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British Association for the Advancement of Science

MEETING IN TORONTO, AUGUST 1924

THE annual meeting of the British Association for the Advancement of Science was held this year during the week August 6th to August 13th, in the very pleasantly situated buildings of the University of Toronto, and the gathering proved to be one of the most successful of recent years from the meteorological point of view. The meeting brought together a large number of distinguished meteorologists from Europe and America, including Sir Napier Shaw, Sir Frederic Stupart, Director of the Meteorological Service of Canada, Professor C. F. Marvin, Chief of the United States Weather Bureau, and Professor V. Bjerknes of Bergen, Norway, and formal and informal discussions were held, giving valuable opportunities for the exchange of ideas between investigators of the two continents.

Meteorological activities commenced during the voyage from Liverpool to Quebec, in the Cunarder " R.M.S. Caronia," of a party of meteorologists, who carried out work on a plan drawn up by a Committee appointed by the Council of the Royal Meteorological Society. The outstanding feature of this work was an enquiry into the vertical temperature gradients in the little explored region of the atmosphere lying below the masthead of the ship, use being made of an electrical resistance thermometer specially constructed by Mr. L. F. Richardson.

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Observations were obtained at numerous points along the route, including the Straits of Belle Isle, and a variety of conditions were found, including some cases of " inversions," in which the highest temperature in the strata considered occurred at the mast-head. Another problem attacked was the difficult one of obtaining a satisfactory exposure for thermometers on board ship to give true air temperature. In this connection, Mr. F. J. W. Whipple carried out a temperature survey of certain parts of the ship, using an Assmann psychrometer. This only emphasised the importance of the enquiry, showing that, even on overcast days, contact with the ship may affect the temperature of the arriving air with surprising rapidity. Air and sea temperatures reported by wireless from ships plays an important part in weather forecasting in England and other countries, so that the results of the present investigation should be of very practical value. Other work done was the construction of daily weather charts, and the preparation of forecasts from data received by wireless from ships and land stations. This was carried out by Mr. J. Bjerknes and Mr. M. A. Giblett in collaboration, and the charts not only added greatly to the interest of the voyage, but, being made with no preliminary preparation, demonstrated the extent to which the existing wireless weather organisation enables such work to be done in the northern part of the North Atlantic. It is gratifying to record that in mid-ocean it was possible to draw a weather chart extending from Russia across the Atlantic to the Pacific coast of America, though this was no longer possible during the later stages of the voyage.

During the subsequent meeting in Toronto, an afternoon was devoted to the discussion of the above work, and on the same occasion Dr. J. S. Owens described some interesting observations of atmospheric impurity made on the " Caronia." A white haze observed on the St. Lawrence in the neighbourhood of Anticosti Island, shortly before sunset, was found to consist of hygroscopic salt particles, although readings of an Assmann psychrometer showed the air to be relatively dry. (An apparently similar haze observed later on Lake Ontario consisted of solid particles, almost certainly soot.)

It would be impossible to deal in detail with the numerous papers read on meteorological and allied subjects, and only a very brief account will be attempted. Sir Napier Shaw, under the rather amusing title " If the Earth went Dry," invited the audience to consider what the condition of the atmosphere and the general circulation would be like if there were no water vapour at all in the air. Although the subject is hypothetical, the picture presented as the result of the technical discussion is likely to aid considerably in understanding the workings of the atmosphere as it actually is. Striking particulars as to the

great variations of mean temperature which may occur between one winter and another in Canada were given by Sir Frederic Stupart. It appears that in certain years the Pacific cyclonic systems are less intense than in others, and enter the continent farther south, while great anticyclonic developments occur in the far north and sweep south-eastward over Canada. These are conditions which lead to abnormally cold winters. On the other hand, mild winters are associated with vigorous cyclonic systems entering the continent in high latitudes. It is thought that a connection may exist between this difference of behaviour of depressions and the temperature and position of the Japan current, and the matter is being looked into.

Professor C. F. Marvin again brought forward the subject of a simplified calendar, urging meteorologists to promote the adoption of the simple equal month calendar others are now advocating. He supported the plea by showing the great practical advantages of having statistical data covering the fields of meteorology, yields and prices of crops, business and economic conditions, etc., appropriately assembled, summarised in suitable units of time and sectional area or representative groups, and promptly, regularly and systematically published.

Upper air work was represented by several papers. The average variation of wind with height above the surface shows certain definite characteristics which Professor W. J. Humphreys explained as effects of mechanical and thermal turbulence. The progressive development of upper air research in Canada, formed the subject of an address by Mr. J. Patterson, while a valuable series of upper wind measurements made at Samoa, was described by Mr. A. Thomson. These latter observations fill a gap in our knowledge of conditions over the Pacific Ocean, and show a very definite average maximum of wind velocity at a height of 12 km. If the region of maximum velocity corresponds to the tropopause, as in temperate latitudes, then the stratosphere is considerably lower than might be expected in the latitude of Samoa.

Mr. J. Bjerknes outlined further work emphasising the importance of atmospheric discontinuities in weather forecasting. The main point made was that the temperature distribution in a depression gives useful indication concerning its development. The result is capable of mathematical expression leading theoretically to a mathematical forecast, and an example of such a forecast in practice was given. Although the various methods of " rain making " which have from time to time been proposed are usually turned aside by the meteorologist, Professor W. J. Humphreys showed that each when treated quantitatively is full of meteorological interest. But, of course, none of these methods is practicable in the commercial sense.

The subject of radiation was represented by a paper by Pro-

fessor H. H. Kimball, who described work on the determination of daylight intensity from automatic records of total solar and sky radiation. Mr. F. J. W. Whipple showed an interesting laboratory reproduction of the "green flash," illustrating the theory that the phenomenon is due to simultaneous action of dispersion and absorption. In another paper he discussed the problem, as yet unsolved, of the diurnal variation of pressure. The facts as shown by observational material available from stations in the British Isles were shown to be hard to reconcile with Lord Kelvin's resonance hypothesis, to which other objections may also be raised. Mr. L. F. Richardson gave particulars of some further work on atmospheric turbulence, for which he is so well known. This time the field of investigation was among trees, where the gustiness as measured by a Dines pressure-tube anemometer was compared with the vertical temperature gradient measured by a pair of thermojunctions placed at different heights.

The automatic measurement of atmospheric pollution was described by Dr. J. S. Owens, and Dr. H. Jeffreys discoursed on "Tidal Friction." The Rev. A. L. Cortie gave further information as to his researches into the nature of the relation between solar activity and terrestrial magnetic disturbance.

Seismology was represented by contributions by Mr. E. A. Hodgson, of Ottawa, on the correlation of records of two distant Milne-Shaw Seismographs, and by Mr. J. J. Shaw, who presented the report of the Seismology Committee. The latter contained the result of experiments testifying to the very satisfactory nature of the Milne-Shaw Seismograph, also a note to the effect that research has shown that the 21-minute periodicity, already mentioned in previous reports, is probably controlled by the moon, being of the nature of a tidal effect.

In addition to the above papers read in section A (Mathematics and Physics), Dr. Vaughan Cornish discussed wind, wave and swell on the North Atlantic Ocean, before the geographical section. One important conclusion was that the growth of waves is much hindered by a crossing swell, so that it can be inferred that the general absence of swell upon enclosed seas favours the rapid rise of waves. Dr. W. Bell Dawson shewed the great progress made in the period 1893 to 1924 in the survey of tides and currents in Canadian waters, and in the agricultural section Mr. R. A. Fisher discussed the incidence of rainfall in relation to the wheat crop. In the geological section Pre-Cambrian climates were described by Professor A. P. Coleman, who concluded that "On the whole, the Pre-Cambrian formations indicate cooler conditions than the Palæozoic up to the end of the Carboniferous, and much cooler conditions than those of the Mesozoic." Even in the programme of the Zoological section

there was a paper on the circulation of the water off the Canadian Atlantic Coast, in which Professor A. G. Huntsman drew deductions from the distribution of planktonic forms, including the larvæ of fishes. The circulation indicated was confirmed by observation with drift bottles.

Meteorological activities were not confined to the British Association meetings, a number of papers being contributed to the geophysical section of the International Mathematical Congress, which also met in Toronto during the same period. These included contributions by Sir Napier Shaw, Professor V. Bjerknes, Professor W. J. Humphreys, and Mr. J. Patterson, while other branches of geophysics were also represented.

A scientific exhibition was held throughout the meetings, and to this some instrumental exhibits were contributed by the Meteorological Service of Canada, which also undertook the daily display of weather charts and forecasts in a prominent position.

The custom of holding a Meteorological Luncheon in the course of the meeting was duly honoured, a party of 59, meteorologists and their friends, assembling at Hart House. Sir Napier Shaw presided. After the loyal toast, Sir Napier welcomed the representatives of various sciences, emphasising the universal importance of weather and the numerous points of contact of meteorology and other subjects. Professor E. W. Brown of Yale, representing Astronomy, spoke of the opportunity which would be afforded by the eclipse of January next year for showing the general public the possibilities of weather forecasting. It was hoped that the public would be co-operating with the astronomers by reporting observations from which the boundary of the band of totality could be determined with high precision, and all would be anxiously hoping for clear skies on the critical day.

An interesting speech was delivered by Dr. L. A. Bauer, representing terrestrial magnetism and electricity, while Professor V. Bjerknes, as a representative of physical sciences, remarked that if ten years ago he had been asked which was the more probable—the splitting of atoms or the solution of the problem of weather forecasting, he would have answered without hesitation, forecasting. He drew the moral that we should tackle weather problems with enthusiasm and the assurance that our efforts would be crowned with success. Sir Henry Rew, speaking as an agriculturalist, thought that meteorologists did not always receive the credit due to them for success in forecasting. He told the story of the Englishman, who was asked by an Australian who had been suffering from a chilly May in London, when the summer would come, and replied " Last year we had it on a Wednesday."

Mr. J. J. Shaw, who spoke for seismology, traced many connections between his science and meteorology. He pointed out that the origin of microseisms had not yet been ascertained, and that the idea that they came from the swell in the oceans would probably have to be abandoned. The oscillations of the ground owing to the alternate heating and cooling of a house on days with passing clouds, were quite appreciable by the seismograph. Professor C. F. Marvin, spoke with enthusiasm of the benefit of personal contact between scientists, and especially between meteorologists, at such international gatherings.

The chairman, in a toast to " Toronto Hospitality," expressed the gratitude of all who had taken part in the meeting to Sir Frederic Stupart for his efforts to make it a success, and, in reply, Sir Frederic spoke of the welcome which Canadians wished to give to their colleagues from England and the United States, and gave credit to Mr. J. Patterson for his part in the preparations for the meeting.

M: A. G.

The Wet Weather of April to August, 1924

By C. E. P. Brooks, M.Sc.

Following the dry, cold weather of the winter and early spring, the British Isles have experienced a period of five months with excess of rainfall, especially in England and Wales. Summarising the figures published in the *Meteorological Magazine* each month, we have the following percentages of the average fall (1881—1915) :—

	April	May	June	July	Aug.	MEAN
England and Wales ...	145	214	104	152	114	146
Scotland	95	161	108	152	113	126
Ireland	125	159	129	132	112	131
British Isles	128	189	110	149	113	138
South-east England ...	183	217	118	166	121	161

The rainfall was rather unevenly distributed. In April, Scotland and the north of England were generally dry, while the counties near London had twice their normal amount. In May the excess was more uniform, but the north-west of the Scottish mainland had a rainfall below normal, while parts of Kent and Gloucester had over three times their normal total. In June the excess was greatest in the south and south-west of the British Isles, and the east coast of England was relatively dry, while in July the greatest percentage excess was in London and the Midlands. In August the excess was greatest in Sussex

and the counties to the west and south of London and also in the north of Scotland and Ireland. Thus south-eastern England suffered throughout; this is brought out by the figures in the last line of the table, which refer to twenty stations within the triangle including Norfolk, Hampshire and Kent. Generally speaking, the five months in question formed a decidedly rainy period, without being in any way phenomenal. The rains of April to June and August were chiefly cyclonic, those of July, in England at least, were largely associated with thunderstorms.

The first step in elucidating the causes of this rainy period is to discuss the abnormalities of pressure with which it was associated. The chart of pressure deviations for March was highly abnormal, pressure being more than 15 mb. below normal over the Azores.* It has been found that centres of negative pressure deviation often move across the chart in a similar way to the barometric depressions shown on daily weather maps, but more slowly. Thus, in March 1912, a marked centre of negative anomaly lay over the British Isles, while in April a similar centre lay to the north of Norway. By constructing a series of 32 charts covering the periods March 1st to 30th, March 2nd to 31st, March 3rd to April 1st and so on, the track of this centre was traced, and it was found that it moved in an almost straight line north-eastward from the British Isles, at a rate just sufficient to carry it to the north of Norway in a month. This progressive movement of low pressure centres was well shown during the late spring and summer of 1924, see Fig. 1, in which the Roman numerals refer to the months of the year. The centre A which lay over the Azores in March 1924, moved north-eastward, and in April lay over Scandinavia. Meanwhile a new negative centre B had appeared north-west of the Azores. In May, centre A had moved into the Arctic Ocean somewhere east of Vardo, while the new centre B had moved to the neighbourhood of the west coast of Ireland. In June, centre B had in turn moved to Scandinavia, and a third centre C had appeared in the North Atlantic, somewhere east of Newfoundland and south of Greenland. In July, centre B lay over the Arctic Ocean, and C occupied a position between Ireland and Iceland. In August centre C had moved only slightly north-eastward, being near the Faroës, and an area of positive anomaly had appeared over the Atlantic to the north of the Azores. In March, pressure was well above normal over Iceland, Jan Mayen and Spitzbergen, and this high pressure persisted throughout April, May and June (Fig. 2). At the same time, pressure was generally above normal over a belt extending in a west-south-westerly

* The chart for March is shown on p. 80 of the *Meteorological Magazine* for May 1924.

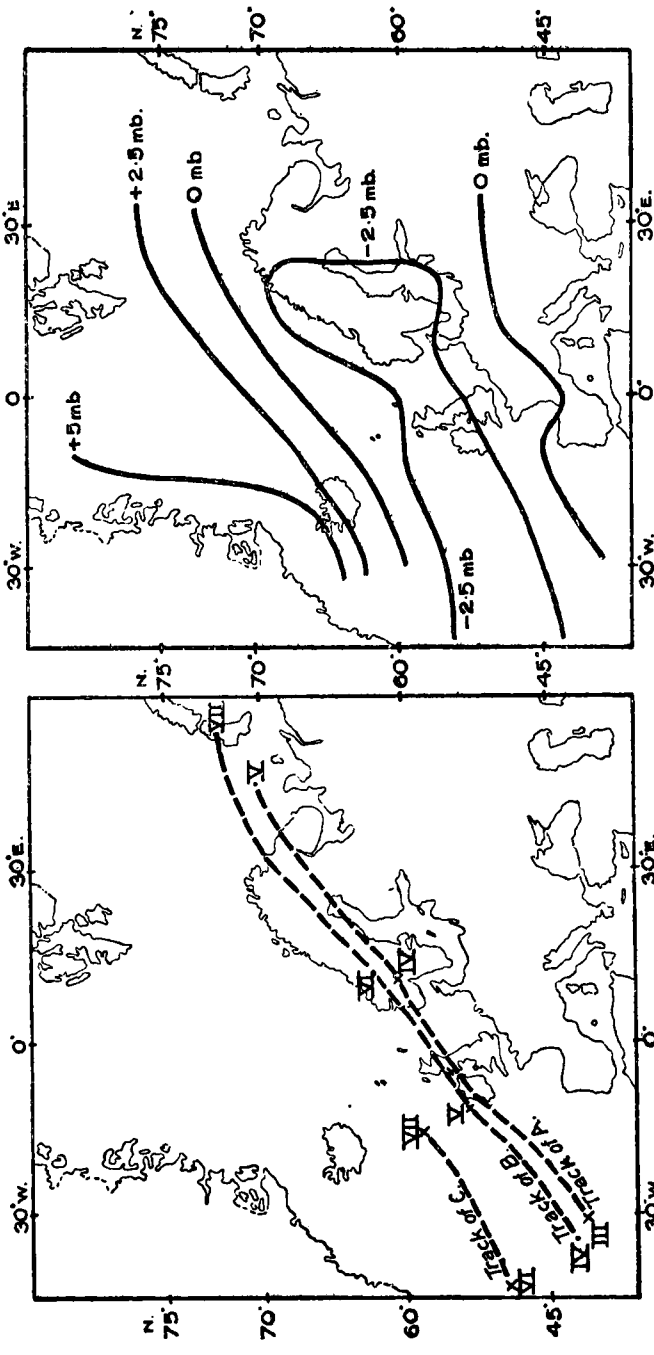

Fig. 1. Tracks of Centres of Negative Pressure Deviation.

Fig. 2. Deviations of Pressure, April to June.

direction from southern Russia, across Italy and Spain towards Madeira. The average pressure distribution during these three months is shown in Fig. 2, from which it will be seen that centres A and B were travelling along a corridor between two centres of high pressure. In July the high pressure between Iceland and Spitzbergen broke down, giving place to small negative deviations, and, with the barometer remaining high over Spain, centre C followed a more northerly course. In August the conditions had changed still more. Pressure was high in the rear of centre C and over Spain, and, the negative deviations over the Baltic having become very slight, the course of centre C was turning more northwards.

The abnormal pressure distribution of the winter and early spring was tentatively attributed to an exceptionally high temperature over the Arctic Ocean,* which persisted from September to February. In the Arctic, high temperature is associated with low pressure and great storminess, which breaks up the edges of the palæocrystic ice and sets free large quantities of field ice to pass into the East Greenland Current.† Ice conditions off East Greenland this year were severe enough to interfere for a time with the plans of the United States flight from Iceland to Greenland, and an unusual amount of ice is certainly effective in raising the mean pressure of spring and early summer. W. Weise‡ found also a southward shift of the mean tracks of depressions during years with much ice in the Greenland Sea compared with the tracks during years with little ice, the average difference being about three degrees of latitude. The East Greenland ice conditions were probably one of the causes of the rainy spell.

Fluctuations in the strength and temperature of the Gulf Stream sometimes have an appreciable effect on the subsequent pressure conditions over the North Atlantic, but on this occasion the Gulf Stream must be held guiltless. The pressure gradient from the Azores to the African coast and from Bermuda to Charleston at the appropriate times approximated to normal, and Commander E. H. Smith, of the Atlantic Ice Patrol, informs me that the temperature of the Gulf Stream off Newfoundland in spring was also normal.

Over the Grand Banks of Newfoundland, between the Gulf Stream and the Labrador Current, the water forms a slowly rotating whirl which is largely isolated from the surrounding

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* *Meteorological Magazine*, Vol. 59, May 1924, p. 79.

† *Q.J.R. Met. Soc.*, Vol. xlviii, 1922, p. 162.

‡ Die Einwirkung des Polareises im Grönlandischen Meere auf die Nordatlantische Zyklonale Tätigkeit. *Ann. Hydrogr., Berlin*, Vol. 50, 1922, p. 271.

currents, and which is kept at an almost uniform temperature through its whole depth of 35 to 40 fathoms owing to mixing. This water is usually very close to 32° F., but in the spring of 1924 it was 5 to 7° F. warmer. Commander Smith attributes this high temperature to the mild winter and the absence of field ice. Pressure data for the south of Greenland are not yet available, but during the three months, January to March, pressure at St. John's, Newfoundland, was 6·8 mb. below normal, whilst pressure at Reykjavik, Iceland, was 1·4 mb. above normal. In these three months St. John's is normally 7·8 mb. above Reykjavik, but in 1924 it was 0·4 mb. below. Hence the strong winds which normally drive the ice and cold surface waters from Davis Strait into the Atlantic were absent, and light winds from the opposite direction predominated. This explains the absence of field ice.

I had previously found a positive correlation between the pressure difference Sydney (Nova Scotia)-Ivigtut (south Greenland) in January to March (1891-1915), and the pressure over Western Europe in the following April to June. This is presumably due to the action of the cold Labrador current in lowering the temperature of and raising the pressure over the eastward-drifting waters of the North Atlantic north of 50° N. According to the results for 1891 to 1915, a pressure-difference between Sydney and Ivigtut, 8 mb. below normal in January to March, should give a pressure deficit during April to June of 4 mb. at Bergen and about 2·4 mb. at Paris and Berlin. These are near enough to the deficits actually found in April to June 1924, to give reason for supposing that the trough of low pressure across western and northern Europe shown in Fig. 2 is a direct consequence of the holding back of the Labrador Current in January to March.

The effect of the Sydney-Ivigtut pressure difference appears to persist until about the fifth month. As the reversal of the normal gradient was greatest in March, there was a tendency for the low pressure trough to continue during August. On the other hand, the effect of ice in the Greenland Sea on pressure is much greater during April, May and June than later in the year, Hence the belt of maximum negative pressure deviation tended to shift northward during July, and southern England was visited by secondaries instead of by the main depressions, giving the month its thundery character. During August, however, the centre of negative deviation lay so close to the north of the British Isles that these islands lay under cyclonic conditions during the greater part of the month.

Meteorological observers are reminded that Summer Time will cease on September 21st at 2h. G.M.T.

OFFICIAL NOTICES

Lightning Investigation

THE Director of the Meteorological Office is investigating the form of lightning discharges, and is very desirous of inspecting as many photographs of lightning as possible. He would therefore be very grateful for the opportunity of inspecting any photographs of lightning which our readers may possess. It is not necessary that the photographs should be technically good, any photograph showing the form of the flash will be valuable.

Photographs will be returned if required as soon as they have been examined.

Discussions at the Meteorological Office

THE series of meetings for the discussion of recent contributions to meteorological literature, especially in foreign and colonial journals, will be resumed at the Meteorological Office during the session 1924-25. The meetings will be held on alternate Mondays at 5 p.m., beginning on Monday, October 13th, 1924, when Dr. Simpson, F.R.S., will open the discussion.

The dates for subsequent meetings are as follows :—

> October 27th; November 10th and 24th, 1924; January 19th; February 2nd and 16th; March 2nd and 16th, 1925.

The Director of the Meteorological Office wishes it to be known that visitors are welcomed at these meetings.

Correspondence

To the Editor, *The Meteorological Magazine*

Fate of Old Weather Records

I WILL not assert that the notes on the vagaries of our climate which we know to have been made by our forefathers of two or three centuries ago were worth their weight in gold, but if they had been handed down to us intact they would, in their simple form, be found of considerable value for modern investigation purposes. Only the merest handful of old registers have been unearthed in the course of recent years, and yet it is certain that many persons did take observations and wrote them for preservation, thinking no doubt that they would be of interest to posterity. What has become of them? As regards some important ones the following provides the answer, which will

be a surprise to many, perhaps to most, readers of the *Meteorological Magazine*.

In the course of the present year *Nature* has given a series of extracts from the Early Science records of the Royal Society, and in the issue for June 28th, 1924, p. 946, there appeared this paragraph :—

> " June 25th, 1684. There was shown an account of the weather during the month of May last, as it was observed at Dublin by Mr. Willian Molyneux."

Many years ago when collecting information for an article on " The Great Storm of 1703," which appeared in the *Cornhill Magazine* for November 1897, I visited Burlington House in the hope of finding some helpful observations in the archives of the Royal Society, but I was disappointed—the Society had nothing.

My next essay was to search numbers of the Philosophical Transactions, but while the result was very disappointing, it afforded a clue to what had become of such records as had been committed to the custody of the Royal Society. In the volume for 1705, at p. 200, there is a reference to Towneley's and Derham's meteorological observations for 1703 and the first part of 1704, ending with " The registers of the winds and weather are omitted as useless." (They included barometer observations by both, certainly for November 25th-29th, and very good ones too, for they were copied by DeFoe for his work on " The Storm.") At p. 206 of the same volume appears a note on the weather register kept by Mr. John Locke, at Oakes, Essex, for the year 1692, giving the state of the barometer, thermometer, hygrometer, wind and weather, " the particulars of which are now no longer of any use." In the volume for 1707, p. 347, Derham's meteorological tables for 1705 are referred to—" This register of the weather it is of no use now to retain."

The Assistant Secretaries afterwards informed me that the Society used to destroy all such documents after storing them for a time, apparently a couple of years. It looks as if we have thus been deprived of series of records for at least the years 1684 to 1705, a period of 22 years, by the best observers of those days.

HY. HARRIES.

10, *Tennis Road, Hove, Brighton. August 8th*, 1924.

Cloud Observations

YOUR readers may be interested in a use to which we have been putting a pilot balloon theodolite at the Central Weather Bureau recently. When used to follow a cloud point in the same way as a balloon it forms a very convenient nephoscope. The cloud direction and relative velocity can readily be derived by

a similar computation to that for a balloon. If an estimate of the cloud height be made, a close approximation to the wind velocity at that height can be deduced.

The method is an obvious one, but it had not occurred to the writer, and the same is probably true of others, to use it until lately. It is more rapid than nephoscope observations of the usual type and generally more accurate. Its value for military purposes in cloudy weather is obvious.

EDWARD KIDSON.

Meteorological Bureau, Melbourne. June 5th, 1924.

A Fireball in 1792

IN the *Chichester Diocesan Gazette* for August, 1924, in an article entitled "Master John Bourne, A Glimpse of Church Life in East Sussex in the Days of George III." by the Rev. G. E. Frewer, there is the following extract from the Journal of the above John Bourne, of Brede, who died in 1793.

> "1792. Nov. 25. Mr. Davis taught a Sermon concerning misforten by a Ball of fire or Litening a few days before on a house in Brede neare the King's head. The dwellers where Mast. Bates Henry Stonham Thos. Fox a single man and Furminger a neighbour unluckily being theire going out part of the Chimly fell on him which hurt him very much. The Tax 2 Sam xxii 14-15. 'The Lord thundered from Heaven . . . He sent out lightning and discomfited them.'"

Mr. Frewer adds "I wish I knew if Mr. Davis' treatment of this passage were moral, spiritual or mystical."

CICELY M. BOTLEY.

10, *Wellington Road, Hastings. August 31st,* 1924.

Heavy Rainfall in Ireland

THE rainfall here at Coolatore for the past 24 hrs. taken this morning was 1·44 in., the fourth heaviest fall in the 24 hrs. for the last 20 years.

H. A. S. UPTON.

Coolatore, Moate, Westmeath. September 8th, 1924.

According to the *Times* a new "record" for a gliding flight has been made at the aerodrome of Les Alpilles near St. Rémy-en-Provence by Lieut. Thoret the French pilot. He remained in the air with the engine of his machine stopped for 9h. 8m. The previous record was held by a German airman who was in the air for 8h. 42m.

NOTES AND QUERIES

Dr. A. Crichton Mitchell

By the retirement on September 30th of Dr. A. Crichton Mitchell the Meteorological Office loses not only an efficient Superintendent but also a real friend in need. When in 1916 every young and able-bodied man wished to do "his bit," Mr. L. F. Richardson, who was then in charge of the Observatory at Eskdalemuir, was pressing the Director to let him get away to France with an ambulance corps, Dr. Mitchell's offer to undertake any job for the Meteorological Office came as a godsend.

Dr. Mitchell had spent many years in India in the Travancore Education Service, and retired in 1913 as Director of Public Instruction. On his return to Scotland he commenced working in physics at the Edinburgh University, but on the outbreak of war he threw himself with characteristic energy into experimenting on harbour defences. Feeling, however, that he would like to undertake some regular work which would set a younger man free for war service, he offered his services to Sir Napier Shaw. Sir Napier received this proposal with delight, and, when he offered Dr. Mitchell the post of Superintendent of the Eskdalemuir Observatory, the latter was nearly equally pleased, for it was work he loved and work with which he was quite familiar, having been in charge of a similar observatory for nearly twenty years at Trivandrum. Dr. Mitchell took up his duties as Superintendent at Eskdalemuir on May 15th, 1916.

The Meteorological Office was again in difficulties in 1920. The Office had taken over from the Scottish Meteorological Society the administration of the Meteorological Office, Edinburgh, and had also undertaken the establishment of a geophysical observatory in the Shetlands. A man was wanted to organise all this work, and, in his need, Sir Napier Shaw again turned to Dr. Mitchell. In the end, Dr. Mitchell was given a sort of roving commission for two years "to superintend what needs to be superintended at Edinburgh, Eskdalemuir and the Shetlands." This was really a very tall order, but work and responsibility never daunted Dr. Mitchell. He retained his headquarters at Eskdalemuir but spent a great deal of time in Edinburgh and made several visits to the Shetlands. He rapidly put the Edinburgh Meteorological Office on its feet, and organised the Geophysical Observatory in Lerwick, the latter being almost entirely the product of Dr. Mitchell's enthusiasm and energy. At the end of two years some of the strain was taken off Dr. Mitchell's shoulders by the appointment of Captain Absalom to take charge of the observatory at Eskdalemuir

under the general supervision of Dr. Mitchell, who then removed to Edinburgh.

Dr. Mitchell can look back over the eight and a half years which he has spent in the Meteorological Office with satisfaction. He has left his mark not only on the official establishments but also on the general level of the meteorological work done voluntarily in Scotland. The great characteristic of Dr. Mitchell's work has been that he has known what he wanted, has worked to get it, and worked still harder when he had got it, but through it all he has shown perfect loyalty to Headquarters and has always been ready to carry out, under instructions, second-best plans when his own ideals could not be attained. G.C.S.

Heavy Rainfall of the Early Morning of August 19th at Cannington, in Somerset

THE heavy rainfall to the east of the Quantock Hills was remarkable for giving one of the largest falls ever recorded in one rainfall day in the British Isles. At Brymore House, about three-quarters of a mile to the west of Cannington, near Bridgwater, the measurement at 9 a.m. on August 19th (*i.e.*, for the rainfall day of the 18th), was 9·04 in.

The largest falls recorded previously are :—

Somerset	...Bruton, Sexey's School ...	...9.56 in.	on June 28th, 1917
,,	... ,, King's School ...	...8.48 in.	,, ,,
,,	...Aisholt, Timbercombe ...	...8.39 in.	,, ,,
Inverness	...Loch Quoich, Kinlochquoich	...8.20 in.	,, Oct. 11th, 1916
Cumberland	...Borrowdale, Seathwaite ...	...8.03 in.	,, Nov. 12th, 1897

Thus only one larger fall has been reported in the British Isles.

Mr. W. Kendall, who measured the rainfall in the presence of two gardeners, has supplied the following details of this large measurement : " About 8½ in. of this rain and hail fell between 3 a.m. and 7.30 a.m. on the 19th. There had been no rain before 11 p.m. on the 18th but several heavy showers fell by 3 a.m. Thunder was heard in the west. It then commenced to rain very heavily and thunder got quite close and frequent. The rain and hail almost stifled the noise of the thunder. As soon as one could see out the place was like a river and in places the water was 4½ feet deep . . . . The raingauge I have here is a " Snowdon " and will hold about 10 in. of water."

Although no direct measurement was made in support of the 8½ in. in 4½ hours mentioned by Mr. Kendall, other observers agree that the period of most intense rainfall was between 3 and 7.30 a.m. There seems little doubt therefore that over that period the mean rate of fall at Brymore House must have been well over 1 in. an hour. Further details are requested about the heavy rainfall in this area.

Reports of damage done by floods suggest that there were two distinct areas of heavy rainfall. One area on the eastern side of the Quantock Hills included the villages of Stogursey, Combwich, Cannington, Fiddington and Nether Stowey. On the other side of Bridgwater heavy rain fell on the Polden Hills, especially in the villages of Cossington, Catcott and Ashcott. No measurements of rainfall are available in either of these areas other than that at Brymore House. From just outside the Quantock Hills area of exceptional damage two rainfall readings have, however, been received, viz., 4·50 in. at Ashford (1 mile to the south-west of Brymore House) and 3·93 in. at Fairfield House to the west of Stogursey. These falls, taken in conjunction with reports of damages, floods, etc., appear to confirm the exceptional amount recorded at Brymore House.

The heavy rainfall was confined to a small area, more than 4 in. probably falling on about 10 sq. miles. In the case of the Bruton rain of June 28th, 1917, more than 4 in. fell over 809 sq. miles. At a distance of 6 miles to the south-west and 7 miles to the north-east of Brymore House only half an inch was recorded. In fact outside an area stretching from Watchet to Warminster more than half an inch of rain appears to have occurred on the rainfall day, August 18th, only in the districts of Dartmoor, Exmoor, and Central Wales.

Many observers commented on the hail which accompanied the rain. Lord St. Audries mentions that at Fairfield House flooding occurred " by water getting into the house owing to the gutters being blocked by hailstones. The following evening there were still remaining immense heaps of hail stones in the back yard which had been removed from the gutters." At Edington on the edge of the Polden Hills there was " a tremendous fall of hail, some of which remained till next evening."

Another feature of special interest is that this is the second measurement of unusually heavy rain in the district. Timbercombe, where the large fall already mentioned of 8·39 in. was measured in 1917, is only 5 miles to the south-west of Brymore House. The fall of the 28th June, 1917, at Brymore House was 4·91 in.

It appears to have rained in the Quantock Hills and Polden Hills on every day from the 14th to 30th. Lord St. Audries writing from St. Audries on August 31st makes these interesting comments: " The recent heavy downpours have been accompanied by remarkably little wind, and in some cases have moved extraordinarily slowly. Several times I have seen and heard of rain a couple of hundred yards off several minutes before it has reached this house." The rainfall of the 19th and 22nd was considerable, as much as ·50 in. and 1·00 in. respectively falling over a large area to the east of the Quantock Hills. The total

for the month at Brymore House was 13·11 in.

Utilising the record at Brymore House, which extends back to 1904, a value of 2·8 in. has been calculated as the average August rainfall for the period 1881 to 1915. The fall of 13·11 in. is 470 per cent. of the average. This is comparable with the maximum monthly percentage falls in the areas of the Bruton and Norwich rains of June, 1917, and August, 1912, respectively. The values were: June, 1917, 410 per cent.; August, 1912, 470 per cent. of the average 1881 to 1915.

J.G.

The Chinese Floods

WHILE England is bewailing a lost summer, China is suffering from floods which are unparalleled in the present century. In the province of Chih-li 25,000 square miles of rich agricultural plain are under water, and it is estimated that nearly five million people are homeless. The level of the water is three feet higher than during the great flood of 1917, when three million people were involved and the material damage done was estimated at £25,000,000.

The district between Tientsin and the Shansi Mountains is the meeting ground of five rivers, all of which bring down great quantities of silt from the mountains. This is deposited in the river bed, raising its level. The waters are restrained by embankments, and in places flow many feet above the level of the surrounding country, so that if a gap is broken in the embankment a river may flood a wide area of country. The average annual rainfall is not large—only twenty inches a year, but it falls almost entirely within the three months July to September, and since the deforestation of the mountains the summer months have been a period of anxiety even in normal years. This year, the summer rainfall has been abnormally heavy; at Pekin 26 in. fell during July alone, 9·38 in. falling in two days (15th and 16th), while at Tientsin 32 in. fell in three weeks. Owing to these heavy rainstorms the rush of water from the mountains has broken numerous gaps in the banks, and the rivers have spread out over all the low-lying country. The floods are aggravated by the embankments which have been built from time to time to protect Tientsin, and which prevent the water from escaping directly to the sea. Up to the time of writing, Tientsin itself has not suffered greatly, but there is still a month of the rainy season to pass, and if the abnormal rainfall continues the water may break through the embankments and flood the whole city.

The meteorological situation which favours floods in north China is a strengthening of the south-east monsoon. This comes about owing to a fall of pressure below normal over the

of measuring tapes constructed of invar. Ramsden's theodolite interior, while the North Pacific anticyclone occupies a more northerly position than usual. The stronger monsoon not only brings more rain but to some extent holds back the water in the rivers. This condition of affairs occurred in 1911 and 1917, and so far as one can judge from the scattered information available, a similar situation began to develop in May of this year. The main flood problem of north China, however, is one not of meteorology but of river conservancy.

If two new outlets to the sea were cut, one to the north and one to the south of Tientsin, the danger of excessive floods would be averted. An admirable article in *The Times* of September 2nd points out that after the flood of 1917 the Chih-li Conservancy Commission prepared definite plans to this effect which would require an expenditure less than the average annual loss, but in the present condition of the country there is no likelihood that these will be carried out.

The Geophysical Exhibition at the Science Museum

THIS exhibition has been arranged to supplement the exhibition of Geophysical work and instruments which has been organised by the Royal Society Committee of the British Empire Exhibition at Wembley. As the space in the British Government Pavilion is limited, many geophysical exhibits can only be shown there for a portion of the time during which the Exhibition at Wembley is open. They are therefore being exhibited in turn, each section being shown for a period of six weeks. In order, however, that the whole collection may be available to the public throughout the period of the Exhibition, accommodation has been provided at the Science Museum, in which the exhibits will remain on view for the rest of the period.

The sections included under the heading Geophysics, comprise Geodesy, Seismology, Terrestrial Magnetism, Atmospheric Electricity, Meteorology, Atmospheric Pollution, Hydrology and Gravity, each section being supplemented by a number of objects of interest selected from the collection of the Science Museum.

Geodesy is represented by three maps which illustrate respectively the first order triangulation, the precise levelling, and the topographical and geographical mapping of the Empire. Of the Museum exhibits, Colby's Bars and Ramsden's three foot altazimuth theodolite are specially interesting. Colby's Compensation Bars were designed to eliminate the errors due to the impossibility of determining accurately the temperature of ordinary measuring bars at the time of observation. They were used in determining some of the baselines for the Trigonometrical Survey of Great Britain, but they have now been superseded by the use

was constructed in 1790, and was in constant use in the Survey from 1792 to 1862.

The Seismology exhibit which was on view in the British Government Pavilion from August 18th to September 14th, includes Mr. J. J. Shaw's latest improvement of the Milne-Shaw seismograph, which is shown in operation, while on a map of the world are plotted the positions of seismological disturbances recorded during the period 1913-1919 at either Shide or Oxford. In addition a map is exhibited showing the seismological stations which send records to Oxford or have done so in the past.

In the Atmospheric Electricity section a number of records obtained at British Observatories indicate the variations of electric potential gradients associated with various types of weather, from the continous positive trace of fine weather to the violent fluctuations associated with thunderstorms. There is also a recording Dolezalek electrometer, used for recording the earth's potential gradient. Modern instruments in general use for measurement of the elements of Terrestrial Magnetism are displayed alongside instruments which were in use well over a hundred years ago. The most modern types of instruments, including the Schuster-Smith absolute magnetometer for determining the horizontal component, the Kew magnetometer for declination and horizontal force, and the Smith recording magnetograph, are remarkable for their delicacy and accuracy, and, one might almost add, for their beauty. This exhibit also includes records of magnetic storms taken simultaneously at the various geophysical observatories, and auroral sketches made by Dr. E. A. Wilson on Captain Scott's First (Discovery) Antarctic Expedition.

The Meteorology exhibit is very complete, and much greater space than is available here would be required to do justice to it. A case of ancient and modern weather charts includes a reproduction of part of the earliest journal of the weather in England, that kept by the Rev. William Merle from 1337-1344. Large maps show the distribution of the average annual rainfall over the whole world and the average loss by evaporation. Series of cloud photographs, including some taken from aeroplanes are arranged to show the various types of cloud formations, and these include an attractive series of transparencies by Mr. G. A. Clarke which can be lit up from behind. A photograph of the whole sky on one plate, taken by Mr. R. Hill with a special lens, is shown. The exhibition of instruments is admirably designed to show the history of the different types. The barometers include a "diagonal barometer," dating from about 1750, in which the upper portion of the tube is greatly inclined to obtain an open scale—a process rendered unnecessary by the invention of the vernier. Three cases are devoted to instruments for measuring

the humidity of the air, including Hooke's oat-beard hygrometer of 1664, Daniell's hygrometer (1819), and a number of instruments constructed of such varied material as hair, wood and whalebone. The anemometers include the first pressure-tube instrument, designed by Lind in 1775, and the curious shot pressure-plate anemometer for recording the maximum gust. Other cases contain sunshine recorders and radiation thermometers, and various types of rain-gauges, including Symons' Storm Gauge, referred to in the article on p. 150 of the August number of this magazine. Various forms of balloon and kite meteorographs are shown, together with the other equipment necessary for the investigation of the upper air.

The section on Atmospheric Pollution is represented by a set of the instruments employed in measuring this important element. The Gravity exhibit traces the history of the measurements of the density of the earth and the local variations of g, including the measurements at Schiehallien in 1774-6, the apparatus used by Baily in 1841-2, and that of C. V. Boys in 1889-94, both of which employ the attraction of large lead spheres. The most modern instruments include the Wade Latitude instrument and the Eötvös Torsion Balance. Two charts show the positions of gravity stations in Europe and the World, and there are a number of diagrams and records illustrating the methods employed and the results obtained by Dr. Vening Meinesz in his determination of gravity at sea in the Dutch Submarine KII during the latter part of 1923. The exhibition is an education in the history of the geophysical sciences, and especially in the great strides which have been made in the precision of measurements during recent years. Many of the instruments are dissected to show the principles on which they are based.

The Kew Pattern Barometer—Marine Type

THE outstanding difference in the design of the Kew pattern Marine Barometer and that of the Kew Station Barometer, is the introduction of a length of capillary in the tube of the former in order to reduce the " pumping " or oscillation of the mercury column due to the motion of the ship. The choice of the dimensions of the capillary portion is a matter of some importance, for they must be such that the capillary reduces appreciable pumping while not unduly interfering with the responsiveness of the barometer to pressure changes. These conditions are ensured in practice by specifying the " falling time " of the barometer, which is defined as the time taken by the mercury to fall from 1·5 to 0·5 in. above the true barometric height. In the case of marine barometers supplied by the Meteorological Office to observing ships, the falling time lies between 3 and 6 minutes.

The method of adjusting the capillary in order to ensure that the falling time comes within the specified limits varies among different instrument makers, but there is little doubt that, at the present time, the introduction of a suitable capillary involves a certain amount of manipulation. There has been no general method by which a maker could produce a marine barometer with a falling time within closer limits than those normally specified.

As a result of investigations carried out in the Instruments Division of the Meteorological Office during the last two years, it has now been possible to construct a Kew pattern Marine barometer having a given falling time. The method consists in simply specifying the bore of the glass tube at the top and the length and bore of the capillary in the middle of the tube. A special feature of the barometer is its wide cistern, in consequence of which the scale is only 1½ per cent. contracted as compared with the Fortin instrument. The various dimensions of the tube were so chosen that the falling time from 52 to 18 mb. above the actual barometric height would be five minutes. A barometer (No. M.O.2209) was made for the Office by Messrs. S. & A. Calderara of Springfield Gardens, Clapton, according to the new specification, and was found to have, actually, a falling time of five minutes, the difference between the theoretical and experimental values not exceeding two or three seconds. Also the " lagging time " of this barometer (M.O. 2209) was found to be in accordance with Stokes' theory. It is hoped that a paper on the subject will be published shortly.

A New Rain Measure

ONE of the difficulties which have been felt in the past by rainfall observers has been the accurate measurement of small quantities of rain of the order of an hundredth of an inch or less. In the ordinary pattern measuring glass with flat base it is very difficult to determine the lowest graduations with accuracy, and the errors in estimating falls of less than one-hundredth of an inch (one-tenth of a millimetre in the case of millimetre glasses) may well make a serious difference to the number of raindays reported at a particular station.

More than one attempt has been made in the past to improve the pattern of the measuring glass with a view to overcoming this defect. Among the modified forms, probably the best known is the " Camden " measure, which is used by several rainfall observers in this country. In this measure the glass tapers towards the bottom so that the graduations are more widely spaced than in the ordinary measure. Moreover a special graduation, ·005 in., is engraved on the glass so that the question whether the rainfall shall be counted as ·01 in. or " trace," may

be answered with confidence. The external diameter of the Camden is, however, uniform throughout its length, so that the lower tapered portion is surrounded by a thick wall of glass, and in taking readings at the lower graduations it is extremely difficult to avoid errors due to parallax. The advantages which the measure is intended to possess are largely discounted.

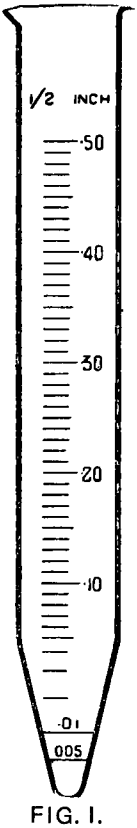

FIG. I.

Measuring glasses of a new pattern have recently been adopted by the Meteorological Office, and are now in use at certain official stations. The measure tapers at the lower end similarly to the Camden glass, but the walls are of uniform thickness throughout, so that the chief defect of the latter measure is overcome. Very fine limits have been laid down by the Meteorological Office with regard to the accuracy of the lower graduations, and it is possible to measure small quantities of rain accurately. A drawing of the new glass is shown in Fig. I.

It will be observed that the new measure is not provided with a base of any kind, a fact which might at first appear a disadvantage. It is intended that the measure should be held in the hand when taking a reading, as illustrated in Fig. II. In order to assist the observer to hold the glass vertically the graduations for each twentieth of an inch (each whole millimetre in the case of the millimetre measure) are reproduced on the back of the glass, the lower graduations (·01 in. and ·005 in.) extending completely round the measure. The risk of error from lack of verticality is actually less than in the case of the ordinary glass which may not stand vertical on its base, or which may be placed for reading on a table or support which is not level. If it were found desirable to support the glass in some way when pouring in the rain from the container of the gauge, a brass ring fixed in a post about three feet in height near (but not too near) the raingauge would serve. The open end of the measure is splayed sufficiently to allow this to be done. The measure can be conveniently stored when not in use by inverting it on a fixed vertical peg in a protected position. The risk of breakage is thereby minimised. Observers who have not used a measure with the ·005 in. graduation before should note that an entry ·005 should not be made in the register. If when the rainwater is poured into the measure the bottom of the meniscus is below ·005 the appropriate entry is " trace," when above the mark the entry is ·01. Doubtful cases are rare, the rule is to give the rain the benefit of the doubt and enter ·01.

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FIG. 11.—THE NEW TAPERED RAIN MEASURE IN USE.

Rainfall observers who report to the Meteorological Office can now obtain measures of the new type on application to the Director. The price of a new measure (graduated in inches or millimetres) for a 5 in. gauge is 6s. 1d., plus 9d. the cost of postage.

Probability Paper

WHILST it is well known that the distribution of many meteorological elements obeys more or less closely the law of errors, verification in particular instances is troublesome. It is interesting to notice that in discussing, in the *Monthly Weather Review* for March, 1924, " The Frequency of Winds of Different Speeds at Flying Levels between New York and Chicago," the authors, W. R. Gregg and J. P. Van Zandt, utilise " Probability Paper " to show that the west to east component of the wind is characterised by such a distribution. The mean component is 7·4 miles per hour from west, and half of the components are between 18·3 m.p.h. from west and 3·5 m.p.h. from east. The illustration of probability paper bears the name of the General Electric Company. Is such paper to be obtained in this country ?

Obituary

WE regret to learn of the death of Mr. C. Percival Bolton of Brook Lodge, Waterford, in July last. Mr. Bolton had maintained observations of rainfall at Brook Lodge since 1875, and the record has been published in this magazine since March, 1881. His sister, Miss Bolton, has offered to continue the rainfall observations, and the monthly total appears again in this number.

The Weather of August, 1924

THE weather during August was mainly cool and unsettled, with westerly winds. At the beginning of the month rain fell generally over the whole country, but this was followed by a short spell of anticyclonic conditions from the 6th to the 10th, during which period 13 and 14 hours of bright sunshine were registered daily at several stations. At a few places in the north-eastern counties the week ending the 9th was rainless. On the 11th, the approach of a depression south of Iceland caused a renewal of unsettled weather on the western seaboard and this subsequently spread south-eastwards. For the rest of the month pressure continued generally low in the north and north-west, and rain fell repeatedly over the whole country. The most noteworthy depression of the month was the one which crossed Ireland and England in an easterly direction on the 17th, causing

high winds or gales in the English Channel and some other parts of our coasts and subsequently followed an unusual track, moving north-westwards from the North Sea and then returning slowly first south then east across Scotland to the North Sea.

There was a comparatively small range of temperature, the deviation from the average being much more marked by day than by night. 79° F. was the highest temperature recorded during the month and this occurred in London on only one day, the 11th. The night of the 4th to 5th was very warm in many parts of England, temperature not falling below 60° F. at some stations. Ground frosts occurred at isolated places on a few nights.

The total rainfall for the month was very variable, some places having less than their average amount while a few had more than twice their average. Among the heaviest total falls were 457 mm. (18 ins.) at The Stye, Seathwaite, 335 mm. (13·19 ins.) at Delphi Lodge, Mayo, and 305 mm. (12·01 ins.) at Llyn Fawr, Glamorgan. It was, however, largely due to the frequency of precipitation rather than its magnitude that the month seemed so unusually wet, though at a few places there were heavy falls, mainly associated with thunderstorms. On the 19th in particular torrential rain and hail were experienced at Cannington (Somerset), when the observer at Brymore House measured 230 mm. (9·04 ins.) in the 24 hours (see p. 187).

During the first half of August mainly fair weather prevailed over Europe with thunderstorms in many districts. On the 7th a violent thunderstorm broke over the central plateau and eastern departments of France, interrupting communications and causing much damage to the harvest and vineyards. Temperature was rather high at the beginning of the month, but on the twelfth the weather changed for the worst, and remained unsettled until the end of the month, most places having lower temperatures and more rain than usual. However, in parts of Spain, the drought continued; Madrid itself on the 16th had been 100 days without rain. The crops in Andalusia, Aragon and Catalonia are reported to be failures through lack of rain. In Finland also owing to the heat and drought considerable areas of forest were burning. At the beginning of the month, the river Isar was in flood near Munich, and in southern Poland the floods destroyed a number of bridges and houses. Hungary reports that the wine crop wi l be far below the average this year owing to unfavourable weather, but the other crops are mostly normal. The severe weather in Switzerland continued, and a party of tourists were weather-bound on the Matterhorn from the 10th to the 15th. On the 28th fresh snow was covering the Bernese Oberland down to 3,000 ft., and the thermometer fell

to freezing point at Davos and St. Moritz on the 29th. Very heavy rainfall was reported from the districts round Lakes Maggiore and Varese on the 15th. In the central and southern districts of Norway floods have done great damage and a number of people have been rendered homeless.

In India, the rains in Madras have caused considerable floods, and large areas have been inundated. At Mercara, the capital of Coorg, the rainfall for June and July was over 100 inches, 24 inches falling on one day alone. In Bombay, where the harvest was threatened by drought, moderate rains have eased the situation. The reports concerning the floods in China show that intermittent rain continued to augment the area already covered with water, but that the pressure on Tientsin has been eased (see p. 189). Floods are also reported from Formosa, where 700 people have been drowned.

The eastern United States suffered from a heat wave at the beginning of August, Washington having a maximum temperature of 102° F. on the 6th. Destructive thunderstorms were reported from many districts. Owing to the heat and lack of rain in the south-eastern States the outlook for the cotton crop is unfavourable. During the evening of the 26th a hurricane swept the western Atlantic and several liners reported injuries to passengers and damage to the ships. During the 28th-29th another hurricane swept the Leeward Islands. Enormous damage was done to property and to crops and there were more than one hundred casualties.

From Australia comes the news that splendid rains have fallen on the wheat areas. The rain was less welcome as floods followed in the low-lying districts of Victoria.

The special message from Brazil, states that the winter rains were plentiful in the north-east, being 62 mm. above the normal for the month, but that elsewhere the rainfall was scanty, being 20 mm., 25 mm. and 60 mm. below normal in the northern, central and southern districts respectively. Temperature was 3·6° F. below the normal, a cold spell having occurred in the middle of the month. Many well developed anticyclones continued to cross the country quickly. The lack of rain and unusually low temperature have been very unfavourable for the cane and coffee crops. Pressure at Rio de Janeiro was 3·6 mb. above normal and temperature 1° F. below normal.

Rainfall August, 1924: General Distribution

England and Wales	114	per cent. of the average 1881-1915.
Scotland	113	
Ireland	112	
British Isles	113	

Rainfall: August, 1924: England and Wales.

CO.	STATION.	In.	mm.	Per-cent. of Av	CO.	STATION.	In.	mm.	Per-cent. of Av.
Lond.	Camden Square.....	2·72	69	123	*War.*	Birminghm, Edgbaston	3·50	89	129
Sur .	Reigate, Hartswood...	3·74	95	163	*Leics*	Leicester Town Hall...	2·53	64	...
Kent.	Tenterden, View Tower	3·12	79	136	,, .	Belvoir Castle.....	2·66	68	102
,, .	Folkestone, Boro. San.	3·52	89	...	*Rut .*	Ridlington.....	2·24	57	...
,, .	Broadstairs	1·70	43	82	*Linc.*	Boston, Skirbeck	1·99	51	83
,, .	Sevenoaks, Speldhurst.	2·85	72	...	,, .	Lincoln, Sessions House	2·85	72	116
Sus .	Patching Farm.....	3·47	88	138	,, .	Skegness, Estate Office.	1·80	46	74
,, .	Eastbourne, Wilm. Sq.	3·34	85	135	,, .	Louth, Westgate	1·93	49	69
,, .	Tottingworth Park....	5·28	134	196	,, .	Brigg	2·18	55	78
Hants	Totland Bay, Aston...	2·59	66	116	*Notts.*	Worksop, Hodsock....	3·17	81	129
,, .	Fordingbridge, Oaklnds	3·09	79	117	*Derby*	Mickleover, Clyde Ho..	3·27	83	120
,, .	Portsmouth, Vic. Park.	2·61	66	117	,, .	Buxton, Devon. Hos...	8·04	204	184
,, .	Ovington Rectory	2·67	68	99	*Ches.*	Runcorn, Weston Pt...	5·57	141	155
,, .	Grayshott	3·03	77	108	,, ..	Nantwich, Dorfold Hall	4·23	107	...
Berks	Wellington College...	2·67	68	115	*Lancs*	Bolton, Queen's Park .	8·53	216	...
,, .	Newbury, Greenham..	2·36	60	90	,, ..	Stonyhurst College....	7·54	191	149
Herts.	Bennington House....	1·92	49	79	,, ..	Southport, Hesketh...	4·44	113	128
Bucks	High Wycombe	2·81	71	121	,, ..	Lancaster, Strathspey.	4·66	118	...
Oxf..	Oxford, Mag. College..	2·05	52	91	*Yorks*	Sedbergh, Akay	4·64	118	83
Nor .	Pitsford, Sedgebrook..	2·00	51	83	,, .	Wath-upon-Dearne ...	2·81	71	117
,, .	Eye, Northolm.....	1·48	38	...	,, .	Bradford, Lister Pk...	2·86	73	111
Beds.	Woburn, Crawley Mill.	2·27	58	101	,, .	Oughtershaw Hall	6·74	171	...
Cam.	Cambridge, Bot. Gdns.	2·25	57	96	,, .	Wetherby, Ribston H..	4·79	122	175
Essex	Chelmsford, CountyLab	2·04	52	...	,, .	Hull, Pearson Park ...	2·33	59	80
,, .	Lexden, Hill House...	1·95	49	...	,, .	Holme-on-Spalding ...	2·90	74	...
Suff .	Hawkedon Rectory ...	2·44	62	94	,, .	Lowthorpe, The Elms.	1·92	49	70
,, .	Haughley House.....	2·85	72	...	,, .	West Witton, Ivy Ho..	1·81	46	...
Norf.	Beccles, Geldeston....	1·81	46	84	,, .	Pickering, Hungate ...	2·69	68	...
,, .	Norwich, Eaton	2·39	61	101	,, .	Middlesbrough	3·32	84	121
,, .	Blakeney	1·77	45	78	,, .	Baldersdale, Hury Res.	1·99	51	57
,, .	Swaffham	2·37	60	91	*Durh.*	Ushaw College	2·44	62	84
Wilts.	Devizes, Highclere....	2·86	73	99	*Nor .*	Newcastle, Town Moor.	3·27	83	112
Dor .	Evershot, Melbury Ho.	2·77	70	88	,, .	Bellingham Manor....	2·64	67	...
,, .	Weymouth, Westham..	2·30	58	107	,, .	Lilburn Tower Gdns...	1·85	47	...
,, .	Shaftesbury, Abbey Ho.	3·71	94	127	*Cumb*	Penrith, Newton Rigg..	2·21	56	62
Devon	Plymouth, The Hoe...	2·92	74	98	,, .	Carlisle, Scaleby Hall .	3·79	96	92
,, .	Polapit Tamar	4·97	126	156	,, .	Seathwaite	10·20	259	88
,, .	Ashburton, Druid Ho..	4·38	111	117	*Glam.*	Cardiff, Ely P. Stn.....	6·09	155	141
,, .	Cullompton	4·23	107	139	,, .	Treherbert, Tynywaun	11·27	286	...
,, .	Sidmouth, Sidmount ..	3·52	89	125	*Carm*	Carmarthen Friary....	5·39	137	116
,, .	Filleigh, Castle Hill ...	7·35	187	...	,, .	Llanwrda, Dolaucothy.	8·53	217	155
,, .	Hartland Abbey.....	4·06	103	...	*Pemb*	Haverfordwest, Portf'd	4·42	112	106
Corn.	Redruth, Trewirgie ...	3·30	84	96	*Card.*	Gogerddan.....	6·85	174	141
,, .	Penzance, Morrab Gdn.	2·57	65	81	,, .	Cardigan, County Sch. .	3·65	93	...
,, .	St. Austell, Trevarna..	4·58	116	126	*Brec .*	Crickhowell, Talymaes	6·00	152	...
Soms	Chewton Mendip	6·04	153	135	*Rad .*	Birm.W.W.Tyrmynydd	6·35	161	118
,, .	Street, Hind Hayes ...	5·91	150	...	*Mont.*	Lake Vyrnwy	6·64	169	128
Glos..	Clifton College	4·69	119	134	*Denb.*	Llangynhafal	3·89	99	...
,, .	Cirencester	4·00	102	130	*Mer .*	Dolgelly, Bryntirion..	9·64	245	171
Here.	Ross, County Obsy. ...	3.02	77	118	*Carn.*	Llandudno	3·06	78	101
,, .	Ledbury, Underdown.	3·45	88	132	,, .	Snowdon, L. Llydaw 9	22·95	583	...
Salop	Church Stretton.....	3·74	95	115	*Ang .*	Holyhead, Salt Island.	3·13	79	98
,, .	Shifnal, Hatton Grange	3·42	87	122	,, .	Lligwy	3·41	87	...
Staff.	Tean, The Heath Ho...	4·98	126	143	*Isle of Man*				
Worc.	Ombersley, Holt Lock.	3·00	76	112		Douglas, Boro' Cem...	5·48	139	141
,, .	Blockley, Upton Wold.	3·01	77	102	*Guernsey*				
War.	Farnborough.....	3·62	92	133		St. Peter Port Grange.	2·85	72	121

Rainfall: August, 1924: Scotland and Ireland

CO.	STATION	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent. of Av.
Wigt.	Stoneykirk, Ardwell Ho	3·64	93	97	*Suth.*	Loch More, Achfary...	7·62	193	130
,, .	Pt. William, Monreith .	4·02	102	...	*Caith*	Wick	2·30	58	84
Kirk.	Carsphairn, Shiel.	6·66	169	...	*Ork .*	Pomona, Deerness	3·12	79	109
,, .	Dumfries, Cargen.....	4·67	119	106	*Shet .*	Lerwick	1·74	45	58
Dum	Drumlanrig	4·41	112	104					
Roxb	Branxholme	3·02	77	94	*Cork.*	Caheragh Rectory	4·36	111	...
Selk .	Ettrick Manse.....	4·73	120	...	,, ..	Dunmanway Rectory.	3·52	89	75
Berk.	Marchmont House	3·61	92	109	,, ..	Ballinacurra	1·97	50	53
Hadd	North Berwick Res....	2·55	65	81	,, ..	Glanmire, Lota Lo. ...	2·40	61	66
Midl	Edinburgh, Roy. Obs..	3·05	77	104	*Kerry*	Valencia Obsy.	5·03	128	105
Lan .	Biggar	2·97	75	89	,, .	Gearahameen	5·50	140	...
Ayr .	Kilmarnock, Agric. C..	4·13	105	105	,, .	Killarney Asylum.....	5·67	144	128
,, .	Girvan, Pinmore.....	4·64	118	104	,, .	Darrynane Abbey	5·23	133	120
Renf.	Glasgow, Queen's Pk..	3·10	79	88	*Wat .*	Waterford, Brook Lo..	2·72	69	71
,, .	Greenock, Prospect H..	3·80	97	70	*Tip .*	Nenagh, Cas. Lough...	2·61	66	66
Bute.	Rothesay, Ardencraig.	5·16	131	106	,, .	Tipperary	4·13	105	...
,, .	Dougarie Lodge	4·96	126	...	,, .	Cashel, Ballinamona ..	3·44	87	97
Arg .	Glen Etive.....	...	...	...	*Lim .*	Foynes, Coolnanes	4·55	116	118
,, .	Oban	5·43	138	...	,, .	Castleconnell Rec.	5·56	141	...
,, .	Poltalloch	6·54	166	133	*Clare*	Inagh, Mount Callan ..	8·97	228	...
,, .	Inveraray Castle.....	...	...	...	,, .	Broadford, Hurdlest'n.	5·21	132	...
,, .	Islay, Eallabus.....	6·40	163	147	*Wexf*	Newtownbarry	3·61	92	...
,, .	Mull, Benmore	15·50	394	...	,, .	Gorey, Courtown Ho...	2·80	71	84
Kinr.	Loch Leven Sluice	3·06	78	80	*Kilk.*	Kilkenny Castle	2·87	73	82
Perth	Loch Dhu	5·25	133	78	*Wic .*	Rathnew, Clonmannon	1·91	49	...
,, ..	Balquhidder, Stronvar.	5·03	128	83	*Carl .*	Hacketstown Rectory .	4·19	106	103
,, ..	Crieff, Strathearn Hyd.	4·35	111	103	*QCo..*	Blandsfort House.....	3·50	89	89
,, ..	Blair Castle Gardens ..	4·78	121	...	,,	Mountmellick	3·61	92	...
,, .	Coupar Angus School..	3·07	78	93	*KCo.*	Birr Castle.....	3·77	96	99
Forf.	Dundee, E. Necropolis.	2·88	73	85	*Dubl.*	Dublin, FitzWm. Sq...	3·02	77	99
,, .	Pearsie House.....	4·39	111	...	,, .	Balbriggan, Ardgillan .	4·12	105	121
,, .	Montrose, Sunnyside..	3·76	95	135	*Me'th*	Drogheda, Mornington	3·78	96	...
Aber.	Braemar Bank	3·47	88	103	*W.M*	Mullingar, Belvedere .	3·92	100	94
,, .	Logie Coldstone Sch. ..	6·24	159	197	*Long*	Castle Forbes Gdns....	5·18	132	127
,, .	Aberdeen, Cranford Ho	2·75	70	95	*Gal .*	Galway, Waterdale ...	...	...	...
,, .	Fyvie Castle	5·95	151	...	,, .	Ballynahinch Castle ..	7·60	193	...
Mor .	Gordon Castle.....	5·05	128	159	*Mayo*	Mallaranny.....	9·53	242	...
,,	Grantown-on-Spey....	6·15	156	192	,, .	Westport House.....	5·83	148	144
Na .	Nairn, Delnies.....	4·68	119	194	,, .	Delphi Lodge	13·19	335	...
Inv..	Ben Alder Lodge	4·52	115	...	*Sligo*	Markree Obsy.	7·91	201	183
,, .	Kingussie, The Birches	4·13	105	...	*Ferm*	Enniskillen, Portora ..	...	...	...
,, .	Fort Augustus	3·95	100	114	*Arm.*	Armagh Obsy.	4·42	112	122
,, .	Loch Quoich, Loan....	8·20	208	...	*Down*	Warrenpoint	4·74	120	...
,, .	Glenquoich	7·01	178	85	,, .	Seaforde	3·93	100	105
,, .	Inverness, Culduthel R.	4·43	112	...	,, .	Donaghadee	3·31	84	100
,, .	Arisaig, Faire-na-Squir	7·11	181	...	,, .	Banbridge, Milltown .	5·13	130	147
,, .	Fort William.....	6·38	162	104	*Antr.*	Belfast, Cavehill Rd. ..	5·44	138	...
,, .	Skye, Dunvegan.....	6·04	153	...	,, .	Glenarm Castle.....	4·17	106	...
,, .	Barra, Castlebay	3·57	91	...	,, .	Ballymena, Harryville	6·45	164	151
R&C	Alness, Ardross Cas. ..	4·59	117	156	*Lon .*	Londonderry, Creggan	6·89	175	149
,, .	Ullapool.....	8·12	206	...	*Tyr .*	Donaghmore	4·87	124	...
,, .	Torridon, Bendamph..	7·00	178	106	,, .	Omagh, Edenfel	6·64	169	155
,, .	L. Carron, Plockton...	...	...	...	*Don .*	Malin Head	5·04	128	143
,, .	Stornoway	...	...	...	,, .	Rathmullen.....	6·54	166	...
Suth.	Lairg	5·42	138	...	,, .	Dunfanaghy	4·51	115	102
,, .	Tongue Manse.....	5·87	149	183	,, .	Narin, Kiltoorish	6·33	161	...
,, .	Melvich School.....	4·44	113	149	,, .	Killybegs, Rockmount.	10·34	263	184

Climatological Table for the British Empire, March, 1924

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb.			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0—10	mm.	mm.			
London, Kew Obsy. ..	1012·3	− 1·1	58	26	48·6	33·8	41·2	− 1·2	38·6	75	5·4	21	− 22	8	5·0	42
Gibraltar	1013·6	− 3·4	68	43	60·5	53·5	57·0	− 0·5	53·9	82	8·3	250	+128	26	...	...
Malta	1014·4	+ 0·5	68	44	60·7	51·8	56·3	+ 0·2	52·7	83	5·5	38	+ 4	10	5·9	50
Sierra Leone	1010·4	− 0·5	94	72	90·6	74·9	82·7	0·0	75·9	69	2·8	24	− 4	2	...	...
Lagos, Nigeria	1008·0	− 1·4	93	72	90·7	78·2	84·5	+ 1·6	81·0	77	5·5	134	+ 38	5	...	...
Kaduna, Nigeria	1011·1	0·0	100	...	97·2	...	...	...	71·0	53	0·8	7	− 3	2	...	...
Zomba, Nyasaland ...	1010·2	+ 0·5	87	61	81·8	65·3	73·5	+ 2·8	...	89	7·7	145	− 65	17	...	...
Salisbury, Rhodesia ..	1009·5	− 1·9	87	55	81·2	59·9	70·5	+ 2·4	63·7	68	4·5	87	− 20	14	...	...
Cape Town	1014·9	+ 0·4	91	51	75·0	56·6	65·8	− 2·4	59·8	63	3·8	19	− 5	6	...	...
Johannesburg	1014·7	+ 0·8	82	43	69·5	55·4	62·5	− 0·8	56·9	83	7·4	159	+ 52	18	4·5	37
Mauritius	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	...	...	91	45	76·2	57·1	66·7	− 0·7	60·3	81	3·0	175	+ 74	15	...	...
Calcutta, Alipore Obsy.	1010·1	+ 0·2	102	61	97·4	70·8	84·1	+ 4·0	69·6	72	1·5	0	− 32	0*	...	...
Bombay	1010·0	− 0·7	94	71	89·3	75·7	82·5	+ 3·0	72·7	69	1·6	0	− 1	0*	...	...
Madras	1011·1	+ 0·2	95	64	90·7	71·5	81·1	+ 0·1	74·7	76	2·4	3	− 2	1*	...	...
Colombo, Ceylon	1009·7	− 0·3	93	67	89·2	73·6	81·4	− 0·6	77·4	66	5·4	287	+175	12	7·6	63
Hong Kong	1017·6	+ 1·8	75	52	67·0	59·2	63·1	− 0·2	58·7	79	8·0	5	− 71	8	4·3	36
Sandakan	...	...	89	73	86·6	76·3	81·5	+ 0·4	76·9	77	...	164	− 42	8	...	...
Sydney	1016·1	− 0·1	91	56	76·3	62·5	69·4	+ 0·2	63·2	68	5·8	107	− 23	11	6·3	51
Melbourne	1016·4	− 0·6	91	45	72·9	54·2	63·5	− 1·0	58·3	65	5·9	147	+ 90	8	6·1	50
Adelaide	1016·9	− 0·1	95	49	77·8	56·3	67·1	− 2·8	58·2	53	4·4	53	+ 27	6	6·6	54
Perth, W. Australia ...	1016·4	+ 1·0	96	50	80·2	59·6	69·9	− 1·0	59·9	53	3·3	10	− 8	3	8·0	65
Coolgardie	1016·9	+ 2·1	97	47	79·9	56·9	68·4	− 3·3	59·1	46	4·5	45	+ 26	7	...	...
Brisbane	1014·6	+ 0·5	91	59	82·9	65·8	74·3	− 0·1	68·9	68	4·4	88	− 62	10	8·0	65
Hobart, Tasmania	1015·2	+ 1·2	84	42	67·3	52·1	59·7	+ 0·3	54·9	71	6·4	67	+ 24	16	6·1	50
Wellington, N.Z.	1020·5	+ 3·5	76	46	68·1	56·2	62·1	+ 1·4	57·6	75	6·3	121	+ 38	13	4·7	38
Suva, Fiji	1007·6	− 0·9	93	71	86·0	74·1	80·1	0·0	76·9	84	6·3	349	− 24	23	...	...
Kingston, Jamaica ...	1013·3	− 1·6	92	61	87·1	69·2	78·1	+ 1·0	70·7	65	3·3	5	− 21	4	...	...
Grenada, W.I.	1013·7	+ 0·8	87	71	84·2	72·9	78·5	+ 0·8	72·6	70	2·9	10	− 60	5	...	...
Toronto	1011·8	− 5·2	51	10	37·2	26·0	31·6	+ 2·7	27·3	61	6·3	20	− 47	11	4·6	39
Winnipeg	1021·1	+ 2·3	46	2	33·0	14·8	23·9	+ 9·5	21·0	71	4·4	2	− 25	3	5·5	47
St. John, N.B.	1004·1	−10·1	50	7	36·9	25·2	31·1	+ 2·7	28·4	74	7·2	56	− 59	14	4·0	34
Victoria, B.C.	1017·8	+ 2·0	57	31	51·1	38·9	45·0	+ 1·8	40·6	78	4·9	15	− 50	10	5·8	49

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.