Plymouth, The Hoe...	3·66	126	,,	Lilburn Tower Gdns..	3·26	123
,,	Holne, Church Pk.Cott	5·77	107	*Cumb*	Carlisle, Scaleby Hall.	5·50	224
,,	Teignmouth, Den Gdns	2·44	94	,,	Borrowdale,Seathwaite	15·75	150
,,	Cullompton	2·90	106	,,	Thirlmere,DaleHeadH.	..	..
,,	Sidmouth, U.D.C.....	2·40	..	,,	Keswick, High Hill...	5·76	128
,,	Barnstaple,N. Dev.Ath	2·18	83	,,	Ravenglass, The Grove	4·67	151
,,	Dartm'r,Cranmere P'l	5·50	..	*West*	Appleby, Castle Bank.	2·82	105
,,	Okehampton, Uplands.	4·39	106	*Mon*	Abergavenny, Larchf'd	2·06	68
Cornw	Bude, School House ..	..	..	*Glam*	Ystalyfera, Wern Ho..	5·94	111
,,	Penzance,Morrab Gdns	3·37	105	,,	Treherbert, Tynywaun	8·12	..
,,	St. Austell, Trevarna..	3·91	114	,,	Cardiff, Penylan.....	3·43	109
Soms	Chewton Mendip.....	3·59	101	*Carm*	St. Ann's Head.....	2·88	106
,,	Long Ashton	2·65	105	*Card*	Aberystwyth	3·17	..
,,	Street, Millfield	2·19	109	*Radn'r*	Bir. W. W. Tyrmynydd	4·50	..
Glostr	Blockley	2·09	..	*Mont*	Lake Vyrnwy.....	4·74	..
,,	Cirencester, Gwynfa ..	2·95	128	*Flint*	Sealand Aerodrome...	2·19	127
Here	Ross-on-Wye	1·60	179	*Mer*	Blaenau Festiniog....	9·87	126
,,	Kington, Lynhales....	1·79	73	,,	Dolgelley, Bontddu...	4·39	89
Salop	Church Stretton.....	2·35	..	*Carn*	Llandudno	1·40	69
,,	Shifnal, Hatton Grange	1·44	78	,,	Snowdon, L. Llydaw 9	15·15	..
,,	Cheswardine Hall	2·62	124	*Angl*	Holyhead, Salt Island.	2·05	78
Worc	Malvern, Free Library.	1·54	79	,,	Lligwy.....	2·19	..
,,	Ombersley, Holt Lock.	1·40	82	*I.Man*	Douglas, Boro' Cem...	5·21	176

Rainfall: March, 1940: Scotland and Ireland

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Guern.	St.PeterP't.GrangeRd.	3·51	142	*R&C.*	Stornoway, C.G.Stn...	2·22	57
Wig.	Pt. William, Monreith.	5·11	179	*Suth.*	Lairg.....	2·15	69
,, .	New Luce School.....	6·85	194	,, .	Skerray Borgie.....	3·73	..
Kirk.	Dalry, Glendarroch...	5·04	112	,, .	Melvich.....	3·66	128
Dumf.	Eskdalemuir Obs.....	6·49	132	,, .	Loch More, Achfary..	7·37	114
Roxb.	Hawick, Wolfelee	4·32	129	*Caith.*	Wick.....	1·78	78
,, .	Kelso, Broomlands....	2·76	142	*Orkney*	Kirkwall, Bignold Park	3.41	117
Peebs.	Stobo Castle.....	3·60	124	*Shet.*	Lerwick Observatory.	4·96	157
Berw.	Marchmont House....	3·43	129	*Cork.*	Cork, University Coll.	2·73	91
E.Lot.	North Berwick Res...	2·63	140	,, .	Roches Point, C.G.Stn.	2·96	98
Midl.	Edinburgh, Blackfd. H	2·24	114	,, .	Mallow, Hazlewood ..	2·16	..
Lanark	Auchtyfardle	3·87	..	*Kerry.*	Valentia Observatory.	3·41	75
Ayr.	Kilmarnock, Kay Park	4·59	..	,, .	Gearhameen.....	6·80	84
,, .	Girvan, Pinmore	6·55	174	,, .	Bally McElligott Rec.	3·39	..
,, .	Glen Afton, Ayr San..	..	..	,, .	Darrynane Abbey....	2·92	72
Renf.	Glasgow, Queen's Park	5·01	192	*Wat.*	Waterford, Gortmore.	2·35	86
,, .	Greenock, Prospect H.	5·26	113	*Tip.*	Nenagh, Castle Lough.	2·76	89
Bute.	Rothesay, Ardencraig.	5·13	143	,, .	Cashel, Ballinamona..	2·50	92
,,	Dougarie Lodge.....	4·20	120	*Lim.*	Foynes, Coolnanes....	2·81	95
Argyll	Loch Sunart, G'dale..	6·26	113	,, .	Limerick, Mulgrave St.	2·33	79
,,	Ardgour House	7·94	..	*Clare.*	Inagh, Mount Callan..	5·08	..
,,	Glen Etive	..	..	*Wexf.*	Gorey, Courtown Ho..	2·62	113
,,	Oban.....	4·08	..	*Wick.*	Rathnew, Clonmannon	2·46	..
,,	Poltalloch.....	5·19	135	,, .	Newcastle.....	..	..
,,	Inveraray Castle	5·84	92	*Carlow*	Bagnalstown FenaghH	2·53	104
,,	Islay, Eallabus	4·25	111	,, .	Hacketstown Rectory.	2·45	87
,,	Mull, Benmore.....	8·30	78	*Leix.*	Blandsfort House	2·32	89
,,	Tiree	3·89	116	*Offaly.*	Birr Castle	2·12	88
Kinr.	Loch Leven Sluice....	3·22	108	*Dublin*	Dublin, Phoenix Park.	1·40	72
Fife.	Leuchars Aerodrome..	2·84	146	*Meath.*	Kells, Headfort.....	4·40	160
Perth.	Loch Dhu	7·40	112	*W.M.*	Moate, Coolatore.....	3·16	..
,, .	Crieff, Strathearn Hyd.	4·00	125	,, .	Mullingar, Belvedere..	3·68	136
,, .	Blair Castle Gardens..	2·68	102	*Long.*	Castle Forbes Gdns ..	5.83	198
Angus.	Kettins School.....	2·72	112	*Galway*	Galway, Grammar Sch.	4·65	155
,, .	Pearsie House	2·22	..	,, .	Ballynahinch Castle ..	7·71	151
,, .	Montrose, Sunnyside..	2·70	130	,, .	Ahascragh, Clonbrock.	4·97	149
Aberd.	Balmoral Castle Gdns.	2·26	79	*Rosc.*	Strokestown, C'node..	4·92	178
,, .	Logie Coldstone Sch ..	..	..	*Mayo.*	Blacksod Point	5·14	125
,, .	Aberdeen Observatory.	2·35	98	,, .	Mallaranny.....	8·69	..
,, .	New Deer SchoolHouse	2·38	92	,, .	Westport House.....	7·11	182
Moray	Gordon Castle	3·44	148	,, .	Delphi Lodge.....	12·34	148
,, .	Grantown-on-Spey ...	..	..	*Sligo.*	Markree Castle.....	6·44	186
Nairn.	Nairn.....	2·30	123	*Cavan.*	Crossdoney, Kevit Cas.	5·56	..
Inv's.	Ben Alder Lodge.....	..	..	*Ferm.*	Crom Castle	5·21	168
,, .	Kingussie, The Birches	2·27	..	*Arm'h*	Armagh Obsy.....	3·85	164
,, .	Loch Ness, Foyers....	..	..	*Down.*	Fofanny Reservoir ...	..	..
,, .	Inverness, Culduthel R	1·76	80	,, .	Seaforde	4·46	153
,, .	Loch Quoich, Loan...	..	..	,, .	Donaghadee, C. G. Stn.	4·21	191
,, .	Glenquoich.....	..	..	*Antrim*	Belfast,Queen's Univ .	4·31	169
,, .	Arisaig House	4·89	104	,, .	Aldergrove Aerodrome	4·82	192
,, .	Glenleven, Corrour ...	5·62	97	,, .	Ballymena, Harryville.	5·12	163
,, .	Ft. William, Glasdrum	5·89	..	*Lon.*	Garvagh, Moneydig...	4·24	..
,, .	Skye, Dunvegan	4·65	..	,, .	Londonderry, Creggan.	6·22	194
,, .	Barra, Skallary	3·48	..	*Tyrone*	Omagh, Edenfel.....	4·75	151
R&C.	Tain, Ardlarach.....	1·85	75	*Don.*	Malin Head.....	4·98	172
,, .	Ullapool	3·85	92	,, .	Dunfanaghy	4·67	146
,, .	Achnashellach	5·97	83	,, .	Dunkineely.....	5·00	..

Climatological Table for the British Empire, September, 1939

STATIONS.	PRESSURE.		TEMPERATURE.							Relative Humidity.	Mean Cloud Am'nt	PRECIPITATION.			BRIGHT SUNSHINE.	
			Absolute.		Mean Values.				Mean.							
	Mean of Day M.S.L.	Diff. from Normal.	Max.	Min.	Max.	Min.	½ Max. and Min.	Diff. from Normal.	Wet Bulb.			Am'nt.	Diff. from Normal.	Days.	Hours per day.	Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0–10	in.	in.			
London, Kew Obsy...	1019·9	+ 2·5	77	44	66·2	53·4	59·8	+ 2·5	53·7	87	7·3	0·91	− 0·96	9	5·4	43
Gibraltar.....	1015·2	− 2·0	85	59	75·6	64·9	70·3	− 2·1	63·3	80	4·7	1·47	—	8	9·0	73
Malta.....	1013·5	− 2·8	87	65	80·7	71·1	75·9	− 0·1	70·8	80	5·0	4·68	+ 3.41	10	7·8	63
St. Helena	1019·4	− 0·3	67	53	63·3	55·3	59·3	+ 2·8	56·1	87	9·3	1·10	− 1·08	18	—	—
Freetown, Sierra Leone	1013·4	+ 2·8	86	71	82·7	73·5	78·1	—	72·9	91	8·4	24·86	− 3·62	25	—	—
Lagos, Nigeria	1013·3	+ 1·1	83	65	81·8	71·7	76·7	− 2·0	72·4	91	8·7	0·67	− 4·92	4	4·9	40
Kaduna, Nigeria	1012·2	—	88	63	82·3	65·5	73·9	− 2·0	68·6	94	7·5	15·63	+ 4·13	29	5·7	47
Zomba, Nyasaland....	1014·1	+ 0·5	88	51	79·9	58·7	69·3	− 0·2	61·9	68	4·1	0·16	− 0·18	2	—	—
Salisbury, Rhodesia ..	1016·0	0·0	85	40	76·6	50·2	63·4	− 3·0	53·5	52	2·0	0·24	—	2	9·2	77
Cape Town	1019·4	+ 0·3	90	45	70·1	50·7	60·4	+ 2·5	52·8	76	5·7	1·19	− 1·05	12	—	—
Johannesburg	1019·6	− 0·2	76	29	67·9	45·6	56·7	− 2·7	46·0	49	3·2	0·72	− 0·24	3	9·2	77
Mauritius	1020·2	+ 0·1	83	54	78·1	64·2	71·1	+ 1·0	67·3	70	5·1	1·89	+ 0·49	16	7·3	61
Calcutta, Alipore Obsy.	1004·2	− 0·3	95	76	89·5	78·8	84·1	+ 0·9	79·7	90	7·9	10·85	+ 0·84	17*	—	—
Bombay	1008·6	+ 0·6	87	73	85·3	76·5	80·9	0·0	76·1	85	7·0	5·39	− 5·29	10*	—	—
Madras	1006·9	+ 0·4	101	73	93·5	77·7	85·6	+ 0·4	76·0	76	8·1	5·22	+ 0·37	10*	—	—
Colombo, Ceylon	1010·8	+ 0·9	87	73	85·7	77·1	81·4	+ 0·2	77·1	77	7·3	4·97	+ 0·21	16	7·2	59
Singapore	1010·3	+ 0·5	87	71	84·6	75·1	79·9	− 1·2	76·9	81	8·5	12·25	+ 5·46	17	4·2	35
Hongkong.....	1009·4	+ 1·1	92	69	86·0	77·1	81·5	+ 0·5	75·2	72	5·7	4·87	− 4·82	13	6·2	51
Sandakan	1009·7	—	92	72	88·7	75·1	81·9	+ 0·2	76·5	82	7·7	10·20	+ 0·87	16	—	—
Sydney, N.S.W.....	1018·7	+ 2·6	85	—	67·6	50·0	58·8	− 0·4	51·6	57	4·5	2·91	+ 0·05	8	7·0	59
Melbourne	1017·1	+ 1·3	75	35	63·0	46·3	54·7	+ 0·6	48·9	64	7·0	2·11	− 0·33	14	4·7	40
Adelaide	1021·0	+ 3·5	80	38	65·4	46·6	56·0	− 1·2	50·8	60	6·6	0·88	− 1·20	11	5·9	50
Perth, W.Australia....	1021·8	+ 3·8	87	41	69·0	50·1	59·5	+ 1·3	54·2	64	4·4	0·43	− 2·99	6	8·4	71
Coolgardie																
Brisbane.....	1014·1	− 3·5	84	44	73·8	51·0	62·4	− 2·8	56·0	58	1·3	0·45	− 1·55	3	10·2	86
Hobart, Tasmania....	1009·9	− 1·1	69	34	57·7	41·8	49·7	− 1·3	45·1	67	6·8	3·14	+ 1·07	23	5·9	50
Wellington, N.Z.....	1013·4	− 1·2	62	36	56·3	44·3	50·3	− 1·3	48·1	76	7·6	2·86	− 1·11	11	5·7	48
Suva, Fiji.....	1015·0	+ 0·7	89	61	80·0	68·5	74·3	− 0·2	68·5	78	6·7	6·25	− 1·44	15	5·4	45
Apia, Samoa	1011·9	− 0·3	86	71	83·7	73·9	78·8	+ 0·6	74·9	80	6·8	7·87	+ 2·76	18	6·8	57
Kingston, Jamaica ...	1012·8	+ 0·6	93	72	90·0	74·4	82·2	+ 0·7	72·2	81	4·3	2·82	− 1·21	10	7·6	62
Grenada, W.I.																
Toronto.....	1016·5	− 1·3	92	41	69·8	53·6	61·7	+ 1·4	54·1	86	6·0	2·52	− 0·15	13	5·9	47
Winnipeg	1013·6	− 0·2	87	23	66·0	44·6	55·3	+ 1·6	45·3	88	6·7	1·62	− 0·60	10	6·2	49
St. John, N.B.	1015·3	− 2·1	80	31	63·7	48·8	56·3	+ 0·4	51·7	87	6·7	3·91	+ 0·17	14	5·0	40
Victoria, B.C.....	1016·8	+ 0·4	75	47	65·7	50·4	58·1	+ 2·0	54·5	80	4·5	0·31	− 1·50	5	7·6	60

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

(51324) Wt. 23/26/3717 1,200 4/40 Hw. G. 377/6