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March-May, 1942.

Abnormal Winds at Benson.

The question of katabatic flow off the neighbouring Chiltern Hills has been under review at Benson. Although the results of this survey are by no means complete, one of the views put forward has been to some extent confirmed by recent winds. The case in point is striking enough to deserve early record.

Newnham (Prof. Notes met. Off., London, 1, 1918, No. 2) and Dines (4th report on Wind Structure, Rep. Memor. adv. Comm. Aero., London, 1913, No. 92) have described katabatic flow from the Chilterns in this area. On 'radiation nights' at Benson Observatory House, Newnham obtained anemometer records showing winds from ESE. at forces up to 4. The recording instrument was situated at the mouth of a long valley giving air drainage to a large area of the face of the Chilterns. Such winds were frequent in light gradients, but were absent on many occasions when conditions seemed favourable. Similar anomalous calms are often observed on the modern station.

It has been suggested that some of these absences of katabatic flow occur when a light north-westerly gradient gives an uphill component to the motion of the cooling air. Conversely, a light south-east gradient should aid the downslope drift. It might also push some of the cold air on the plateau surface over the lip of the hills into the Vale of Oxford, thereby increasing the area draining onto Benson.

Night of November 30-December 1, 1941. Conditions on this night were as suggested at the end of the last paragraph. A light southerly gradient covered England (see synoptic chart attached) and as far as could be ascertained by interpolation of the 1027 mb. isobar, the gradient over Benson was 160-170°, 12-15 m.p.h. Pressure was high and uniform over the continent, while gradients were tightening in the south-west as a warm front slowly advanced from the Atlantic. At Larkhill which lay in the direction of the tighter gradient, the wind at 500 m. was 170°, 19 m.p.h. at 0300, G.M.T.

Surface winds were less than 10 m.p.h. everywhere in south England except for the south-west and at two stations at the foot of the Chilterns, Dunstable and Benson.

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Until midnight, Benson's winds were light south-easterly or variable, less than 5 m.p.h. From 0130 until 0715 G.M.T. winds were from between E. by S. and SE. by E., force 4-5, gusty reaching a peak of force 6 (almost double the gradient wind speed) at about 0430 G.M.T., when blackout shutters to windward of the office were blown down by the draught through the chinks in the closed windows. After 0700 G.M.T., despite a tightening gradient, the wind rapidly fell off to force 2.

Similar winds were observed at Dunstable, and nowhere else in the south of England. Since the gradient was so slack and since these stations both lie at the foot of the Chiltern escarpment, katabatic flow from the latter is an obvious inference.

Conditions locally were unfavourable for surface cooling except after 0400 G.M.T., when a sheet of stratocumulus at 3,000 ft. which had covered the area all night broke up into detached rafts of cloud. Extensive breaks had however persisted for some hours to the south-east below 40° elevation. These breaks cannot have laid over the scarp-face area of the Chilterns (to which the drainage area of the valleys converging on Benson is confined on still nights), but it is possible that cooling could have begun early on the plateau top itself. This plateau surface is open arable land, at this season mainly bare plough furrows. Soils are usually very dry, as the chalk subsoil of the Chilterns is highly absorbent. The slope is very gentle towards the south-east and in the absence of any other disturbance, cold air from the plateau should drift gently down this slope until it flows more rapidly into the deep valleys converging on Henley-on-Thames. It has been argued at Benson that, with the very gentle slope of the plateau top, a small gradient from the south-east, while not preventing cooling, may push the body of cooled air upslope, until it spills into the Vale of Oxford. In this manner, the drainage area of the Benson valleys might be greatly increased.

On the night in question, since cooling must have been very restricted in the normal drainage area of Benson, only the above mechanism could operate if indeed the winds experienced were katabatic.

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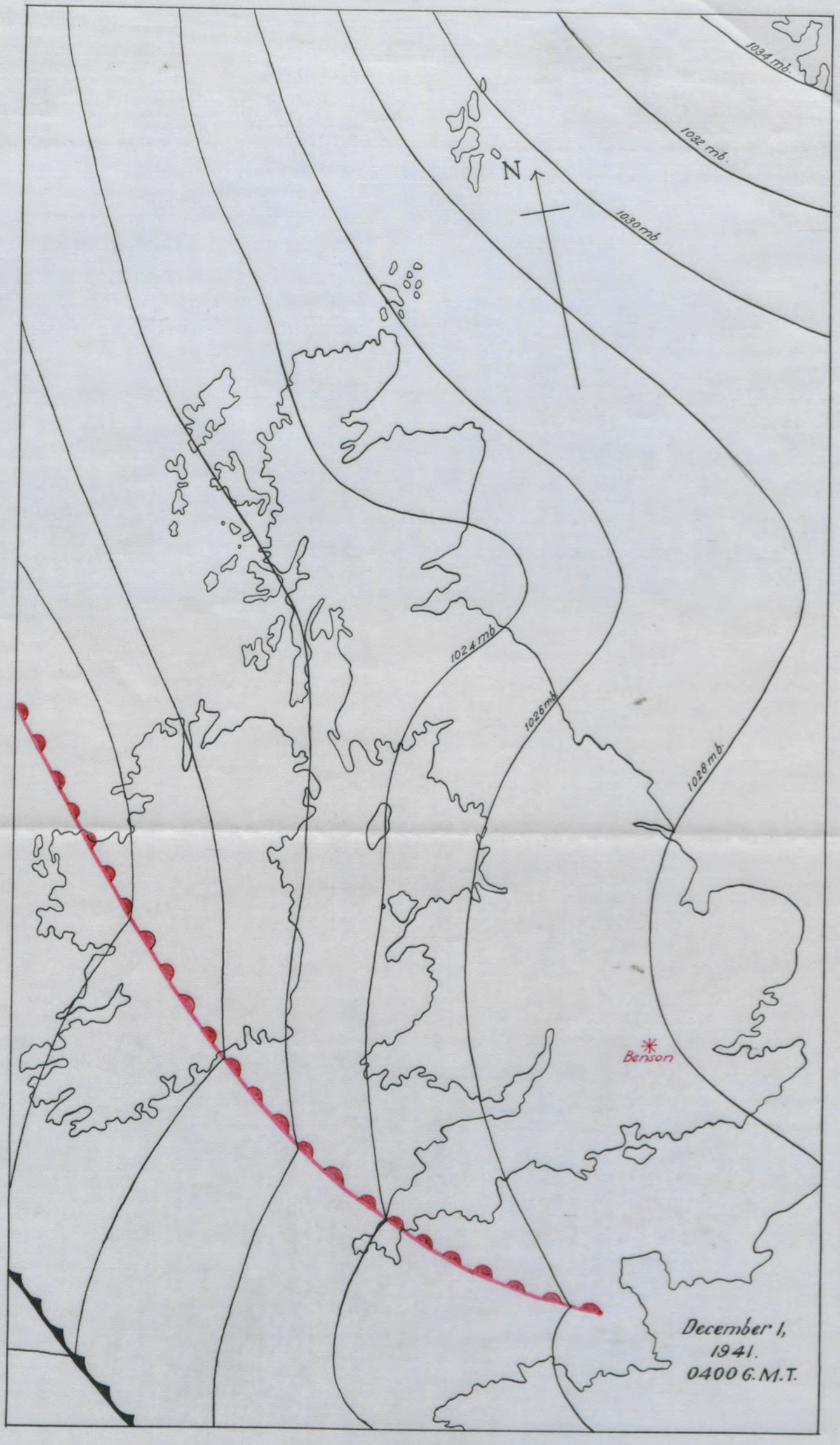
1034 mb.
1032 mb.
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1024 mb
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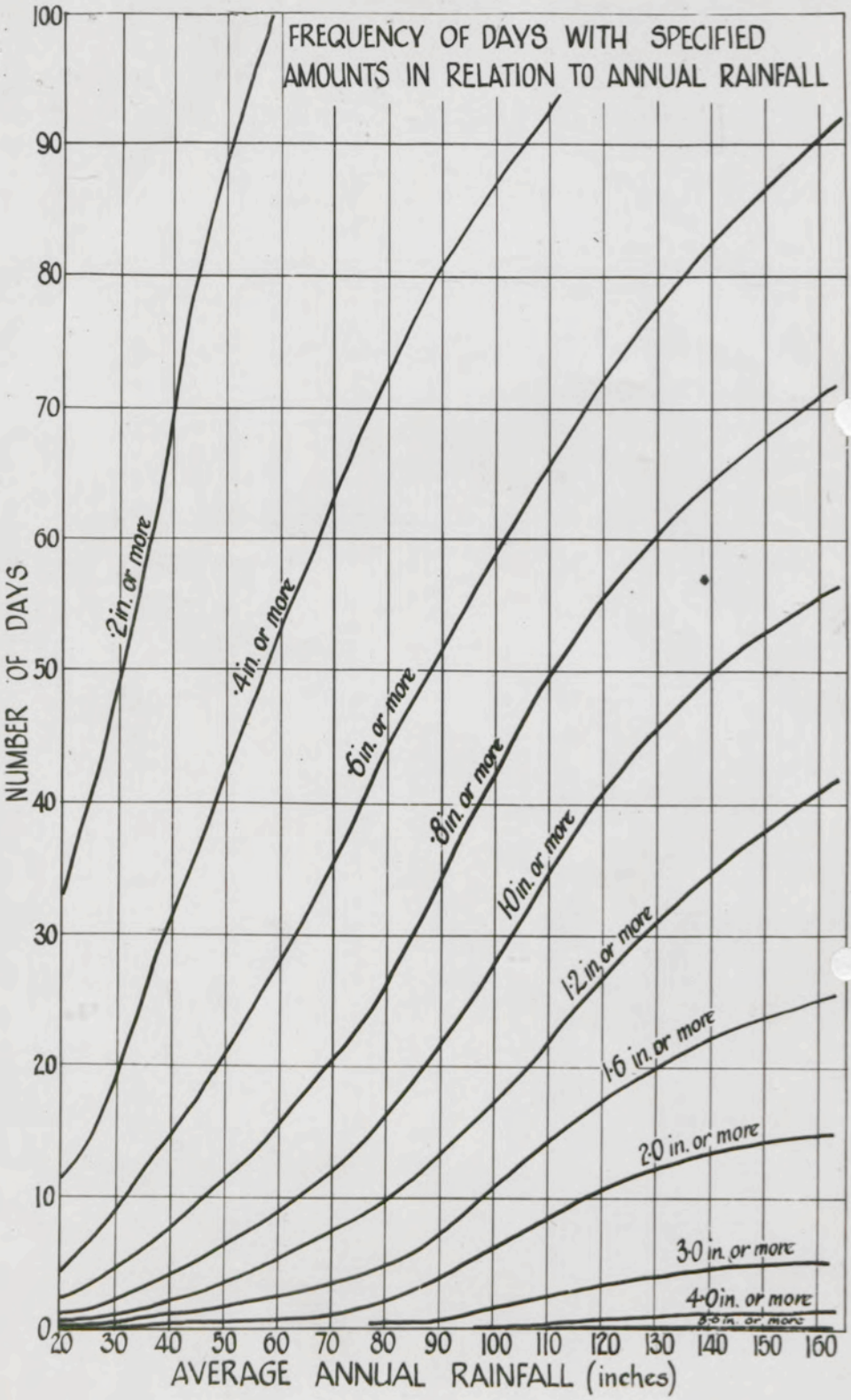
Benson
December 1,
1941.
0400 G.M.T.


FREQUENCY OF DAYS WITH SPECIFIED AMOUNTS IN RELATION TO ANNUAL RAINFALL
NUMBER OF DAYS
AVERAGE ANNUAL RAINFALL (inches)
0
10
20
30
40
50
60
70
80
90
100
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
·2 in. or more
·4 in. or more
·6 in. or more
·8 in. or more
1·0 in. or more
1·2 in. or more
1·6 in. or more
2·0 in. or more
3·0 in. or more
4·0 in. or more
5·0 in. or more

The continued warmth of the air in the Vale, would provide a good density-contrast for the overspilling air. It is notable that the air became drier at Benson during the wind despite a fall of dry bulb.

Temperatures were as follows:-

	2200 G.M.T	0100 G.M.T	0400 G.M.T	0700 G.M.T
Dry Bulb ..	37.6°	37.5°	37.0°	38.5°
Wet Bulb ..	36.0°	35.7°	35.1°	37.0°

The abnormal wind had not begun at 2200 G.M.T., and was slacking at 0700 G.M.T.

Abingdon, 11 miles directly down wind in this abnormal current, experienced light winds throughout the night.

K. HARE.

Frequency of Days with Specified Amounts of Rain.

Statistics of the frequency of days with specified amounts of rain are given in British Rainfall, 1932, pp.273-7 and in Table VII of the Annual Summary of the Monthly Weather Report. These statistics define fairly well the variation in the number of days with a specified amount of rain in the drier parts of the British Isles. In wet districts few records are available but as the number of days depends very largely on the average rainfall an attempt has been made to relate the frequency and the annual rainfall. The result is given in the diagram attached. The diagram is based on the mean frequencies for the wetter stations as mentioned above and on those recently calculated for Ben Nevis Observatory, Dungeon Ghyll (English Lake District) and Fort William. The diagram is given as representing a first approximation to the facts and the calculation of formulae for these curves seems hardly justified until more detailed frequency statistics can be obtained for more stations and longer periods.

J. GLASSPOOLE.

A Statistical Survey of Spells of Wet and Dry Weather at York.

by D.J. Behrens.

D.J. Behrens in a statistical survey of spells of wet and dry weather at York supplies the following table:-

Type of Weather.	No. of Dry Spells.	Duration of dry Spells (recorded)	No. of Depressions	Duration of Depressions	Total Duration.
Between depressions of a family	656	748 days	656	821 days	1,569 days
Between families of depressions	183	718 days	183	229 days	947 days
Anticyclonic	140	961 days	140	175 days	1,136 days
Total ..	979	2,427 days	979	1,225 days	3,652 days

The object of his investigation was to calculate the probability of a dry spell being followed by another dry day or a wet spell by another wet day. The word spell refers to any period of consecutive dry or wet days, however short. Rainfall records for the period January 1, 1930 to December 31, 1939 were used and the set of 3,652 days was divided into wet and dry days. Wet days were taken as those days upon which a fall of 0.04 in. or more precipitation was recorded, dry days were taken as all other days. The rainfall records constituted the whole of the material of the survey. The synoptic records were not available as far back as 1930.

The conclusions drawn from his analysis indicate that the sequence of wet and dry days is by no means random and that there is a sharp rise in the probability of the next day being dry as the number of consecutive previous days known to have been dry rises from 0-4; after which it remains fairly constant, then increasing again to a peak at about fifteen previous consecutive dry days.

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The dry spells were analysed and it was found reasonable to assume that the longer dry spells were due to the presence of anticyclones over the area. The shorter dry spells were assumed to be due to two types of weather, with a Poisson distribution of dry spells in each, as the distribution clearly indicated that there must be more than one fundamental type. These two types of weather were identified with the periods between families of depressions and between depressions of a family.

Mr.Behrens also estimated the average duration of the spells associated with the weather types mentioned above. These are his conclusions:-

(1) The average duration over York of the influence of a depression is 1.04 days, or about 25 hours. (The average recorded duration is about 30 hours, this excess being due to the fact that if any part of a day is wet, then the whole of the day is recorded as a wet day.)

(2) The average duration of the dry period between depressions of a family is about 1.35 days, or 32½ hours. It is highly unusual for such a dry period to be more than double this average. (The average recorded duration is 27½ hours, for the reason explained in (1).)

(3) The average duration of the dry period between families of depressions is 4.13 days. The dry period very seldom lies outside the limits 2 days to 6 days. (The average recorded duration is again 5 hours less than the actual average.)

(4) The average number of depressions in a family is 3.03, (insofar as they affect York).

(5) The average duration of a family of depressions is 5.89 days.

(6) The average duration of an anticyclone over York is 7.08 days.

(7) Very long anticyclones are more probable in spring than at other times of the year.

Flying through an Occlusion.

The crew of an aircraft en route from Wick to Reykjavik on January 21, had a startling experience when flying in an occlusion in position approximately 61°N., 10°W. The aircraft had been flying through rain for an hour and a half, when at about 1015 G.M.T., they were plunged into comparative darkness. Water began pouring into the aircraft and the navigator's compartment was flooded. The crew realised immediately that this was not the normal effect of rain. At the same time the pilot had to ease the control column foreward in order to counteract upcurrents and finally both he and the second pilot had to thrust it forward by force until it was touching the dashboard. This combined effort had the effect of more or less stabilizing the aircraft, but not before it had risen from 1,200 to 1,800 ft.

Southerly

During the upward rush of the aircraft, on what was presumably a waterspout, the pilot noticed that the gyro horizon indicated a dive of at least 60°.

Another aircraft had to fly through the same occlusion on January 21. They had reached position 60°.50'N.,10° 30'W. and had been forced down to 350 ft. by a heavy dark brown cloud when the aircraft was caught in a strong down current. The crew were lifted out of their seats, while the aircraft dropped approximately 300 ft. When the Squadron Commander, who was piloting the aircraft, finally regained control, he found that they were flying barely 50 ft. above sea level.

Meteorological Office,
H.Q. No. 16 Group.

Minor occurrence of Glazed Frost at Exeter, Devon.

At 6h.30m. G.M.T. on Saturday, February 7, 1942, screen temperature was 31°F. and the sky 10 tenths overcast, with light drizzle. A very sparse fall of snow during the night had formed a hard, thin crust on the tops of brick walls, while grass was rough to the touch. Evergreens, birch twigs and particularly laurel leaves were encased in a thin coating of clear ice of approximate thickness 1/32 to 1/16 in.

A thin coating of clear ice was also noted on metal railings but roads and paths were for the most part merely wet. At 7h. G.M.T. the wind was found to be NE., force 1, and drizzle continued until about 8h. G.M.T. being followed by occasional snowflakes.

When the rain-gauge at St.Mark's, Exeter, was visited at 9h. G.M.T. the outside of the gauge facing north was found to be coated with thin clear ice and also the whole of the inside of the funnel, which contained a small quantity of snow.

W.N. LAVIS.
5, Mayfield Road,
Heavitree,
Exeter, Devon.

Snowballs.

Mr.J.R. Brown, editor of the Nautical Magazine, has sent the following letter dated Feb. 2, 1942 :—

"As a matter of interest, could you explain the following? I left my house on Saturday, 7.30 p.m. temperature 32°F., returning at 10.30 p.m. - temperature had risen five or six degrees.

Someone, I thought, was throwing a snowball at me which landed plumb at my feet. I found about twenty or thirty snowballs 500 yards along but discovered they could not be snowballs as they came straight down and made a perfectly round piece of snow about 8 in. in diameter.

Would it be the case that snow could be condensed and drop down? The ceiling was about 1,000 ft., there were barrage balloons about and the snow may have dropped from one of them, but if it did it must have come down at a considerable angle as the balloons were some distance away. The snowballs, or whatever they were, must have come from a height as they fell with a considerable thump."

A suggested explanation is that the "snowballs" were caused by lumps of snow being blown off roofs of buildings and off trees. The rise in temperature would help the snow which had collected there to coagulate and with an increase in wind the snow may have drifted and been blown off in sufficient quantity to form the "snowballs" described.

Another and perhaps more probable explanation is that if snow began rolling down a sloping roof it would collect more snow and might become sufficiently large to form balls. Also it would gain velocity rolling down the roof. This could happen more easily if the snow were in a sticky condition as the rise in temperature suggests it might be.

- Ed. M.M.)

METEOROLOGICAL STATIONS IN SCOTLAND.

A new climatological station has been opened at Longforgan, near Dundee, and regular reports are now received from the observer, Dr. J.H. Brush.

Observations at Montrose (Health Resort Station), which had been suspended in April, 1941 owing to difficulties arising from the war, were resumed in full from November.

The climatological stations at Strathy (Sutherland), Craigston (Hebrides) and Carnoustie (Angus) have closed down owing to war conditions.

Telegraphic reporting stations at Sumburgh R.A.F. and Wick R.A.F. replaced the Coast Guard stations at Lerwick and Wick on September 1, 1941.

OBITUARY.

Sir William Bragg, O.M. who contributed so much to science especially in the field of crystalline analysis and X-ray spectroscopy, died in London on March 12, 1942. He was President of the Royal Society, 1935-40, and Director of the Royal Institution.
