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Editorial

The first number of Volume 72 of the *Meteorological Magazine* appears in a new cover, which has been designed by Mr. E. H. Clarke. The design formerly in use was adopted in February, 1920, the first number to be published by the Meteorological Office. The new design, with its somewhat conventionalised representation of a meteorological station, carries on the tradition begun by G. J. Symons with a representation, on the cover of *Symons's Meteorological Magazine*, of the Observatory on Ben Nevis.

Special Importance of Actinometric and Solar Climatic Investigations in Different Rivieras of the World*

By WLAD. GORCZYNSKI, D.Sc.

Although the name of " Riviera " is common enough and extensively used, we find till now no scientific classification and very few investigations concerning the climatic and other aspects of a Riviera. We need, however, such a classification and methodical study of this important problem, fascinating not only from scientific but also from various practical points of view. First of all we should not forget that there exist several rivieras in different continents of the earth. In addition to the well-known Mediterranean Riviera, we

* This communication was read by the author on September 16th, 1936, at the Oxford meeting of the International Commission of Solar Radiation. See also *The Meteorological Magazine* 71, 1936, pp. 1–5 and 29–33.

find four other important Rivieras, viz.: certain coasts of California and of South America; various portions of the littoral of Chile and perhaps also of Argentina and of Uruguay; of South Africa near Cape Town; and of the corner of south-west Australia.

On the other hand, each of the above-named Rivieras can be conveniently divided into some subdivisions and similar portions. Without entering into the details of the classification, we note that the Mediterranean Riviera is naturally divided into three principal parts, Occidental, Central and Oriental. The same can be said, and certain subdivisions established, for the four big Rivieras situated in other continents.

The condition of the brightness of the sky or sunniness is not sufficient for the attribution of a Riviera climatic type: this climate should be characteristically mild especially during winter. The conditions of sunniness and mildness should be scientifically determined by using some appropriate numerical limits. We shall also notice that a mild type of climate implies not only certain limits for the air-temperature, but also certain conditions of climatic "comfort" relating to the humidity, rain and wind. As a general rule, an efficient protection by surrounding mountains seems to be necessary for a proper Riviera in order to maintain a sufficiently mild climate. Desert and the semi-desert places (even situated on the shores as we see in some parts of North Africa) prove that abundant sunshine alone can not be considered as sufficient condition for a Riviera type of climate.

On the other hand, there exist some sunny climates, particularly in winter, at more elevated places above the sea level, but too rigorous and windy to be classified as a Riviera. Finally there are some climates with a pleasant temperature but so monotonously warm throughout the year, or with so much humidity that the necessary conditions of sufficient climatic comfort are not present.

We see therefore that the problem of a scientific definition and classification of a Riviera is complicated enough and should be methodically examined, discussed and established; this must be done above all from the point of view of actinometry and of climatology: general, medical and local (microclimatic studies). Besides their scientific aspect, the various Rivieras have great economic significance, very important for the general life of humanity, for tourists and residents, for the establishment of sanatoria, especially for actinotherapy, for acclimatizations of plants, and so on.

All this justifies fully and incites still more the organization of special research and measurements in climatic localities. In order to be able to "sell" sunny weather efficiently, as the whole tourist industry endeavours to do, it is necessary to provide a good organization of the material life with some festivals; but in addition, it is important to secure also appropriate studies and measurements proper for the scientific interpretation and comparison of the natural resources of each individual Riviera.

The actual " Rivierology " has hitherto been confined to the issue of illustrated booklets and pamphlets for propaganda ; they contain general information and addresses for practical use, but are designed above all to praise and emphasize the beauty and natural charm of these enchanting places. But, in our modern era, it is no longer considered sufficient to praise, but the people demand to be convinced. It is necessary to prove, by means of special studies and scientific measurements, of what the natural resources and advantages of each climatic station really consist. With this methodical procedure on a scientific basis it would be possible to establish the true character of each locality and even to discover some new particularities of climatic cure perhaps unsuspected till now. It is necessary to create a scientific " Rivierology," based on actinometric studies and on climatological data, but applied also to various practical problems connected with these.

A New Distant Reading Anemometer

By J. S. Dines, M.A.

(*Superintendent of Instruments, Meteorological Office*).

Pressure tube anemometers have, for many years past, been installed at the principal Meteorological Office reporting stations and have admirably fulfilled requirements in giving a continuous record of wind speed and direction. Recently a demand has arisen, principally at aerodromes, for an anemometer in which the head can be placed at a considerable distance from the recording portion. It is very desirable, on an aerodrome, that the recorder should be in the main office block where the chart can be seen by the meteorological officer and the pilots. The anemometer mast, if placed on this building, would be a considerable danger to flying and it is therefore necessary to locate it at some point on the outskirts of the aerodrome which may be half a mile or more from the office block. In the case of the pressure tube anemometer the relative positions of the head and recorder are somewhat strictly controlled by the necessity for leading the pressure and suction given by the head through connecting pipes to the velocity recorder and coupling the vane by a direction rod to the direction recorder. Pressure and suction pipes are now made of 1 in. diameter to provide a free flow of air and avoid damping the movement of the float. These tubes may be 100 ft. long without harm. So far as the writer is aware no tests have been carried out to ascertain the extreme permissible length. It is probable that lengths up to 150 or 200 ft. might be used without serious deterioration of the record but it would be undesirable to place the recorder at a greater distance from the head than this. As regards wind direction, it is found in practice best to mount the vane immediately above the recorder so that a straight direction rod can be used to couple the two. It would be possible, by the introduction of bevel gears, to take the movement round corners but the practical limitations to this are obvious. The normal pressure tube anemometer cannot therefore be made to fulfil the functions of a distant reading anemometer, and when the need for such arose a few years ago the Instruments Division of the Meteorological Office was asked to design a suitable instrument. The conditions to be fulfilled were as follows :—

(1) A record of velocity and direction must be given in which not only the mean wind is shown but also the gusts and lulls and momentary changes in direction.

(2) The records of velocity and direction should be on the same chart, one above the other, in order that striking features in the one record can readily be correlated with those in the other.

(3) In addition it was felt that it would be advantageous if the instrument could be designed to use the same chart as the normal pressure tube recorder. Anemometer records in addition to meeting the immediate operational needs on the aerodrome are subsequently analysed for statistical purposes and if the records of the distant reading anemometer could be made identical with those of the normal recorder, the statistical data obtained from the two instruments would be strictly comparable and further, the same tabulating scales could be used for carrying out the analysis.

A survey of the existing literature was first made to see if there were any instruments already on the market which fulfilled the required conditions or could readily be made to do so. This search was fruitless ; it did not appear that any existing instrument fulfilled condition (1) above in a satisfactory manner even if (2) and (3) were neglected. It therefore became necessary to attack the problem *de novo*. The recording at a distance of wind velocity and direction forms two independent problems. A satisfactory solution for direction was arrived at first and a description of the direction recorder will therefore be given first. In the course of the inquiry the matter was discussed with the Superintendent of the Admiralty Research Laboratory who pointed out that electrical units are available which, when suitably connected, have the property of turning in phase with each other. These units are in general appearance not unlike direct current dynamos though the windings are of a special character. If a pair of units are taken and the two armatures are fed with alternating current from the same source while the field windings are suitably connected together by three wires, any angular rotation given to one armature will be accurately reproduced by the other. The units are made in this country by the British Thomson-Houston Company under the name of "Selsyn Units." It is clear that if sufficient turning moment is given to operate a standard M.O. pattern twin-pen direction recorder, these Selsyn units would solve the problem of recording wind direction at a distance. All that would be

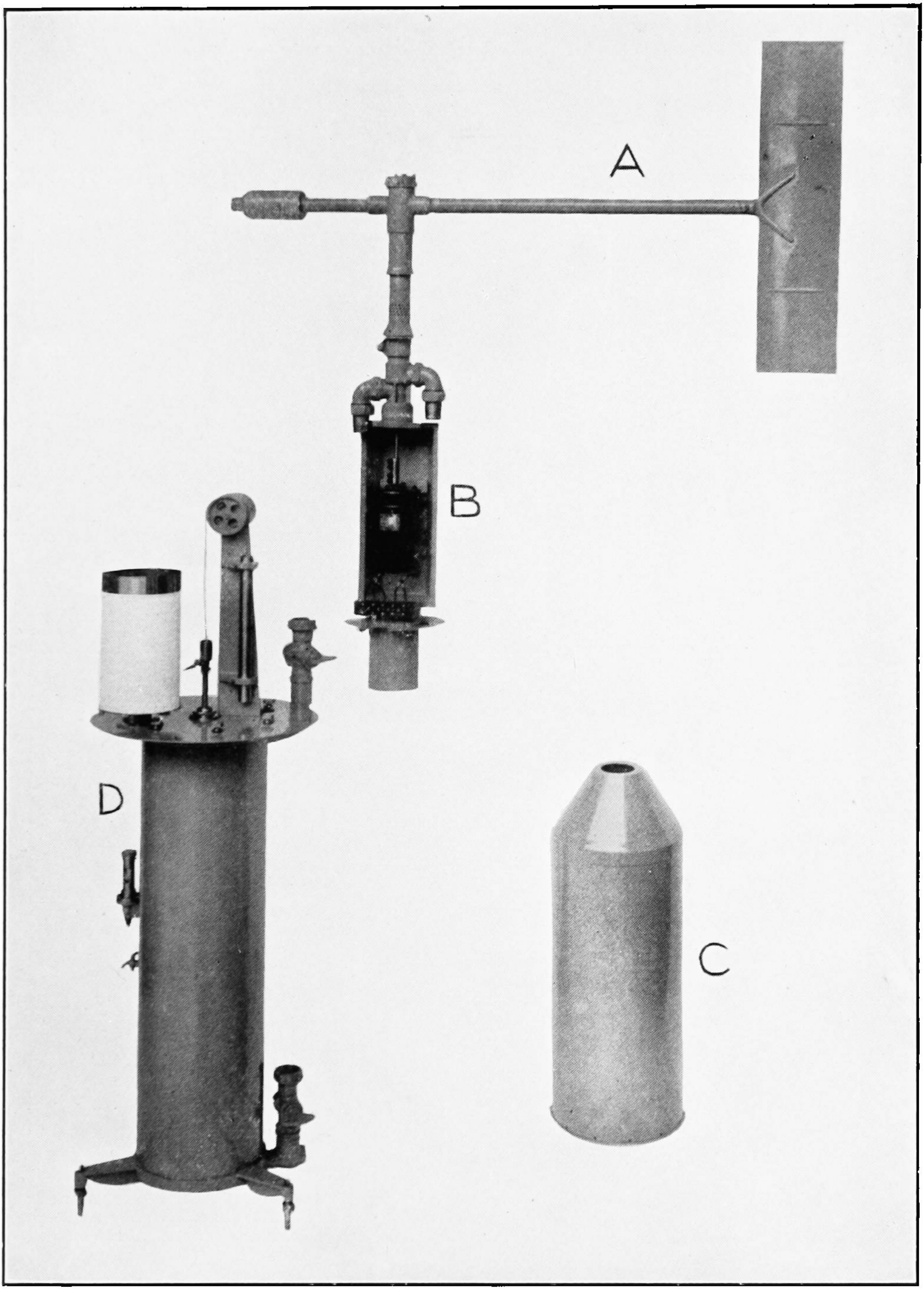


FIG 1

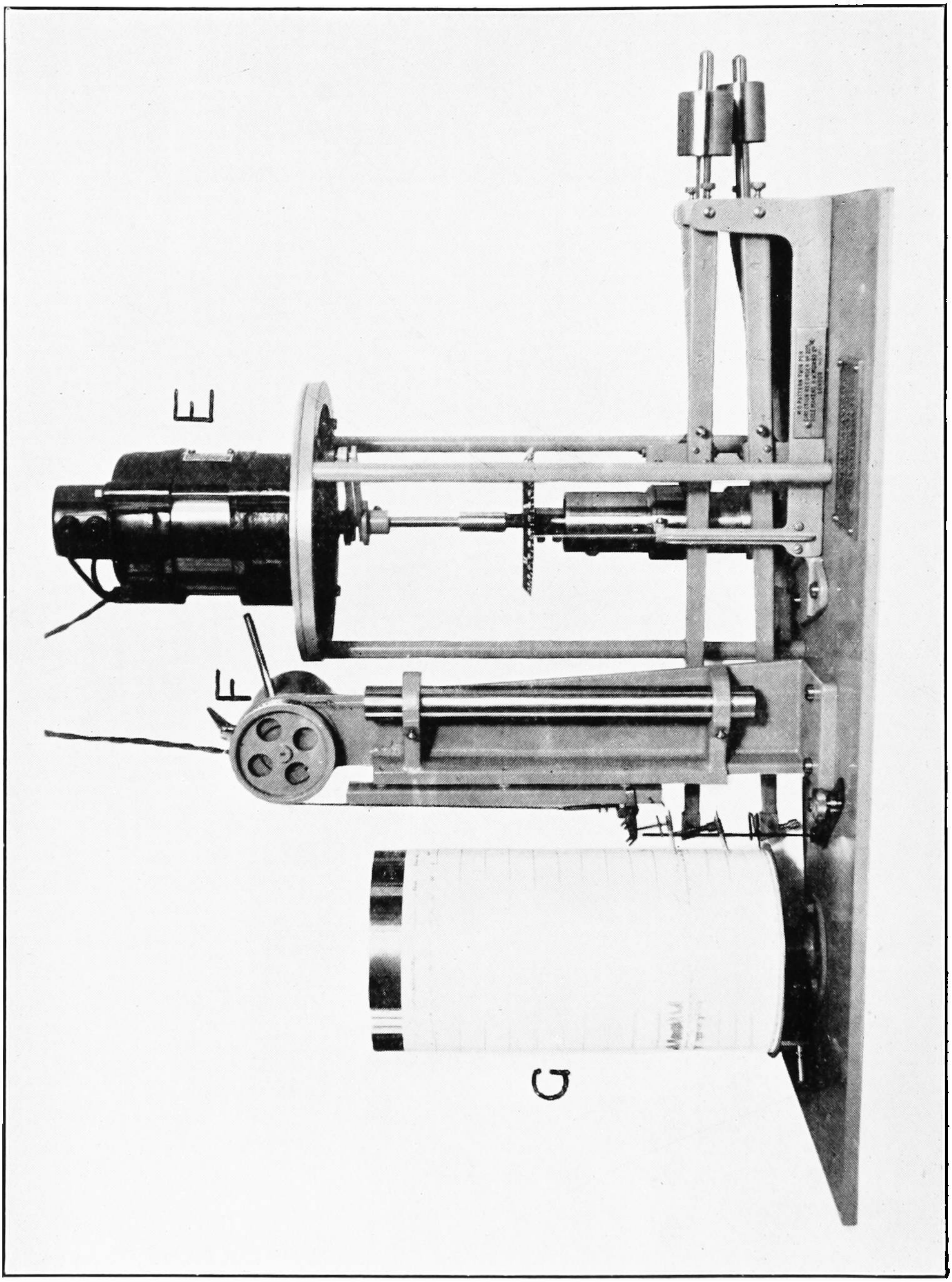


FIG. 2

necessary would be to mount one unit beneath the vane, coupling the armature direct to the vane, while the second unit would be mounted above the direction recorder to which it would be coupled through a suitable universal joint. The chief doubt about the effectiveness of this method concerned the adequacy of the turning moment given by the Selsyn units. In the initial installation, therefore, the largest size of unit was purchased and fitted to a direction recorder and after some preliminary trials in the Meteorological Office the equipment was installed at Cranwell aerodrome, the recorder being mounted 1,200 yards from the head. This instrument proved to be completely successful and has now been running for more than a year without trouble. The design has therefore been incorporated in the Meteorological Office pattern of distant reading anemometer. Experience at Cranwell showed that the turning moment given by the large size Selsyn units was more than adequate to drive the direction recorder. These large units use considerably more current than the smaller sizes and it was therefore decided to use a smaller unit in future instruments. Fig. 1 shows the lay-out now adopted. A standard Meteorological Office type streamline vane A is mounted on a special housing which contains the Selsyn unit B, to which it is connected by a short direction rod. The Selsyn unit is protected from the weather by the shield C which is identical with the standard conical shield fitted to pressure tube anemometers except that it is extended a few inches at the bottom. Fig. 2 shows the recording mechanism where E is the second Selsyn unit mounted immediately above the M.O. pattern twin-pen direction recorder The only important departure from standard in this recorder lies in the mounting of the helix which is modified to reduce the turning resistance to a minimum. The rotating parts are also lightened to reduce inertia forces. High tension alternating current at 220 volts is fed to each of the two Selsyns from the mains while three wires are used to connect the two sets of field windings. These connecting wires can be a mile or more in length without introducing any hindrance to the working of the Selsyns.

While the tests were being carried out at Cranwell on the direction recorder, experiments were also being conducted with a velocity recorder but it was found that this did not meet the requirements laid down above and a fresh solution had to be sought. If it were possible to obtain units similar to the Selsyn units but of smaller size and light construction, a ready solution for the velocity recorder might be obtained in the following manner. One unit would be mounted above the standard pressure tube velocity recorder and coupled to the float rod by a light chain passing over a pulley mounted on the Selsyn spindle. A linear movement of the float would then be transformed to an angular rotation of the armature of the Selsyn unit. A similar arrangement on a second unit at the other end of the line would reconvert the angular movement to a linear movement of the pen. It is essential that the units should be of light construction as the force moving the pressure tube float in light winds is extremely small and the inertia of a heavy Selsyn unit would prevent an accurate record being obtained of the gusts in these circumstances. Unfortunately, Selsyn units are not at present made in this country which are light enough to meet the requirements but it was learned on inquiry that much lighter units are obtainable in the United States under the trade name " Autosyn ". A pair of these units was purchased and a trial instrument which was made up in the Meteorological Office workshop proved so successful that it was decided to adopt this type of transmission for velocity as well as direction. The method of construction will be clear from Figs. 1 and 2. Fig. 1 shows the pressure tube recorder D, termed the velocity control unit, with a light chain from the pen rod running over a pulley about $2\frac{1}{2}$ in. in diameter attached to the spindle of the Autosyn unit, a small balance weight hanging from the opposite side of the pulley serving to keep the chain in tension. This balance weight is protected by a tube and is not visible in the photograph. The second unit is shown in Fig. 2 at F on the left of the Selsyn which drives the direction recorder. A light pen carriage is supported by a chain from a pulley identical with that mounted on the first unit and an adjustable balance weight hung from the other side of the pulley counteracts the weight of the pin carriage. These Autosyn units require alternating current at 32 volts and a small transformer is therefore needed to transform down the voltage from the mains. The field windings require three connecting wires as in the case of the Selsyns. The clock drum G fitted to the electrical anemometer is identical with that used on normal pressure tube recorders. The complete recorder has now been running on the roof of the Meteorological Office at South Kensington for some time satisfactorily. The design of the velocity recorder has not been subjected to as thorough a test as that of the direction recorder for the reason already stated, but there is no reason to doubt that it will be equally successful. A satisfactory solution both for velocity and direction has therefore been reached and it will be noted that all three of the conditions laid down above as essential or desirable have been fulfilled. The record given reproduces gusts and lulls and momentary changes in direction. Velocity and direction are recorded on the same chart and this chart is identical with that used for the normal pressure tube recorder. A record obtained from the instrument is reproduced in the lower part of Fig. 3.

A question may naturally be asked as to the accuracy of the records. In the case of velocity the question can easily be answered. A clock drum and recording pen can be fitted to the velocity control unit D. The resistance to turning of the Autosyn units is so slight that the movement of the pen will not be hindered and this record

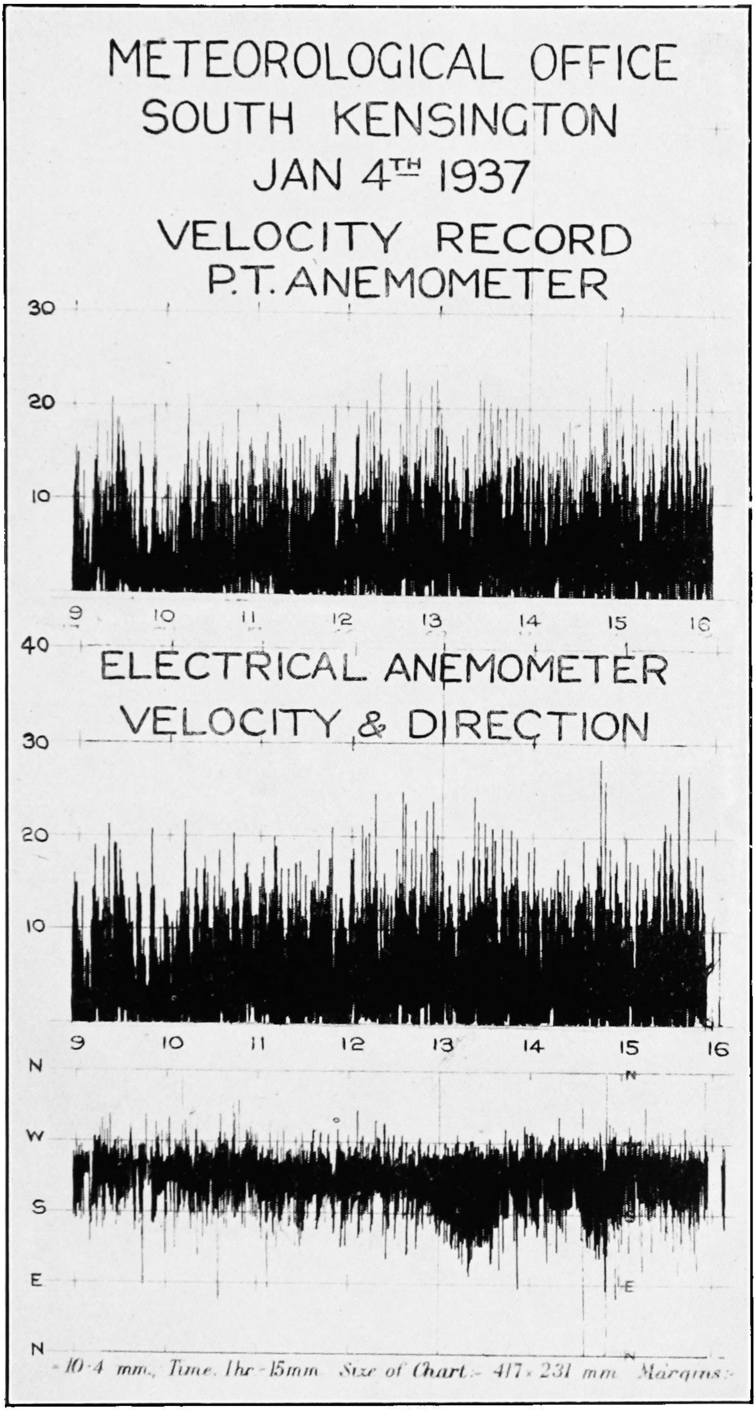
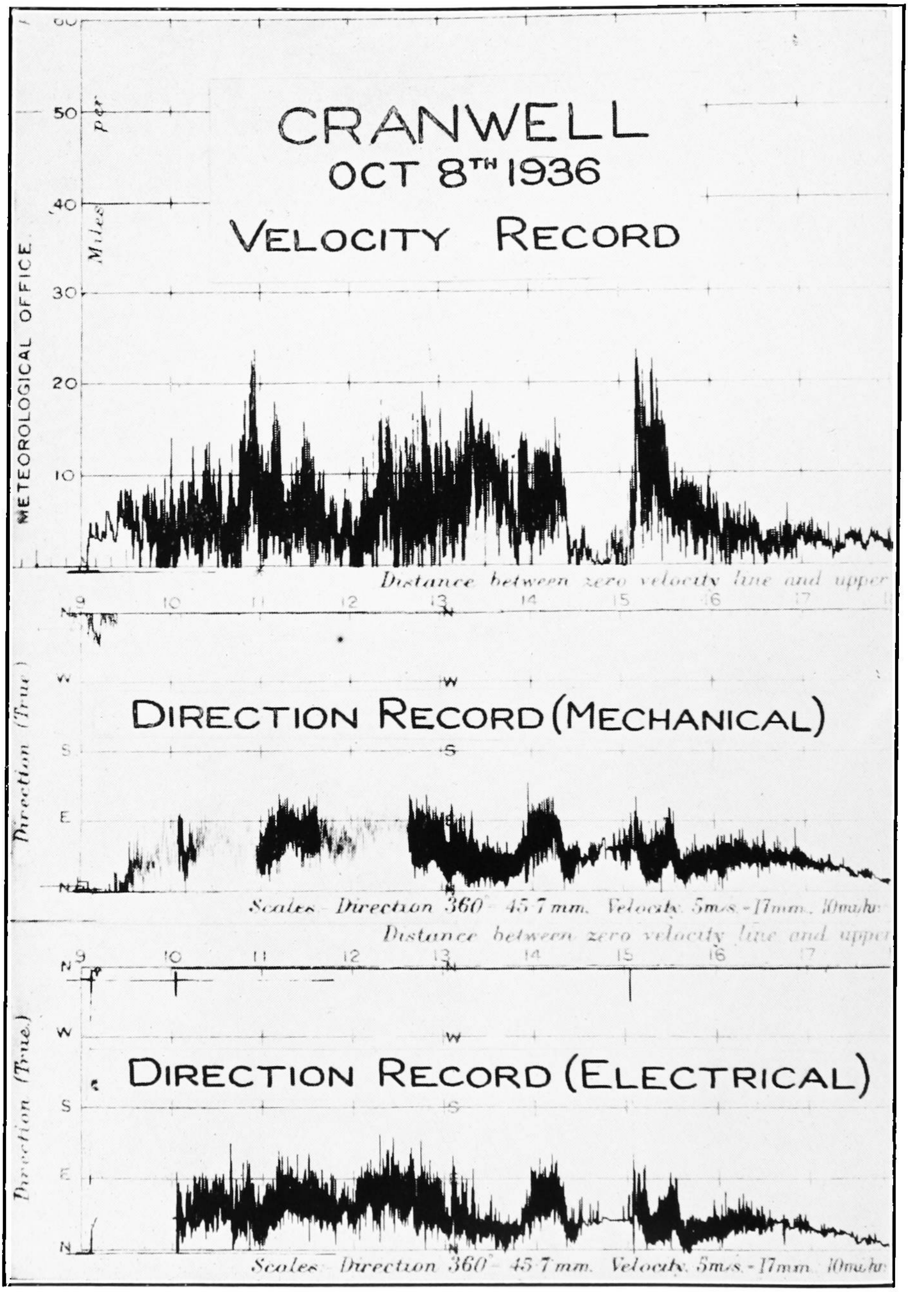

METEOROLOGICAL OFFICE
SOUTH KENSINGTON
JAN 4TH 1937
VELOCITY RECORD
P.T. ANEMOMETER
30
20
10
9
10
11
12
13
14
15
16
40
ELECTRICAL ANEMOMETER
VELOCITY & DIRECTION
30
20
10
9
10
11
12
13
14
15
16
N
W
S
E
N

FIG. 3



CRANWELL
OCT 8TH 1936
VELOCITY RECORD
METEOROLOGICAL OFFICE
Miles per
50
40
30
20
10
Distance between zero velocity line and upper
9
10
11
12
13
14
15
16
17
N
W
S
E
DIRECTION RECORD (MECHANICAL)
Direction (True)
Scales Direction 360° 45·7 mm. Velocity 5m/s.=17mm. 10mi/hr
Distance between zero velocity line and upper
DIRECTION RECORD (ELECTRICAL)
Direction (True.)
Scales Direction 360° 45·7 mm. Velocity 5m/s.=17mm. 10mi/hr

FIG. 4

will be identical with that given by a normal pressure tube recorder. If, therefore, the record is compared with the record given at the other end of the line by the distant reading anemometer, the errors introduced by the distant reading gear can be assessed. Errors may arise from two causes.

(*a*) Any slight lack of accuracy with which one Autosyn unit follows the other under static conditions, and

(*b*) Inertia effects which will be specially pronounced in gusty winds when the float is moving up and down rapidly.

The errors under (*a*) can readily be tested by moving the float of the control unit D up in steps of 10 m.p.h. and noting how closely the pen of the recording unit F follows each step. The error was found not to exceed 1 m.p.h. at any part of the scale. Over the lower parts of the scale up to 50 m.p.h. the error did not exceed 0·3 m.p.h. To assess the value of errors arising under (*b*), charts taken on the roof of the Meteorological Office were measured up. The electrical recorder was here mounted close to the head and velocity control unit, but experience at Cranwell shows that the interposition of long connecting wires does not affect the working of Selsyn units and there is no reason why it should affect the Autosyn units. The Meteorological Office is surrounded on most sides by buildings higher than itself so that the exposure is extremely bad and a very gusty record is obtained, the vane in some cases boxing the compass frequently. When the wind is west the exposure gives a very gusty record but the vane does not box the compass. With a wind of average strength of about 10–15 m.p.h. the gusts in this case rise to 30–35 m.p.h. In these circumstances the gusts at the two ends of the line are found not to differ by more than about 1 m.p.h. when the calibration error mentioned under (*a*) above has been allowed for. The accuracy of reproduction may be judged by comparison of the two velocity records shown in Fig. 3 which were taken in a moderate SW. wind. At the time these records were taken there was a small error in adjustment which caused the electrical recorder to read 1 m.p.h. higher than the pressure tube at 20–30 m.p.h. under static conditions and this error is clearly seen by comparing the gusts shown in the two records. With a strong S. wind the vane boxes the compass frequently and the velocity pen on one occasion was making rapid excursions from zero to 40 m.p.h. Such a record would never be obtained in any normal exposure but even in this case the gusts at the recording end did not show an overrun exceeding 2 m.p.h. The same method of direct comparison cannot be adopted for wind direction as it is not possible to mount a twin-pen direction recorder below the wind vane when this is coupled to a Selsyn unit. At Cranwell the distant reading anemometer head was mounted alongside the standard pressure tube recorder and direct comparison could be made between the records obtained from the two instruments. On days when the wind was fairly steady in direction the agreement was excellent. On gusty days when the vanes were swinging through 90° or more, the electrical recorder magnified some of the excursions of the pen by ten or twenty degrees but the general character of the record is well reproduced, as will be seen from Fig. 4, in which a pair of direction records from Cranwell are shown. Owing to the fact that it was decided to use smaller Selsyn units in recorders made subsequently to that in use at Cranwell and also to lighten the rotating parts, the results obtained at Cranwell cannot be taken as necessarily applicable to the new instrument but it is believed that the electrical recorder will lead to no serious distortion of the movement of the vane as recorded on the chart.

When the anemometer is set up at a station the control portion needs connecting to the recording portion by a number of wires. The number required depends upon whether electrical energy is available at both ends of the line or at one end only. In the latter case a pair of wires will be needed to convey the alternating current to the remote end, two sets of three wires to connect the field windings of the Selsyn and Autosyn units and in addition a telephone circuit is desirable to enable an operator at one end to speak to the operator at the other end when adjustments are being made. A total of 10 wires is therefore required. If alternating current is available at both ends this number can be reduced to 8.

No attempt has been made here to give a detailed description of the instrument. It is felt that detailed drawings and a close specification would be out of place in the pages of the *Meteorological Magazine*. These have, however, been prepared in the Meteorological Office and are available for consultation by anyone who is seriously interested in the design.

The Weather of 1936 in the Northern Pennines

Data from the station at Moor House (1,840 ft.) in Upper Teesdale covering the years 1932–5 have been published in earlier issues of this magazine* and in the *Quarterly Journal of the Royal Meteorological Society* for 1936. The averages of temperature for the year 1936 are given in Table I together with the extremes and dates of occurrence for each month and the rainfall.

During the year "snow lay," that is, snow covered more than half the surrounding country at the level of the station, on about 93 days, of which about 20, 29, 20 and 10 days occurred in the months January to April respectively: "snow lying" was also reported on June 1st, on two days in October and about 11 days in December. Drifts of course were to be found here and there over much longer periods. The heavy drifting fall of February 28th–29th,

* Vol. 68, 1933, p. 180, and Vol. 67, 1932, p. 206.

was noteworthy; the Teesdale–Alston road was only dug out sufficiently to allow the passage of cars ten days later, as digging was necessary for about five miles and for long distances the snow was six feet deep.

TABLE I

	Mean °F.	Mean Max. °F.	Mean Min. °F.	Extremes and dates °F.	°F.	Rainfall in.
Jan.	31·8	34·3	29·3	46 (9)	16 (14, 15)	8·71
Feb.	30·1	34·3	25·9	41 (18)	14 (4, 12)	2·80
Mar.	36·5	39·6	33·4	52 (23, 24)	25 (16)	4·45
Apr.	35·6	41·9	29·3	54 (27)	18 (21)	1·96
May	44·4	52·4	36·4	65 (16)	30 (sev.)	1·57
June	49·8	57·7	41·9	74 (21)	31 (2)	4·06
July	51·4	56·6	46·2	68 (6)	40 (22)	9·93
Aug.	54·3	60·7	47·9	71 (28)	41 (7, 27)	4·34
Sept.	51·7	56·7	46·6	65 (sev.)	34 (28, 29)	8·33
Oct.	42·2	47·9	36·5	57 (4)	29 (sev.)	7·79
Nov.	37·5	41·9	33·1	54 (21)	26 (25)	9·32
Dec.	34·5	38·3	30·7	45 (17)	11 (7)	9·24
Year	41·7	46·9	36·4	74 (21. vi)	11 (7. xii)	72·50

Temperatures showed no outstanding extremes, but again it is clear that the greatest extremes of cold are most likely to occur following a burst of arctic air. Minimum temperatures of 16° F. on January 14th, and 14° F. on February 4th, occurred under these conditions, at the beginning of cold spells; and the lowest temperature of the year, 11° F. on December 7th, occurred with the axis of a wedge of high pressure just to the west of northern England, again following a burst of arctic air and at the beginning of a week of temperatures rather below normal. The anticyclonic spell in November, however, which was marked by so much fog in the lowlands, gave mild sunny weather on the high moors, with a remarkable maximum temperature of 54° F. on November 21st, associated with the subsidence of particularly warm air above an inversion; this was commented on in this magazine for December, 1936, p. 254. On this day the range of temperature at Moor House was 54° F. to 30° F., compared with 46° F. to 27° F. at Durham Observatory. In contrast, the low maxima associated with cloudy north-easterly weather when rain or snow is falling are noteworthy; the maximum temperature on April 13th was only 32° F., and for the twelve successive days, April 11th–22nd, the highest temperature reached was 40° F.; again, on June 3rd, the maximum was only 39° F., on a day of persistent cold rain from the north-east.

Rainfall for the year amounted to 72·5 in.; February, April and May were dry; the last week of August and the first few days of

October gave the only other dry periods. The gauge is read weekly. July gave nearly ten inches of rain, and was a particularly cloudy and cool month. Indeed, temperature only rose above 68° F. on six days in 1936, as compared with an average of 17 days in the three previous years.

G. MANLEY.

OFFICIAL PUBLICATION

The following publication has recently been issued :—

PROFESSIONAL NOTES

No. 74. *A comparison of the records of two anemometers at different heights at Southport.* By W. C. Kaye, B.Sc. (M.O. 336n.)

This publication gives the results of the comparison of wind velocities recorded at two different heights, 59 feet and 42 feet above ground, at Southport (Lancashire). Higher velocities were always recorded by the instrument at the greater height, but the rates of the two velocities were found to vary with the direction of the wind, the strength of the wind, the season of the year and the hour of the day. The average values showed, on the whole, good agreement with the result derived from the formula, due to Hellmann, used in the Meteorological Office for reducing wind velocities to a standard height.

Discussions at the Meteorological Office

The subjects for discussion for the next two meetings are—

February 22nd, 1937. *The evaporation of water from plane and cylindrical surfaces.* By R. W. Powell and E. Griffiths. (London, Trans. Instn. chem. Engrs., 13, 1935, pp. 175–98.) *Opener*—Mr. E. Ll. Davies, M.Sc.

March 8th, 1937. *Weather forecasting by analysis of meteorological charts.* By J. van Mieghem. (Institut Belge de Recherches Radio-scientifiques, Vol. 6 ; Paris, 1936.) (In French.) *Opener*—Mr. C. V. Ockenden, B.Sc.

Royal Meteorological Society

The Annual General Meeting of this Society was held on Wednesday, January 20th, at 49, Cromwell Road, South Kensington. Dr. F. J. W. Whipple, F.Inst.P., President, was in the Chair.

The Report of the Council for 1936 was read and adopted, and the Council for 1937 duly elected, Dr. Whipple being re-elected President.

The Buchan Prize, which is awarded biennially for papers contributed to the Society's publications during a period of five years, was presented to Mr. Charles Sumner Durst, B.A.

Dr. F. J. W. Whipple delivered an address on " Kew Observatory and the development of meteorological instruments in the nineteenth century ", of which the following is an abstract :—

Kew Observatory has been a centre for scientific research since 1842 when the use of the building was granted by the Crown to the British Association. The first Superintendent, Francis Ronalds, designed apparatus for the investigation of atmospheric electricity and was a pioneer in the application of photography to recording meteorological elements. Under his successors, John Welsh and Balfour Stewart, the photographic apparatus was perfected. Beckley's anemograph and recording rain-gauge were also developed. The records of sets of meteorological instruments were skilfully combined by Galton in the charts published by the Meteorological Office in the *Quarterly Weather Report* wherein the sequence of weather at seven observatories was displayed. The work of Kew Observatory as a standardizing institution was also of great importance to meteorologists.

Correspondence

To the Editor, *Meteorological Magazine*

Deficiency of Rain on the Caledonian Canal

It has recently come to my notice that there was an exceptional deficiency of rainfall along the Caledonian Canal during the first six months of 1936.

I do not think attention has previously been called to this fact, which is well illustrated by the accompanying data for the two stations, Fort Augustus and Fort William.

By the end of	Fort Augustus.			Fort William.		
	Total Rainfall.	Deviation from Average.	Percentage of Average.	Total Rainfall.	Deviation from Average.	Percentage of Average.
	mm.	mm.	%	mm.	mm.	%
January ...	47	−90	34	82	−160	34
February ...	84	−159	35	158	−271	37
March ...	125	−211	37	237	−359	40
April ...	156	−245	39	298	−410	42
May ...	181	−281	39	351	−454	44
June ...	206	−308	40	415	−478	46

It will be seen that at the end of June the deficiency amounted to 60 per cent of the average at Fort Augustus and to 54 per cent at Fort William. A decided deficiency was general in northern Scotland, the rainfall for the six months amounting to only 53 per cent of the average at Stornoway.

P. S. HALL.

Woodlands, Farnborough, Hants, January 22nd, 1937.

Wet Harvests in North Wales

As we have recently passed through a very unfavourable harvest period in this district, particularly as far as hay was concerned, the following details of a similar but worse occurrence in 1816 may be of interest.

The reference occurs on page 8 of *Cwm Eithin* by Hugh Evans (Y Brython Press, Liverpool, 1933). Cwm Eithin is in the mountains of Denbighshire, and I give some of the remarks, translated into English. " Great famine and want occurred in the district during the Napoleonic Wars, which was increased by a number of bad harvests. The dearth reached its height in 1816 in north Wales, when at Cwm Eithin only three or four dry days were experienced from the beginning of May to the end of October. It was impossible to dry the corn, or bake it, as it was like dough or clay." Thus the chief trouble was not the crops failing to grow, but the difficulty in harvesting them. This year in Denbighshire the trouble, though not nearly so bad, was due to similar causes. Hay was being carted not far from here after October 1st, this year.

The wet harvest of 1816 is also mentioned in *Gwaith Walter Davies, Gwallter Mechain* (Carmarthen, 1868).

S. E. ASHMORE.

Llannerch Gardens, St. Asaph, Flintshire, December 25th, 1936.

Aeroplane Struck by Lightning

On January 13th, 1937, SU–ABN (Capt. Jackson) of Misr Airlines Cairo was struck by lightning 8 miles north-west of Nazareth. The pilot reports that the cloud which he was near and from which the flash emanated did not appear particularly dangerous ; rain was falling from it and it was of anvil shape, but it was of no great depth and seemed quite unimportant as compared with the towering cumulus and cumulo-nimbus which were in the vicinity.

The flash was forked and of blue or violet colour ; one portion passed in front of the machine and the other struck the fixed aerial post over the roof of the control cabin. There was a loud bang but no damage was done as the wireless aerial was wound in and the set earthed.

The compass is believed to have swung violently in an anti-clockwise direction at the time although this is not certain. On being tested next day it was found to have developed errors of $\pm 28°$.

J. DURWARD.

Airport, Baghdad, January 16th, 1937.

Saline Deposit by Strong Winds

With reference to Mr. Ashmore's interesting letter in the January number of this magazine I should like to mention that a few days after the great mid-September gale in 1935 I went down to Ditchling, Sussex, at the foot of the South Downs. The foliage of many magnificent oaks and other trees was completely " scorched " in a manner that had clearly nothing to do with the encroachment of autumn. Although the situation is protected from direct sea winds by the wall of the South Downs, it is extremely probable that spray was carried over the escarpment by this south-westerly tempest. Since, however, a slight degree of " scorching " was also noticed far inland around London (as at Hampstead) it may be that another factor operates in severe summer gales—desiccation of the leaves through excessive evaporation, at any rate if there is not much accompanying rainfall. Nevertheless this does not rule out the possible effect of salt far inland, for I believe that sea-salt has been detected in exposed situations after severe storms right in the interior of England.

L. C. W. BONACINA.

15, *Christchurch Road, London, N.W.2, January 26th,* 1937.

Wind Circulation around the Meteorological Station, Catterick October 15th, 1936

In order to follow the movements of air in eddies formed in the neighbourhood of obstacles, it was decided that a suitable mode of approach could be made by using " thistledown," which at this time of the year is in fair abundance. When the down attached to each seed is suitably spread out the rate of fall in quiescent air is particularly small, the down taking at times as much as 10 seconds to fall 4 ft. The weight of down attached to each seed is particularly small, so that it was thought that such small weights with a slow rate of descent would indicate very small movements in the air. One, placed near the main pipe leading to the radiator, indicated every time in a marked manner the convection current associated with the pipe. Within the office they have indicated very small wind currents from windows and doors which have been shut.

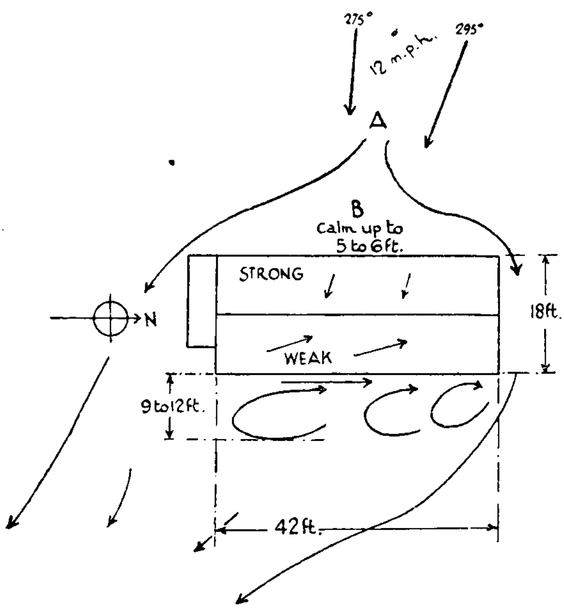


FIG. 1.—SECTION IN PLAN

It was decided to attempt with thistledown an examination of the wind currents in the neighbourhood of the meteorological station. The wind velocity, read from the Dines anemometer at a height of 45 ft. above the surface, was 12–14 m.p.h. from between 275° and 295°. The down was released from numerous positions around the meteorological office, and the resultant flow is indicated in the Figs. 1 and 2, both in plan and in vertical section.

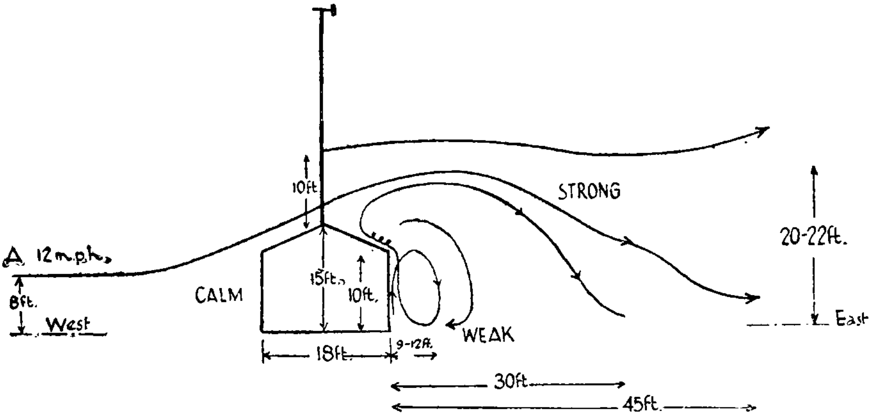


FIG. 2.—VERTICAL SECTION

Down released at the point "A" at a height of 6 ft., in general, went laterally around the office but at a little higher height; with my arm stretched upwards, they went in general over the roof and descended nearly to the earth about 30 to 40 ft. on the leeside. Down released at " B," even up to about 6 ft., usually fell to earth a few feet away, indicating very little air movement. On the roof to windward there was a strong wind, the down being carried rapidly away at first, reaching its highest point about 9 to 12 ft. to leeward of the wall and then descending to earth 30 to 45 ft. to leeward. The highest point reached was about 6 ft. above the ridge, the descent from the highest point to the ground being made in about 4 seconds. Down released on the roof to leeward indicated a weak wind from south to north mainly, but it usually advanced towards the ridge, and was carried quickly away eastwards to descend to earth 9 to 12 ft. to leeward. The weak southerly wind on the leeward roof was corroborated by cigarette smoke near the slates.

One trajectory to leeward was remarkable and is indicated in Figs. 3 and 4.

On the lee side of the building the wind was southerly with a marked vertical component near the wall, but north-westerly with a marked downward component 9 to 12 ft. from the wall.

Down released from the anemometer mast, 10 ft. above the ridge, seem to be unaffected by the building, for they had little downward or upward components, seeming to partake in the general flow. Below this point they were brought down to earth at various distances, usually well beyond 30 ft. to leeward.

Between 9 and 45 ft. from the wall to leeward there was definitely a downward current, the speed timed from its fall from the highest point to earth being 5 ft./sec. If we deduct from this the speed of

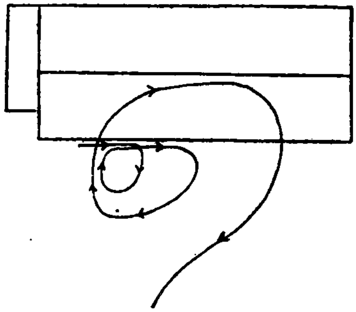


FIG. 3.—TRAJECTORY TO LEEWARD (PLAN)

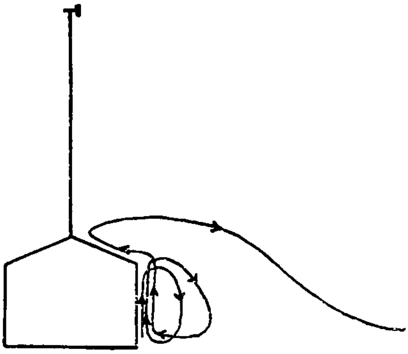


FIG. 4.—TRAJECTORY TO LEEWARD (VERTICAL)

fall of the down in quiescent air, which, with the ones used, was certainly not as great as 1 ft./sec., 4 ft./sec. gives a fair measure of the downward velocities occurring.

At times it became difficult to follow the down owing to the white background of cloud, and when the wind later increased, accompanied by much cloud, no further observations were possible.

W. R. MORGANS.

Mr. Joseph Baxendell and the Fernley Observatory

In June last Mr. Joseph Baxendell retired from the post of Borough Meteorologist to the Corporation of Southport, a position which he had occupied since 1887. As Borough Meteorologist, Mr. Baxendell was Superintendent of the Fernley Observatory, a post formerly held by his father. The name of Baxendell is thus inseparably connected with the history of the Fernley Observatory, that is to say with the history of a meteorological enterprise unique of its kind. The retiring superintendent guided its fortunes for nearly half a century and his relinquishment of that responsibility is an event which calls for more than ordinary notice.

The Fernley Observatory takes its name from Mr. John Fernley, J.P., a retired cotton spinner. Mr. Fernley had been impressed with certain favourable peculiarities of the climate of the Lancashire coast and he decided to establish and give to the Corporation of Southport a model meteorological station, to be located in Hesketh Park. This was done in the summer of 1871 and it was arranged that the first superintendent of the new Fernley Observatory should be Mr. Joseph Baxendell (later F.R.S.), who was then Time-determining Astronomer and Waterworks Meteorologist to the Southport Corporation. The elder Baxendell was a distinguished astronomer, well known as an observer and discoverer of variable stars. His wife was the sister of Norman R. Pogson, C.I.E., for many years Government Astronomer at Madras, and almost as active an investigator of variable stars as Baxendell himself. Their son, the subject of the present notice, was born in 1869 at Crumpsall, now a part of Manchester. He was a delicate child and was precluded by ill-health from being educated at any public school or college. His education was therefore undertaken by his parents and one or two friends. It is not surprising in the circumstances that young Baxendell's training had a strongly scientific trend and that he soon became interested in his father's astronomical and meteorological work. On account of his weak health he found it necessary to abandon his efforts to continue the astronomical observational work and he devoted himself to meteorology. His work in this direction bore early fruit, for on the death of his father in 1887, Joseph Baxendell was appointed to be his successor as Superintendent of the Fernley Observatory on the recommendation of Sir Henry Roscoe, backed by the support of the Town Clerk and the Medical Officer of Health of Southport. Thus the delicate youth of eighteen entered upon the duties which he performed with great distinction for nearly 50 years.

Mr. Baxendell's interest in periodicities was stimulated at a very early age by the work of his father and uncle on variable stars, and it is of interest to note that he had found the periodicity of 5·1 years in Lancashire rainfall even before the death of his father. His subsequent work on the confirmation of this periodicity, and on the investigation of other meteorological periodicities is too well known to need reiteration here. His other statistical investigations included valuable work on the land and sea breezes of Southport and on the association of rainfall with wind direction, summaries of which are to be found in recent annual reports of the Fernley Observatory. As a result of Baxendell's great interest in the details of local climatology we possess certain data for Southport which could only be evaluated for other observatories by a most laborious analysis.

Mr. Baxendell also made important contributions to meteorology as a designer of instruments. The best known of his achievements in this sphere are his "anemoscope," or wind-direction recorder, and the Fernley recording rain-gauge which he designed in co-operation with James Halliwell. The Baxendell anemoscope is still the most satisfactory form of wind-direction recorder which we possess and it was used in the Cardington investigation of wind structure* where it was more important to record the wind direction with great accuracy than to have the records of velocity and direction on one sheet. Mr. Baxendell also designed a "combined head" to actuate both a Dines velocity recorder and a direction recorder

* See *London, Geophys. Mem.* 6, No. 54, 1932.

through a single mast, and he was among the first to recognise the importance of using pipes of wide diameter to transmit the pressure and suction from the Dines head to the recorder. He was responsible, in addition, for the design of several other instruments, and a number of improvements to standard instruments have resulted from his suggestions.

During the later years of his service Mr. Baxendell devoted much thought and labour to the problem of remedying a defect in the Southport meteorological records which had gradually become more serious with the passing of the years. This was the deterioration of the site in Hesketh Park by the growth of trees. Finally, he was able to secure the establishment of a new observing station in Bedford Road Park, Birkdale, where, so far as it is humanly possible to foresee, the exposure of the instruments will remain unimpaired in perpetuity.

Those of us who have had the privilege of working in association with Mr. Baxendell have learnt to regard him as a wise counsellor, ready at all times to place his great knowledge and experience at our disposal. To such a man, retirement from an official appointment can never mean the relinquishment of interest in the work to which he has devoted his life. We wish him many years of pleasant leisure in which to add to the services which he has already rendered with unstinted zeal to the science of meteorology.

E. G. BILHAM.

The Floods in the United States

During the last half of January the Ohio River rose in a flood which proved to be the highest in living memory. The latter months of 1936 were abnormally rainy, the fall for September to December inclusive being nearly 1½ times the average in the valley of the Ohio and the Mississippi above Memphis. At the end of the year the ground was in a waterlogged condition, and during most of January, 1937 the heavy rain continued, so that by the 18th many fields in the Ohio valley were inundated. From that date the situation rapidly became serious. On January 21st the Little Miami and Ohio rivers broke through the levees at Cincinnati and flooded a large area, and by the 26th the level of the Ohio at that city was 80 ft., exceeding by 9 ft. the previous record of 71·1 ft. which occurred in 1883. Cincinnati was without drinking water, a serious fire was raging due to the igniting of floating petrol, and an outbreak of typhoid was feared. Other cities were in similar difficulties and on January 27th it was estimated that a million people were homeless.

By January 29th the floods in the Mississippi were rising rapidly in their turn. Cairo, at the junction of the Ohio and Mississippi, was isolated, and on the last day of the month the water level stood at 59½ ft., 3 ft. higher than in the great Mississippi flood of 1927. The levees all along the river have been reinforced since that date however, and additional protection was being added at all danger points. Early in February the level at Cairo was beginning to fall, and the engineers were confident that the great cities further down the river would be saved.

REVIEWS

The climate of the Gulf of St. Lawrence and surrounding regions in Canada and Newfoundland, as it affects aviation. By W. E. Knowles Middleton. Canadian Meteorological Memoirs, Vol. I, No. 1. Size $9\frac{3}{4}$ in. × $6\frac{1}{2}$ in., pp. 40. *Illus.* Ottawa, 1935.

It is significant of the close relationship which exists between progress in aviation and in meteorology that the first issue of a new series of memoirs to be published by the Meteorological Service of Canada should be concerned with the climate of Newfoundland and adjacent areas from the aviation standpoint. Hitherto this region has attracted the attention of the general climatologist almost exclusively on account of the juxtaposition there of the Gulf Stream and the cold Labrador current, with which is associated a high frequency of sea fogs in spring and summer. By reason, however, of the importance which Newfoundland has now assumed in connexion with the development of regular trans-Atlantic air services, the publication of a summary of our present knowledge of the somewhat wider aspects of its climatology is particularly welcome.

The author, who has some personal knowledge of the regions concerned, regards his memoir as consisting primarily of 13 diagrams, 27 charts and 12 tables, but these are supplemented by useful discussions of the individual elements, i.e., pressure and winds, temperature, thunderstorms, snow, fog, and cloud. Twenty of the charts depict wind roses, which are available for 6 well-distributed stations and are exhibited for the heights :—surface, 500, 1,000, 2,000 and 3,000 metres, with one chart per season for each height. The observations on which the upper wind roses are based cover, in most cases, the three years 1929–31 and were originally instituted to provide data for use in connexion with trans-Atlantic airship routes. The actual number of observations on which each individual wind rose is based might, however, with advantage, have appeared on the charts. The scale to which the surface roses are drawn appears, incidentally, to be 1 mm. = 4 per cent and not 5 per cent as stated on p.4 of the memoir. These charts demonstrate forcibly the predominance of westerly upper winds at all heights and seasons.

Since a considerable part of the text and tables of the memoir is concerned with fog it is to be regretted that the statistics regarding this element cannot be regarded as satisfactory. Not only are occasions of bad visibility due to snow or other obscurity sometimes included with those of true fog and designated by the comprehensive, though unfortunate, title of "thick weather," but no mention is made of the limit of horizontal visibility which has been adopted by the observers in reporting fog. When the present reviewer was recently studying the meteorology of Newfoundland in some detail it was clearly revealed that observations of fog at Newfoundland stations had not been made on a uniform basis, and the need for the provision of reliable visibility data conforming to international standards accordingly became very obvious. It is, for instance, extremely unlikely that the values given in Table II for the number of days per year with fog at St. John's and Cape Race, i.e., 13 and 189 respectively, are mutually comparable, even after due allowance is made for the inclusion in the Cape Race values of days with bad visibility due to atmospheric obscurity other than true fog.

Subsequent memoirs in this series will be awaited with interest. The synoptic meteorology of Newfoundland will constitute a fascinating line of research, to which the upper air observations now being taken regularly will be a valuable contribution.

S. P. PETERS.

Der Scirocco (Hamsin) Palästinas by Dr. D. Ashbel, Folia Medicinæ Internæ Orientalia, Vol. I, 1934–5, Fasc. 3–4, Jerusalem, 1936.

In this study Dr. Ashbel adds some interesting detail to the mental picture of the Hamsin (or Khamsin), the hot dry wind of the Middle East. The Hamsin in Syria is a hot easterly wind, not to be confused however with the cold easterly Sharkia which also occurs in winter. The shade temperature may exceed 100° F., and may be higher on the mountains than in the Dead Sea valley, yet the solar radiation is weak, and the high temperature is attributed partly to adiabatic warming of descending air, partly to long-wave radiation from a high-level moist tropical current. The rate of cooling is small or negative, resulting in unpleasant physiological effects. On the ground the humidity is very low and evaporation enormous, while the electric potential difference is very abnormal. The paper is enriched by tables giving hourly values of the meteorological elements at Jerusalem on selected Hamsin days compared with normal values, and by reproductions of thermograms and hygrograms from Jerusalem and the Dead Sea, making a most interesting and valuable study.

BOOKS RECEIVED

Solar Radiation and weather Studies. By C. G. Abbot, Washington D.C., Smithson. Misc. Coll. Vol. 94, No. 10, 1935.

Regenval in Nederlandsch-Indië. By Dr. J. Boerema. Kon. Magn. Meteor. Obs. Batavia. Verh. No. 24, Vol. IV. Maps of the mean annual and monthly rainfall in Celebes.

The statistical tables from which the maps have been drawn are contained in Vol. I of Verh. No. 24 which was reviewed in the *Meteorological Magazine*, **68**, 1933, p. 21.

OBITUARY

Canon William Frederick Archibald Ellison.—We regret to record the death on December 31st, 1936 of Canon W. F. A. Ellison, Director of Armagh Observatory. Canon Ellison was a scholar of Trinity College, Dublin; he was ordained in 1890 and became rector of Monart, County Wexford in 1902. Six years afterwards he was instituted rector of Fethard, which position he held until 1918, when he was appointed Director of Armagh Observatory. Throughout his life Canon Ellison was devoted to the study of astronomy, as well as meteorology; he was the author of "The Amateur's Telescope" and of many articles on astronomy. He was interested in the mechanical as well as the observational side of astronomy and was well known as a maker of mirrors for reflecting telescopes. He became a Fellow of the Royal Astronomical Society in 1918 and of the Royal Meteorological Society in 1919; in 1932 he was appointed a member of the Royal Irish Academy and he became a Canon of Armagh Cathedral in the same year. He leaves a widow and two sons, one of whom is a member of the staff of Sherborne School.

E. G. Bilham.

Sir William J. Keith, K.C.S.I.—The death took place on January 22nd of Sir William Keith of Saint Margaret's, Dunbar. A son of the late Mr. Davidson Keith and elder brother of Professor A. Berriedale Keith, he was born at Portobello in 1873 and was educated in turn at the Royal High School, Edinburgh University and Christ Church, Oxford. In 1895 he entered the Indian Civil Service, taking first place in the final examination of the following year. In the course of a distinguished career in Burma he held many important offices and was Governor of the province from 1925–30. He was made a Knight in 1925 and Knight Commander of the Star of India in 1928.

On retiring from the Indian Civil Service in 1930 Sir William Keith took up residence at Dunbar, becoming a member of the Town Council and a Magistrate, and devoting his great energies to local affairs. Amongst other matters he was instrumental in starting a climatological station of the Health Resort class and in its efficiency he always maintained a close interest.

He is survived by Lady Keith (only daughter of Sir Harvey Adamson, K.C.S.I.), and a son and two daughters.

A. H. R. Goldie.

NEWS IN BRIEF

Professor Dr. Julius Bartels has been appointed Professor of Meteorology in the University of Berlin.

The sixteenth Annual Dinner of the staff of the Meteorological Office, Shoeburyness, was held at the Palace Hotel, Southend-on-Sea, on Saturday, February 6th. The guests were Mr. J. S. Dines, M.A., Superintendent for Army Services and Instruments, and Col. F. N. C. Rossiter, R.A., M.C., Superintendent of Experiments, Shoeburyness. A number of past members of the staff were present.

The Weather of January, 1937

A large area of low pressure occupied the northern North Atlantic and Arctic, with a centre below 985 mb. extending from Iceland to the south of Greenland and a minor centre below 995 mb. north-east of Spitsbergen. A steep gradient for westerly winds occupied the mid-Atlantic between 40° and 50° N., while between the Faroes and Scandinavia there was a steep gradient for southerly winds. Pressure was high in the east, exceeding 1030 mb. over most of Russia and southern Finland, with a steep gradient towards the Arctic Ocean. In America pressure was high off the Atlantic coast of the United States, decreasing steadily south-westwards to a low pressure area over New Mexico, a distribution favourable to south-easterly winds bringing much moisture from the Gulf of Mexico to the Mississippi basin. Over most of Europe, Canada, northern United States and south-west North Atlantic pressure was considerably above normal, the greatest excesses being 18 mb. at Kuopio (Finland), 19·8 mb. at Kodiak (Alaska) and 7·9 mb. near Nantucket (Mass.), while pressure was below normal over most of the North Atlantic and southern United States, the greatest deficits being 12·8 mb. at Julianehaab (Greenland) and 3·3 mb. near S. Antonio (Texas).

Temperature was above normal over Great Britain, the Faroes, Iceland, east Greenland, the Arctic Ocean, Scandinavia, Finland and northern Russia and Siberia, the excess reaching very high values in the north. The means of 12·4° F. at Myggbukta in east Greenland and 27·7° F. at Spitsbergen were both 17° F. above normal. In the north-west of Siberia the temperatures were especially abnormal, the figures north of the Arctic circle decreasing from about 10° F. in the west to —3° F. in the east, in place of normal temperatures for January 20 to 25 degrees lower. Germany and eastern Europe on the other hand were abnormally cold, the means being well below freezing point even in Germany, and 4° to 7° F. below normal. Western Europe and Switzerland enjoyed mild weather, the mean of 34·3° F. at Zurich being 4·5° F. above the average. Ireland and the Azores were relatively cool.

Rainfall was excessive over Iceland and Jan Mayen, most of the British Isles, France, Switzerland, Austria, Hungary and the Balkans, but deficient over nearly all the east of Europe and western Siberia, a large part of the latter being almost rainless.

Dull and unsettled weather, with frequent rain and gales, prevailed generally over the British Isles, while temperature was generally much above normal except for the wintry spell towards the end of the month. A maximum of 57° F. was recorded at Dublin on the 3rd and at Bradford and Manchester on the 22nd, while minimum temperatures did not fall below 50° F. on several nights, 52° F. at Sealand on the 3rd. The rainfall was generally in excess, being twice the normal in parts of south-east England, while the rainfall at Valentia and Aberdeen was the highest for January since records commenced at these places in 1866 and 1871 respectively. From the 1st to 6th depressions passed in an east-north-easterly direction to the north of the British Isles, giving moderate to strong SW. to W. winds, increasing to gale force at times with mild unsettled weather and intermittent rain, heavy locally; 2·90 in. were recorded at Festiniog (Merioneth) on the 5th and 1·10 in. at Campsea Ashe (Suffolk) on the 1st. Snow fell on the higher ground in many parts of Scotland on the 1st, 4th and 5th, while thunderstorms were experienced at Oban on the 1st and locally in Ireland on the 3rd and 4th. Good sunshine records were obtained in east Scotland and north-east England on the 1st, 4·7 hrs. at Dunbar, and in south-east and east England on the 5th, 6·4 hrs. at Dover. On the 7th and 8th an interval of mainly sunny quiet weather occurred as a ridge of high pressure passed eastwards across the country—between 5 and 7 hours bright sunshine were experienced at many places on both days, Worthing had 7·2 hrs. on the 7th and 7·3 hrs. on the 8th. Some mist or fog occurred on the 8th, mainly in the east. The aurora borealis was observed clearly from Scotland, north England and north Devon on the 7th. By the 9th the depression over Iceland was influencing the weather of Scotland and Ireland, and from then to the 25th pressure was low over the Atlantic and winds were generally S.–SW., moderate to strong. In the eastern districts, however, mainly light or moderate winds prevailed between the 10th and 15th, but after this the depressions moving over the Atlantic approached nearer the British Isles, and the frequent gales of the west and north spread also at times to the eastern districts. Beaufort force 10 was recorded in north Scotland on the 17th, 18th, 21st, 25th and 26th, while among the highest gusts recorded during the month were 83 m.p.h. at Holyhead on the 17th and 80 m.p.h. at Lizard on the 20th. Mist or fog occurred frequently in south Scotland, the Midlands and eastern counties from the 11th to 15th; on the 14th at Manchester and on the 15th at Mildenhall and Catterick temperature failed to rise above the freezing point owing to the persistence of fog. Rain was frequent during this period and heavy at times in the west, 2·50 in. at Holne (Devon) and 2·08 in. at Brechfa (Carmarthen) on the 12th, and 2·58 in. and 2·00 in. at Borrowdale (Cumberland) on the 14th and 18th respectively, while snow occurred on the hills in Scotland and Ireland on the 15th and 16th, and more generally in Scotland, north Ireland, north England, the Midlands and Devon on the 17th–20th. Widespread floods were reported from the Midlands and eastern and southern counties from the 24th onwards. Good sunshine records were obtained in south-east England on the 10th, north England, south Scotland and Ireland on the 14th, and more generally on the 16th and 19th–21st. Thunderstorms occurred in south Scotland and Ireland on the 22nd and 23rd. During the 23rd the wind backed to SE., but the weather remained mild until the 25th. By the 26th the winds had become east and, with the air supply drawn from the cold continental regions, temperature fell considerably except in south Ireland and south-west England where the cold air did not penetrate until the 29th. Maximum temperatures were below freezing point on the 29th at many places in the eastern counties and the Midlands, 28° F. was the maximum that day at Rothamsted and Upper Heyford. Snow, sleet or hail occurred at most places from the 27th to 30th. In parts of north England snow was lying to a depth of 4 to 6 inches on the 29th and 30th. Gales were almost continuous in north Scotland from the 25th to 31st and strong winds or gales were general over the country on the 27th and 28th. Thunderstorms occurred in south Ireland on the 26th and in south-west England on the 30th. In the south milder conditions returned on the 30th and spread northwards to all districts on the 31st. The distribution of bright sunshine for the month was as follows :—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway ...	29	+2	Chester ...	43	−10
Aberdeen ...	42	−5	Ross-on-Wye ...	40	−15
Dublin	51	−6	Falmouth ...	31	−29
Birr Castle ...	42	−7	Gorleston ...	60	+4
Valentia... ...	32	−12	Kew	40	+4

Kew, Temperature, Mean 42·8° F., Diff. from normal + 3·8° F.

Miscellaneous notes on weather abroad culled from various sources.

Fine but very cold weather was experienced in northern Italy early in the month. In Switzerland, after a period of dry weather, snow fell generally on the 4th—on the 7th and 8th however, the weather was mild, but on the 9th snow fell again generally, to a depth of 1 to 3 ft. Fog and penetrating cold were experienced in Madrid on the 11th and 12th. Gales occurred in the Grecian Archipelago about the 12th. Heavy snow had fallen in Bulgaria by the 15th and thirteen people had been frozen to death. Heavy snow stopped all rail and road traffic over most of continental Denmark about the 15th to 19th. On the 18th and 19th a severe gale swept across southern Scandinavia, north Germany and the Baltic doing considerable damage to shipping—three ships with their entire crews were lost, two in the Baltic and one in the North Sea. On the 19th, in north Germany, the canals were frozen and there was deep snow, while in south Germany and Switzerland mild weather with heavy rain prevailed. By the 20th however there was cold and snow again in Switzerland. Severe gales were again experienced over the North Sea and Norway on the 22nd, 24th and 25th. Navigation closed at Sulina (Roumania) on the 22nd. Heavy rain occurred in Madrid from about the 24th to 27th. A severe south-westerly gale, accompanied by hail and torrential rain, occurred in Portugal and south Spain on the 25th–28th, doing much damage to shipping, many vessels being sunk inside Leixoes (Oporto), and Gibraltar Harbour damaged. This was followed by floods in various parts of Portugal. Intense cold prevailed in eastern Poland towards the end of the month. Strong winds prevailed off the north and west French coasts during most of the later part of the month, increasing at times to gale force. Storms and heavy snowfalls occurred generally over south Scandinavia and the Baltic on the 29th–31st. In spite of the efforts of icebreakers, the steamers of the Trelleborg-Sassnitz train-ferry services were fast in the ice on the 31st and those of the Storebelt (Denmark) service were drifting away with the ice floes on February 1st. A German tanker sank off Borkum Reef on the 29th, with eleven of the crew, owing to storms. Low temperature with intermittent heavy snowfalls occurred around Vienna during the last 10 days of the month. (*The Times*, January 4th to February 2nd.)

Five natives and eight oxen were killed in a storm which destroyed a kraal on a farm near Vrede, Orange Free State, on the 4th. Strong winds, increasing at times to gales, were experienced along the coast of French Morocco about the 24th to 29th. (*The Times*, January 5th–30th).

At the beginning of the month snow fell generally in and around Jerusalem and much damage was done to the Jaffa orange and grapefruit crops by widespread storms throughout Palestine. The *Aikoku Maru* sunk during a heavy snowstorm on the 12th off Shakotan Cape (Yezo, Japan). Dense fog occurred near Canton about the 20th. (*The Times*, January 5th–21st).

Rain to a depth of $\frac{1}{2}$ to $1\frac{1}{2}$ in. fell soon after the middle of the month in the pastoral areas of South Australia, putting an end to the drought. The total rainfall for the month in Australia was above normal in Northern Territory, South Australia, Victoria and Tasmania, mainly below normal in Queensland, but variable in distribution in Western Australia and New South Wales. (*The Times*, January 20th and cable.)

Navigation closed generally at Quebec on the 2nd, but two tramp steamers convoyed by ice breakers were making their way to the sea on the 3rd. On the 10th Canada had the unusual experience of a thaw in January. In the United States temperature was considerably above normal in the Atlantic Coast States, most of the Gulf States, Ohio Valley, Tennessee and Lake Regions, above normal at first, becoming low in the Mississippi-Missouri Valleys and considerably below normal in the mountain region and along the Pacific Coast. Precipitation was mainly above normal, becoming below normal generally after the middle of the month except in the Ohio Valley and parts of the Atlantic States and Lake Regions. Severe and widespread floods occurred in the Ohio and Mississippi Valleys†. (*The Times*, January 4th–30th and *Washington, D.C., U.S. Dept. Agric., Weekly Weather and Crop Bulletin*).

Daily Readings at Kew Observatory, January, 1937

Date	Pressure, M.S.L. 13h.	Wind, Dir., Force 13h.	Temp. Min.	Temp. Max.	Rel. Hum. 13h.	Rain.	Sun.	REMARKS. (see vol. 69, 1934, p. 1).
	mb.		°F.	°F.	%	in.	hrs.	
1	1015·4	SW.4	46	50	94	0·58	0·0	r_0–r 0h.–20h.
2	1020·6	SW.4	39	49	77	—	0·1	r_0 12h. 15h., and 21h.
3	1026·9	WSW.4	49	53	81	—	0·0	
4	1017·9	SSW.5	48	49	87	0·04	0·0	r–r_0 20h.–22h.
5	1020·3	W.3	36	45	64	—	5·0	
6	1005·5	WSW.4	41	54	79	0·19	0·0	r_0 2h–10h., 20h.–22h.
7	1017·1	W.5	43	48	56	0·03	6·5	r 1h.
8	1035·7	SW.1	33	44	78	—	5·2	xf early and late.
9	1033·4	S.4	32	45	74	—	1·6	x early.
10	1027·7	SSE.3	31	44	57	—	6·8	x early and late.
11	1025·4	S.2	32	48	86	—	0·4	f 7h.–10h.
12	1020·7	S.4	37	48	88	0·01	0·0	r_0 17h.–18h.
13	1018·6	SW.2	47	52	94	0·11	0·0	r_0–r 1h.–9h.
14	1021·5	N.3	41	43	86	0·16	0·0	r_0–r 0h.–10h.
15	1016·1	WSW.1	36	41	87	—	0·1	m 9h.–13h.
16	1006·4	WSW.3	38	45	66	0·13	4·1	r–r_0 6h.–11h.
17	1004·1	SSE.4	33	46	74	0·17	2·6	r_0–r 16h.–24h.
18	981·5	S.4	43	50	87	0·31	0·5	r_0–r 0h.–17h.
19	996·4	W.2	34	43	76	trace	4·8	m 9h., pr_0 20h.
20	1007·5	SSE.4	32	46	71	0·03	4·8	x early r 17h.–24h.
21	1001·1	SSW.4	43	51	80	0·34	2·0	r 0h.–6h., 14h.–15h.
22	1006·2	S.4	48	52	89	0·27	0·0	r–r_0 1h.–14h.
23	1007·2	SE.3	45	50	92	0·49	0·0	r 4h.–13h., f 10h.
24	990·4	SE.5	50	53	84	0·34	0·0	r_0 6h.–9h., 13h.–22h.
25	994·3	ESE.2	46	49	83	0·01	0·3	r–r_0 20h.–24h.
26	1001·9	NE.2	37	37	89	0·04	0·0	r_0 0h.–4h., f 10h.–16h.
27	991·0	ENE.5	36	44	70	—	1·5	f 8h.–11h.
28	985·6	NE.5	36	37	81	0·02	0·0	r_0 3h.–5h., r_0s_0 10h.
29	991·7	NE.4	29	31	85	0·01	0·0	is_0 7h.–18h.
30	992·0	E.2	29	45	93	0·20	0·0	s2h.–4h., r 15h.–19h.
31	996·7	S.2	41	49	81	0·26	1·4	r–r_0 18h.–21h.
*	1008·9	—	39	47	80	3·76	1·5	* Means or Totals.

General Rainfall for January, 1937

England and Wales ...	185	per cent of the average 1881–1915.
Scotland	162	
Ireland	178	
British Isles	176	

† See p. 17.

Rainfall : January, 1937 : England and Wales

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Lond .	Camden Square.........	3·47	187	*War* .	Birminghm, Edgbaston	3·69	183
Sur .	Reigate, Wray Pk. Rd..	5·78	241	*Leics* .	Thornton Reservoir ...	4·48	227
Kent .	Tenterden, Ashenden...	5·56	259	,, .	Belvoir Castle...........	2·79	157
,, .	Folkestone, Boro. San.	4·88	...	*Rut* .	Ridlington	3·37	182
,, .	Margate, Cliftonville....	3·87	234	*Lincs* .	Boston, Skirbeck.........	3·56	220
,, .	Eden'bdg., Falconhurst	6·94	283	,, .	Cranwell Aerodrome...	3·02	176
Sus .	Compton, Compton Ho.	7·56	238	,, .	Skegness, Marine Gdns.	3·28	190
,, .	Patching Farm..........	5·96	229	,, .	Louth, Westgate.........	4·10	189
,, .	Eastbourne, Wil. Sq....	5·73	217	,, .	Brigg, Wrawby St.......	3·09	...
Hants.	Ventnor, Roy.Nat.Hos.	6·05	235	*Notts* .	Worksop, Hodsock......	3·40	192
,, .	Fordingbridge, Oaklnds	6·69	242	*Derby*.	Derby, L. M. & S. Rly.	2·99	150
,, .	Ovington Rectory.......	9·39	347	,, .	Buxton, Terr. Slopes...	6·52	146
,, .	Sherborne St. John......	6·18	265	*Ches* .	Bidston Obsy............	1·86	88
Herts .	Royston, Therfield Rec.	4·06	235	*Lancs*.	Manchester, Whit. Pk.	3·06	122
Bucks.	Slough, Upton...........	4·23	227	,, .	Stonyhurst College......	3·51	82
,, .	H. Wycombe, Flackwell	4·43	204	,, .	Southport, Bedford Pk.	1·62	63
Oxf .	Oxford, Radcliffe.........	3·34	185	,, .	Ulverston, Poaka Beck	...	...
N'hant	Wellingboro, Swanspool	3·46	187	,, .	Lancaster, Greg Obsy.	2·77	79
,, .	Oundle	2·51	...	,, .	Blackpool	2·38	87
Beds .	Woburn, Exptl. Farm...	3·16	185	*Yorks*.	Wath-upon-Dearne......	3·11	162
Cam .	Cambridge, Bot. Gdns.	2·88	192	,, .	Wakefield,Clarence Pk.	3·45	180
,, .	March.....................	2·72	170	,, .	Oughtershaw Hall.......	7·95	...
Essex.	Chelmsford,County Gdns	3·77	246	,, .	Wetherby, Ribston H..	2·98	145
,, .	Lexden Hill House......	3·65	...	,, .	Hull, Pearson Park......	2·53	140
Suff .	Haughley House.........	3·35	...	,, .	Holme-on-Spalding......	2·70	143
,, .	Rendlesham Hall........	4·68	257	,, .	West Witton, Ivy Ho.	4·85	153
,, .	Lowestoft Sec. School...	4·13	247	,, .	Felixkirk, Mt. St. John.	3·21	161
,, .	Bury St. Ed., WestleyH.	4·20	234	,, .	York, Museum Gdns....	2·81	159
Norf. .	Wells, Holkham Hall...	3·74	258	,, .	Pickering, Hungate......	3·63	174
Wilts .	Porton, W.D. Exp'l. Stn	5·98	260	,, .	Scarborough..............	4·07	203
,, .	Bishops Cannings........	4·96	214	,, .	Middlesbrough...........	1·94	121
Dor .	Weymouth, Westham.	4·66	192	,, .	Baldersdale, Hury Res.	4·53	139
,, .	Beaminster, East St....	6·71	193	*Durh* .	Ushaw College............	3·58	175
,, .	Shaftesbury,Abbey Ho.	5·56	214	*Nor* .	Newcastle, Leazes Pk...	2·97	150
Devon.	Plymouth, The Hoe....	4·90	147	,, .	Bellingham, Highgreen	4·44	155
,, .	Holne, Church Pk. Cott.	14·35	232	,, .	Lilburn Tower Gdns....	3·34	162
,, .	Teignmouth, Den Gdns.	7·00	240	*Cumb*.	Carlisle, Scaleby Hall...	2·76	111
,, .	Cullompton	7·41	229	,, .	Borrowdale, Seathwaite	22·00	175
,, .	Sidmouth, U.D.C........	4·23	...	,, .	Thirlmere, Dale Head H.	15·51	191
,, .	Barnstaple, N. Dev.Ath	5·31	163	,, .	Keswick, High Hill......	8·59	170
,, .	Dartm'r,Cranmere Pool	17·70	...	*West* .	Appleby, Castle Bank...	2·61	82
,, .	Okehampton, Uplands.	13·64	268	*Mon* .	Abergavenny, Larchf'd	7·12	211
Corn .	Redruth, Trewirgie......	8·52	201	*Glam* .	Ystalyfera, Wern Ho....	9·87	156
,, .	Penzance, Morrab Gdns.	5·76	152	,, .	Cardiff, Ely P. Stn.......	...	...
,, .	St. Austell, Trevarna...	7·72	180	,, .	Treherbert, Tynywaun.	15·96	...
Soms .	Chewton Mendip.........	6·90	180	*Carm* .	Carmarthen,Model&P.S.	8·29	189
,, .	Long Ashton...........	4·43	155	*Pemb* .	St. Ann's Hd. C. Gd. Stn.	5·06	153
,, .	Street, Millfield..........	4·19	...	*Card* .	Aberystwyth	4·56	...
Glos .	Blockley	4·07	...	*Rad* .	BirmW.W.Tyrmynydd	10·97	174
,, .	Cirencester, Gwynfa....	4·76	190	*Mont* .	Lake Vyrnwy	...	...
Here .	Ross-on-Wye............	4·63	167	*Flint* .	Sealand Aerodrome......	2·57	...
Salop.	Church Stretton.........	4·73	187	*Mer* .	Blaenau Festiniog	10·20	109
,, .	Shifnal, Hatton Grange	2·97	153	,, .	Dolgelley, Bontddu......	6·88	121
Staffs.	Market Drayt'n, Old Sp.	3·00	136	*Carn* .	Llandudno	3·03	126
Worc .	Malvern, Free Library...	3·67	166	,, .	Snowdon, L. Llydaw 9..	18·65	...
,, .	Ombersley, Holt Lock.	2·78	145	*Ang* .	Holyhead, Salt Island...	3·26	112
War .	Alcester, Ragley Hall..	2·93	152	,, .	Lligwy	3·04	...

Rainfall: January, 1937: Scotland and Ireland

Co.	STATION.	In.	Per cent of Av.	Co.	STATION.	In.	Per cent of Av.
I. Man	Douglas, Boro' Cem....	4·30	128	*R&C* .	Achnashellach	...	...
Guern.	St. PeterP't.Grange Rd	5·25	179	,, .	Stornoway,MathesonRd	...	...
Wig .	Pt. William, Monreith.	3·35	103	*Suth* .	Lairg	5·51	168
,, .	New Luce School.........	5·66	140	,, .	Tongue	...	...
Kirk .	Dalry, Glendarroch......	9·09	163	,, .	Melvich.....................	4·82	146
Dumf.	Dumfries, Crichton R.I.	4·59	151	,, .	Loch More, Achfary....	8·18	112
,, .	Eskdalemuir Obs........	9·14	169	*Caith* .	Wick	3·90	159
Roxb .	Hawick, Wolfelee........	4·61	144	*Ork* .	Deerness	5·88	170
Peeb .	Stobo Castle..............	6·66	222	*Shet* .	Lerwick	4·85	114
Berw .	Marchmont House......	3·11	138	*Cork* .	Dunmanway Rectory...	11·59	185
E.Lot .	North Berwick Res.....	...	...	,, .	Cork, University Coll...	9·04	224
Midl .	Edinburgh, Blackfd. H.	2·04	116	,, .	Mallow, Longueville....	11·32	290
Lan .	Auchtyfardle	5·19	...	*Kerry.*	Valentia Obsy............	11·71	213
Ayr .	Kilmarnock, Kay Pk....	4·55	...	,, .	Gearhameen..............	15·30	151
,, .	Girvan, Pinmore.........	7·79	165	,, .	Bally McElligott Rec...	8·23	...
,, .	Glen Afton, Ayr San. ...	11·24	220	,, .	Darrynane Abbey.......	10·72	214
Renf .	Glasgow, Queen's Pk....	3·64	109	*Wat* .	Waterford, Gortmore...	6·43	177
,, .	Greenock, Prospect H..	9·39	137	*Tip* .	Nenagh, Cas. Lough....	7·51	190
Bute .	Rothesay, Ardencraig...	6·73	150	,, .	Roscrea, Timoney Park	5·35	...
,, .	Dougarie Lodge..........	6·35	147	,, .	Cashel, Ballinamona....	7·01	187
Arg .	Lock Sunart, G'dale....	10·33	146	*Lim* .	Foynes, Coolnanes......	6·76	179
,, .	Ardgour House..........	11·72	...	*Clare* .	Inagh, Mount Callan....	10·87	...
,, .	Glen Etive..................	...	...	*Wexf* .	Gorey, Courtown Ho...	7·65	245
,, .	Oban.........................	8·65	...	*Wick* .	Rathnew, Clonmannon.	6·75	...
,, .	Poltalloch..................	...	...	*Carl* .	Bagnalstown,FanaghH.	7·31	233
,, .	Inveraray Castle.........	15·74	192	,, .	Hacketstown Rectory...	7·35	207
,, .	Islay, Eallabus............	7·29	156	*Leix* .	Blandsfort House.......	5·76	176
,, .	Mull, Benmore............	11·70	86	*Offaly.*	Birr Castle................	4·48	158
,, .	Tiree	4·82	113	*Kild* .	Straffan House...........	3·07	119
Kinr .	Loch Leven Sluice.......	3·77	120	*Dublin*	Dublin, Phoenix Park..	2·89	123
Fife .	Leuchars Aerodrome...	2·92	160	*Meath.*	Kells, Headfort..........	4·63	147
Perth .	Loch Dhu...................	12·40	136	*W.M* .	Moate, Coolatore.........	3·56	...
,, .	Crieff, Strathearn Hyd.	4·63	115	,, .	Mullingar, Belvedere...	4·57	142
,, .	Blair Castle Gardens....	8·72	262	*Long* .	Castle Forbes Gdns......	...	...
Angus.	Kettins School............	5·02	192	*Gal* .	Galway, Grammar Sch.	6·09	164
,, .	Pearsie House............	7·97	...	,, .	Ballynahinch Castle....	8·67	139
,, .	Montrose, Sunnyside...	4·15	209	,, .	Ahascragh, Clonbrock.	5·91	152
Aber .	Balmoral Castle Gdns..	11·80	428	*Rosc* .	Strokestown, C'node.....	4·87	156
,, .	Logie Coldstone Sch....	...	...	*Mayo.*	Blacksod Point..........	8·88	175
,, .	Aberdeen, Observatory.	4·96	228	,, .	Mallaranny	7·11	...
,, .	New Deer School House	5·04	216	,, .	Westport House.........	7·86	169
Moray	Gordon Castle............	3·78	187	,, .	Delphi Lodge............	15·74	159
,, .	Grantown-on-Spey	3·82	158	*Sligo* .	Markree Castle..........	5·39	138
Nairn.	Nairn	2·61	131	*Cavan.*	Crossdoney, Kevit Cas..	4·48	...
Inv's .	Ben Alder Lodge.........	9·40	...	*Ferm* .	Newtwnbtlr, Crom Cas.	4·83	145
,, .	Kingussie, The Birches.	6·92	...	*Arm* .	Armagh Obsy............	4·62	183
,, .	Loch Ness, Foyers	...	...	*Down.*	Fofanny Reservoir......	10·03	...
,, .	Inverness, Culduthel R.	3·59	141	,, .	Seaforde	4·86	154
,, .	Loch Quoich, Loan......	20·79	...	,, .	Donaghadee, C. G. Stn.	4·29	169
,, .	Glenquoich................	15·52	113	*Antr* .	Belfast, Cavehill Rd.....	...	...
,, .	Arisaig House............	7·74	125	,, .	Aldergrove Aerodrome.	4·48	164
,, .	Glenleven, Corrour......	11·49	134	,, .	Ballymena, Harryville.	5·08	137
,, .	Fort William, Glasdrum	12·83	...	*Lon* .	Garvagh, Moneydig....	6·50	...
,, .	Skye, Dunvegan.........	6·28	...	,, .	Londonderry, Creggan.	6·29	175
,, .	Barra, Skallary..........	5·13	...	*Tyr* .	Omagh, Edenfel.........	6·15	174
R&C .	Alness, Ardross Castle.	4·52	119	*Don* .	Malin Head..............	5·56	...
,, .	Ullapool	4·80	104	,, .	Killybegs, Rockmount.	2·85	...

Climatological Table for the British Empire, August, 1936

STATIONS.	PRESSURE. Mean of Day M.S.L.	PRESSURE. Diff. from Normal.	TEMPERATURE. Absolute. Max.	TEMPERATURE. Absolute. Min.	TEMPERATURE. Mean Values. Max.	TEMPERATURE. Mean Values. Min.	TEMPERATURE. Mean Values. ½ Max. and Min.	TEMPERATURE. Mean Values. Diff. from Normal	TEMPERATURE. Mean. Wet Bulb.	Relative Humidity.	Mean Cloud Am'nt	PRECIPITATION. Am'nt.	PRECIPITATION. Diff. from Normal.	PRECIPITATION. Days.	BRIGHT SUNSHINE. Hours per day.	BRIGHT SUNSHINE. Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0–10	In.	In.			
London, Kew Obsy	1019·8	+ 4·5	80	47	71·2	54·7	62·9	+ 1·2	55·9	88	7·5	0·48	− 1·76	6	5·9	41
Gibraltar	1017·1	+ 0·6	80	65	76·4	69·2	72·8	...	68·1	88	6·2	0·00	...	0	...	...
Malta	1016·6	+ 1·8	88	69	82·4	71·9	77·1	− 2·0	70·9	76	2·3	0·16	+ 0·02	1	11·0	81
St. Helena	1016·5	− 0·9	65	51	60·7	53·5	57·1	− 0·3	54·7	93	9·2	1·03	− 1·46	19	...	...
Freetown, Sierra Leone	1013·5	+ 2·4	84	69	80·7	72·7	76·7	...	73·2	87	8·3	27·45	− 9·12	24	...	...
Lagos, Nigeria	1014·1	+ 1·1	83	69	80·9	72·1	76·5	− 1·4	71·9	85	8·5	1·12	− 1·52	5	5·4	44
Kaduna, Nigeria	1011·9	...	95	64	82·9	67·5	75·2	+ 1·3	69·8	90	8·5	5·74	− 6·58	16	4·3	35
Zomba, Nyasaland	1017·6	+ 0·7	80	47	74·3	54·0	64·1	− 0·8	58·2	68	4·9	0·11	− 0·26	2	...	...
Salisbury, Rhodesia	1021·6	+ 1·3	82	37	72·4	45·0	58·7	− 1·5	50·3	50	2·2	0·47	+ 0·41	3	9·1	79
Cape Town	1020·2	− 0·1	86	40	65·8	49·6	57·7	+ 2·1	51·1	85	5·4	3·27	− 0·10	10	...	...
Johannesburg	1021·5	+ 1·4	77	31	66·9	44·1	55·5	+ 1·1	43·2	44	0·9	0·00	− 0·51	0	10·1	90
Mauritius	1020·3	− 0·2	79	52	75·7	58·5	67·1	− 1·4	62·8	65	4·8	0·56	− 1·79	12	7·2	63
Calcutta, Alipore Obsy.	1000·3	− 0·7	93	77	89·2	79·7	84·5	+ 1·3	79·5	89	8·2	6·00	− 7·38	13*	...	...
Bombay	1005·7	− 0·2	87	74	85·5	76·5	81·0	+ 0·2	76·7	85	8·6	9·27	− 5·18	16*	...	...
Madras	1004·9	− 0·6	98	72	93·9	77·2	85·5	− 0·5	75·8	74	8·2	5·99	+ 1·45	13*	...	...
Colombo, Ceylon	1010·2	+ 0·9	87	74	85·0	77·1	81·1	− 0·1	77·2	79	6·9	1·15	− 2·09	6	7·7	63
Singapore	1009·6	+ 0·1	89	73	85·5	75·8	80·7	− 0·4	77·1	83	7·1	4·48	− 3·47	23	5·7	47
Hongkong	1004·7	− 0·1	91	74	87·8	78·1	82·9	+ 0·8	78·6	81	6·8	21·31	+ 6·91	19	7·1	55
Sandakan	1008·6	...	90	72	87·5	74·4	80·9	− 0·9	75·9	83	7·8	9·59	+ 1·70	17	...	...
Sydney, N.S.W.	1013·6	− 4·6	81	44	67·4	50·2	58·8	+ 3·8	51·8	63	4·4	1·36	− 1·61	11	7·0	64
Melbourne	1010·8	− 7·2	70	33	59·6	44·7	52·1	+ 1·1	46·7	71	7·3	1·72	− 0·15	19	4·4	41
Adelaide	1013·5	− 5·8	72	42	63·1	47·3	55·2	+ 1·3	50·5	73	6·4	2·08	− 0·45	17	5·1	47
Perth, W. Australia	1015·9	− 3·0	71	42	64·8	52·0	58·4	+ 2·4	53·1	76	6·7	7·26	+ 1·61	24	5·8	53
Coolgardie	1015·6	− 3·7	81	35	65·1	43·9	54·5	+ 0·9	49·4	68	3·5	0·31	− 0·68	4	...	...
Brisbane	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hobart, Tasmania	1002·9	−10·5	61	32	53·3	41·0	47·1	− 0·9	42·4	67	6·2	3·12	+ 1·29	25	4·8	46
Wellington, N.Z.	1013·3	− 1·8	61	33	54·7	44·8	49·7	+ 1·1	47·3	79	6·8	4·68	+ 0·19	20	4·3	41
Suva, Fiji	1013·6	− 0·6	85	63	79·4	68·3	73·9	+ 0·3	68·7	79	5·6	3·03	− 5·26	13	6·3	55
Apia, Samoa	1010·6	− 1·7	86	65	83·5	72·1	77·8	0·0	73·5	74	3·8	7·64	+ 4·01	12	7·6	65
Kingston, Jamaica	1012·3	− 1·2	91	70	88·7	73·7	81·2	− 0·3	73·2	83	4·0	3·94	+ 0·39	8	7·0	55
Grenada, W.I.	1011·2	− 1·4	90	71	87	73	80·0	+ 0·3	74	79	6	6·01	− 3·32	16	...	...
Toronto	1015·6	+ 0·2	97	50	79·0	58·9	68·9	+ 1·7	59·6	74	4·7	1·75	− 1·04	6	7·8	56
Winnipeg	1014·7	+ 1·5	102	42	79·3	53·5	66·4	+ 2·6	53·1	84	4·4	0·50	− 1·66	2	7·4	51
St. John, N.B.	1014·9	− 0·4	85	47	69·3	53·2	61·3	+ 0·7	57·0	82	6·0	2·65	− 1·21	14	6·7	48
Victoria, B.C.	1018·2	+ 1·3	82	48	69·1	53·5	61·3	+ 1·6	56·3	78	3·9	0·66	+ 0·02	3	10·9	76

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FIG. 1.—FOG CLIMBING THE JUDEAN DESERT TO THE JERUSALEM MOUNTAINS

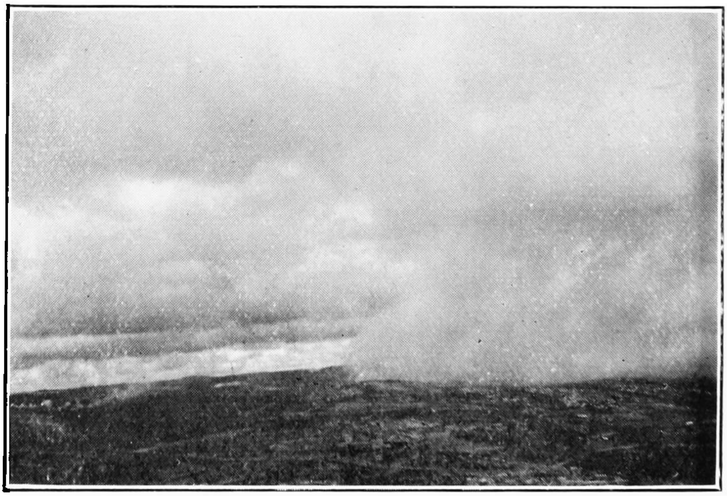

FIG. 2.—FOG FIXED ON THE TOP OF THE MOUNTAIN WITH AN ANGLE TO THE EAST