

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 56' N, Long. 3° 40' W, Distance from Sea one mile.Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of January 1866.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.	CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			SEA.	OZONE. 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.			
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		P.M.			9 h. A.M.														
		Barometer. * No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force		Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.		No. 9 inches.	No. 12 inches.	No. 22 inches.							
		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.			Inches.		Inches.			Inches.		Inches.							
		No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.		No.	Inches.	No.	Inches.		No.	Inches.	No.					Inches.	No.	Inches.
	1	29.16	50	29.56	56	38	32	39	37	36	33			SW	2	SW	2		.20			-					Jan'y has been a very mild	1					
	2	29.60	50	29.15	54	42	34	37	35	37	34			SW	2	SW	2		-			2					and three months, Frost	2					
	3	29.46	49	29.47	54	48	42	40	38	48	45			SW	2	SW	3		-			1					only on 6 nights	3					
	4	29.56	52	29.50	50	54	51	50	46	43	41			SW	5	SW	4		.25			2					Solar Halo seen on the 2 ^d	4					
	5	29.70	48	29.50	58	40	32	31	34	36	34			SW	1	SW	1		-			2					and 28 th	5					
	6	29.70	47	29.65	50	39	33	37	35	35	34			SW	1	SW	1		-			2					Rainbow on the 6 th 13 th 14 th	6					
	7	29.20	48	29.10	58	42	35	38	36	41	38			SW	2	SW	4		.10			1 1/2					Stars shooting on the 17 th	7					
	8	28.80	50	28.70	57	38	33	36	35	36	35			W	1	W	3		.18			1/2					Strong gale of wind on the 1 st	8					
	9	29.60	50	28.70	50	37	33	34	32	34	33			SW	1	SW	2		.04			1								9			
	10	29.10	46	29.15	46	36	28	34	33	43	44			SW	1	SW	1		.06			1/2									10		
	11	29.30	42	29.50	48	28	22	29	19	26	26			SW	1	SW	1		-			1									11		
	12	29.44	40	29.72	40	27	22	22	22	24	24			SW	1	SW	1		-			2 1/2										12	
	13	29.05	42	29.38	47	38	37	36	35	39	37			SW	4	SW	2		.10			-										13	
	14	29.26	44	29.15	63	54	40	48	47	47	46			SW	3	SW	3		.20			1 1/2										14	
	15	29.40	45	29.70	53	44	35	40	39	44	42			SW	3	SW	3		.28			1										15	
	16	29.45	44	29.83	53	41	34	40	40	36	34			SW	-	SW	1		.02			-										16	
	17	29.44	50	29.74	56	44	40	38	38	49	48			SE	1	SW	4		.04			-										17	
	18	29.78	53	29.35	56	54	44	48	45	50	45			SW	2	SW	3		-			1 1/2										18	
	19	29.10	54	29.25	54	45	39	45	42	40	38			SW	2	SW	1		.04			3											19
	20	29.15	51	29.55	51	44	33	43	41	38	35			SW	1	SW	1		.30			-											20
	21	29.43	50	29.45	50	42	39	42	40	40	39			SW	1	SW	1		.20			1											21
	22	29.50	50	29.80	51	44	35	41	38	41	39			SW	4	SW	1		-			2											22
	23	30.02	50	30.33	54	43	38	41	39	39	36			SW	1	SW	1		-			4											23
	24	30.40	50	30.39	53	47	43	44	41	43	42			SW	1	SW	1		-			1											24
	25	30.40	51	30.40	56	52	48	46	44	50	46			SW	1	SW	1		-			1 1/2											25
	26	30.40	52	30.25	56	52	43	49	46	45	43			SW	2	SW	2		-			3											26
	27	30.15	52	29.90	59	51	43	46	43	43	40			SW	2	SW	2		-			4											27
	28	29.60	53	29.40	55	48	31	45	41	42	40			SW	4	SW	2		.02			2											28
	29	29.33	50	29.61	60	57	49	33	31	35	33			W	4	W	4		.08			1 1/2											29
	30	30.00	50	29.75	52	41	34	30	29	34	33			SW	1	SW	1		-			1											30
	31	29.40	50	29.15	55	46	40	41	39	44	42			SE	1	SW	1		.03			-											31
	Sums.	913.46	1619	916.19	1633	1341	1092	1218	1160	1219	1159			60		60		2.14				44											
	Means.	29.330	52.233	29.333	53.322	43.223	35.223	39.29	51.47	39.322	37.372			1.235		1.935		.047				1.423											
	† Total Corrections for Instrumental Errors.																																
	† Corrections for Diurnal Range.																																
	“Corrected Means.”																																
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† = 29.464
for Temp. (Col. 2), = 29.532..... 0.068
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 29.487
for Temp. (Col. 4), = 29.553..... 0.066
Mean at Station, corrected, and at 32°..... = 29.476
Correction for Height, feet, above Mean Sea-level, = 0.1
Mean, reduced to 32°, and Sea-level, = 29.577
Highest Reading, corrected for Index error, on the 14 th, = 30.400
Lowest Do., Do., on the 9 th, = 28.600
Difference, or Monthly Range, = 1.800

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 4 th, = 54.0
Lowest in Month, corrected for Index errors, on the 10 th, = 18.0
Difference, or Monthly Range, = 36.0
“Corrected Mean” of all the Highest, (Col. 5), = 43.2
“Corrected Mean” of all the Lowest, (Col. 6), = 35.2
Difference, or Mean Daily Range, = 8.0
** Calculated Mean Temperature of Month, = 39.2

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, =
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =
“Corrected Mean,” (Col. 8), of Black Bulb Min. on grass, =
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 39.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 37.4
†† Computed Temperature of Dew-point, = 34.9
†† Do. Elastic Force of Vapour, = 20.4
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 85
RAIN fell on 17 Days; Amount in Inches, = 2.14

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	2				1	5	2	1			1.93
P.M.	2				6	2	2				1.93
Mean.	2	0	0	1	5	2	2	0	0		1.93

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

William McIndoe

(Signed)

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS, WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

Hour of Observation.—The Council recommend that Observations be made, precisely at 9 o'clock (Greenwich, or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

Barometer.—*Weather-glasses and Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no *adjustment* of the cistern. Its *scale-heights* are not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air, it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the Sun's direct rays nor the heat of a fire.

In taking an *Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from any local influences. The lids forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-bolts, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal: the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the Thermometers for registering the greatest heat from the Sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*" should be freely exposed to the Sun, and the "*Minimum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the Sun's heat to affect the alcohol by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "*Minimum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down*, by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cap must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is encased in a tin case, which also supports the water cap underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and taping them side by side, so that the fastenings of the requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39·9, 40·0, or 40·1; or again, 40·4, 40·5, or 40·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40·3, respectively. So also 40·1, and 40·4, more or less, must be registered 40·2 or 40·3, and 40·7 or 40·8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of Observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological hour. In the Society's schedules, the indications registered on the *box* are those of a series of phenomena commencing at 9 P.M. on the *2nd*, and extending till 9 P.M. on the *3rd*.

Wind.—A wind-vane ought to be elevated 12 feet at least, above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc. Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council would strongly recommend that every Observatory be furnished with a Hemispherical-Cup Anemometer, a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended: the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a snow shower occurs it must be noted in the "*Remarks*," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations only*; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less observation of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus being unable to judge of their amount, we ought not to take them into account in the clouds column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered on a scale of 0 to 10; thus, when the sky overhead is half-covered by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W. (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W.; and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud"

column, an entry of 2, *ci-cs*, (c-g) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

Shading.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column.

Underground Thermometers.As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy; the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Other.—Mention whether Schönbien's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 $\frac{1}{2}$, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—8 is "4," i.e., that it is *blowing* fresh.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought therefore to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-margin. Additional remarks may be made on the margin.

Observations in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena, that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *year-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order,) A. B.

Edinburgh, 9th December 1866.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	GRASSES.	SWITCHING OR ABOVE GROUND.	APPEARING OR ABOVE GROUND.	IN FLOW OR IN BLOSSOM.	IN FRUIT OR IN SEED.
Alder.....	Barley.....	Bare or Blig.....	Oats.....	Wheat.....	Beans.....
Aspen.....	Beech.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Birch.....	Birch.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Elm.....	Elm.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Larch.....	Larch.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Linum.....	Linum.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Oak.....	Oak.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....
Sycamore or Plane.....	Sycamore or Plane.....	Wheat.....	Wheat.....	Wheat.....	Wheat.....

SHRUBS, ETC.	FRUITS.	First in Blossom.	First in Fruit.	First in Ripeness.	First in Deposition.
Barberry.....	Apple.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Bartree or Elder.....	Black Currant.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Broom.....	Cherry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Hazel.....	Gum.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Hawthorn.....	Gooseberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Holly.....	Peach.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Laburnum.....	Pear.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Lilac.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Mazoeon.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Mountain Ash or Rowan.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Red Flowering Currant.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Rhododendron Ponticum.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....
Whin.....	Strawberry.....	Cuckoo.....	Cuckoo.....	Cuckoo.....	Cuckoo.....

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., in perfection; whether any have suffered from blight, diseases, etc., Whether Epizootic disease prevails among Cattle; and the Agricultural condition of the district generally.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

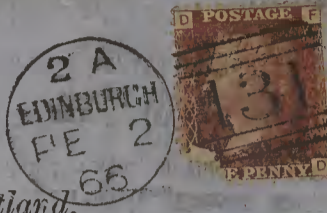
Queen Street,
10 St Andrew Square,

EDINBURGH.

BOOK-POST.

OBSERVATIONS.

Edinburgh
Jan 1866



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Inveresk*, County of *Edinburgh*, in Lat. $55^{\circ}56'08''$ Long. $3^{\circ}40'44''$ Distance from Sea *one* miles.Height of Cistern of the Barometer above Mean Sea-level *Twenty* feet, above Ground *four* feet.During the MONTH of *Feb* 1866.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		Barometer. No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force			Direc- tion.	Force	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 29.420
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.433
Mean at Station, corrected, and at 32°, = 29.426
Correction for Height, feet, above Mean Sea-level, = 1.01
Mean, reduced to 32°, and Sea-level, = 29.527
Highest Reading, corrected for Index error, on the 21st th, = 30.187
Lowest Do., Do., on the 1st th, = 29.000
Difference, or Monthly Range, = 1.187

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
§ *Treadwell*, though not obsolete, is a minus correction.
|| These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the "Calculated Mean Temperature." Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the Observer, in each Schedule. See Over.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 1st th, = 50.0
Lowest in Month, corrected for Index errors, on the 28th, = 29.0
Difference, or Monthly Range, = 27.0
"Corrected Mean" of all the Highest, (Col. 5), = 40.9
"Corrected Mean" of all the Lowest, (Col. 6), = 32.1
Difference, or Mean Daily Range, = 8.8
** Calculated Mean Temperature of Month, = 36.5

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the 1st th, = 50.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 40.9
Lowest at Night, Black Bulb, (corrected for Index errors), on the 28th, = 29.0
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = 32.1
Difference of above Means or Range ("exposed"), = 8.8

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 36.5
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 35.1
†† Computed Temperature of Dew-point, = 33.1
†† Do. Elastic Force of Vapour, = 1.90
†† Do. Weight of Vapour in a Cubic Foot of Air, = 88
†† Relative Humidity, (Saturation = 100), = 88
RAIN fell on 17 Days; Amount in Inches, = 3.34

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.		5	1	1		1	1	9			2.00	
P.M.		5	1	2		1	10	9			2.20	
Mean.		5	1	2		1	10	9	0		2.10	

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

William McQuarrie

(Signed)

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

THE above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the alcohol by distillation.

Registration of Thermometers.—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are not graduated on the stem, but merely on an attached scale, undergoing repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "Minimum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39·9, 40·0, or 40·1; or again, 40·4, 40·5, or 40·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½, under, an exact coincidence with, or a little over 40°, or 40½, respectively. So also 40½, and 40·7 or 40·8 respectively. In reading Rutherford's "Min." and "Max." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of Observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read; since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

Wind.—A wind-vane ought to be elevated 12 feet at least, above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower state of clouds overhead, and to the direction of smoke, etc. Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation pursued at different Stations, would be likely to give highly interesting and important results. The Council could strongly recommend that every Observatory be furnished with a Hemispherical-Cup Anemometer, a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended: the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell. **Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:**—When a snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register *observations only*; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's system, under the following conditions:—When a snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register *observations only*; and nothing that partakes of the nature of deduction or inference.

Self-Registering Thermometers.—Professor Phillips's, and Negretti and Zamboni's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the glass stem. This Thermometer is liable to two disadvantages, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock. **Barometer.** *Weather-glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*. Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes. An excellent Barometer is constructed by Mr. Aile of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its *scale-inches* are not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by the aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *seize* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sherry top* is produced. If this is prevented by an it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired. The Barometer should be suspended in a good light, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

In taking an observation, the attached Thermometer is first adjusted: the tube must then be gently tapped and the cistern-nut carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

OBSERVATIONS.

nonendature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less observation of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half-covered by clouds, 5 is entered as the observation, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2 W., (for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2 ^{est} (e.g.) will indicate that the higher rays cast shadows, should be entered in the proper column.

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy; the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from rain by being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ozone.**—Mention whether Schönbien's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 ⁴, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4," i.e., that it is blowing fresh.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory. **Remarks.**—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off for the purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-margin. Additional remarks may be made on the margin. **Observations in connection with the periodical return of the seasons.** possess not only great scientific value, but are of considerable interest to the agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Council recommend that *year-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order,) A. B. Instruments, 9th December 1866.

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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	IN	LEAF	DIVIDED	OF	MEASURING	CRAPS	SWATHING	OR	PLANTING	IN	FAV	OR	RAISED
Alder													
Aspen													
Beech													
Birch													
Elm													
Larch													
Poplar													
Willow													
Yew													
Other													
Shrub													
Tree													
Grass													
Hay													
Wheat													
Barley													
Oats													
Rye													
Turnip													
Peas													
Beans													
Wheat													
Oats													
Bare or Bigg													
Barley													
CRAPS													
Swathing													
Planting													
IN													
FAV													
OR													
RAISED													

SHRUBS, ETC.	First in Blossom	First in Fruit	First in Ripeness	First in Arrival	Departure
Barberry					
Bourtree or Elder					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
Whin					
Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
Whin					
Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
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Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
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Whin					
Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
Whin					
Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
Whin					
Apple					
Black Currant					
Cherry					
Broom					
Hazel					
Hawthorn					
Holly					
Laburnum					
Labag					
Mezerion					
Mountain Ash or Rowan					
Red Flowering Currant					
Rhododendron Ponticum					
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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Howresk*, County of *Edinburgh*, in Lat. *55° 56' 0"* Long *3° 21' 40" W*, Distance from Sea *one* mile.Height of Cistern of the Barometer above Mean Sea-level *90* feet, above Ground *4* feet.During the MONTH of *March* 186*6*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer. No.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.										
		Barometer. No.	Attached Thermometer.	Barometer. No.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.			Direction.	Force.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.						
																															9 h. A.M.	9 h. P.M.
inches.	inches.	inches.	inches.	No.	No.	No.	No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Density.	0-10.	9 A.M.	9 P.M.			
1	29.60	44	29.68	47	31	27		29	26	29	28	N	1	N	1														March has been a very	1		
2	29.70	44	29.61	48	38	35		29	28	36	35	N	1	N	1														bold and backward month	2		
3	29.50	47	29.68	48	37	29		38	36	33	31	N	2	N	1														with considerable falls of	3		
4	29.74	43	29.82	49	32	19		32	30	29	28	N	1	N	1														snow and keen frosts	4		
5	29.74	43	29.30	46	37	28		22	21	29	27	N	1	N	4														which has retarded	5		
6	29.15	44	29.10	48	34	22		32	32	33	32	N	4	N	1														garden and farm	6		
7	29.10	42	29.32	51	39	31		32	32	32	31	N	1	N	1														operations very much	7		
8	29.77	46	29.94	51	40	32		36	35	33	32	N	4	N	1														snow lay on the ground	8		
9	30.13	44	30.32	50	45	27		38	37	31	30	N	4	N	1														on the first day of month	9		
10	30.40	44	30.34	51	44	33		32	31	37	35	N	1	N	1														5 inches deep and	10		
11	30.22	48	30.06	51	51	38		43	40	42	40	N	1	N	2														on the 7 th 3 inches and	11		
12	29.64	50	29.52	52	49	36		39	37	40	36	N	2	N	1														again on the 22 nd 3 inches	12		
13	29.73	48	29.64	51	39	26		37	34	33	30	N	1	N	1														thunder, stars seen on the	13		
14	29.50	44	29.33	51	39	27		31	28	31	30	N	1	N	1														14 th	14		
15	29.20	44	29.05	49	42	35		34	31	43	41	N	2	N	2														Lunar Halo on the 28 th	15		
16	29.13	43	29.26	52	44	39		40	39	39	37	N	2	N	2																16	
17	29.29	46	29.34	53	47	39		43	41	39	37	N	1	N	1																17	
18	29.34	47	29.44	53	50	37		46	43	41	40	N	1	N	1																18	
19	29.56	48	29.57	51	42	34		39	37	36	34	N	2	N	1																19	
20	29.61	49	29.65	47	39	25		37	35	32	30	N	1	N	1																20	
21	29.67	44	29.74	40	44	16		34	31	27	27	N	1	N	1																21	
22	29.80	44	29.80	54	40	25		26	26	28	28	N	1	N	1																22	
23	29.50	48	29.93	50	40	34		36	35	36	35	N	2	N	5																23	
24	29.80	47	29.26	51	48	39		39	38	42	40	N	2	N	1																24	
25	29.77	50	29.98	57	45	33		44	43	35	34	N	1	N	1																25	
26	30.	50	29.86	58	55	44		44	42	45	34	N	1	N	1																26	
27	29.87	52	29.90	59	56	47		49	47	49	47	N	1	N	2																27	
28	29.90	56	29.94	60	56	45		53	50	46	44	N	1	N	1																28	
29	29.86	57	29.83	60	59	46		53	52	54	51	N	1	N	2																29	
30	29.94	57	30.00	64	54	37		54	50	39	37	N	2	N	1																30	
31	29.90	54	29.76	63	53	30		44	40	30	34	N	1	N	1																31	
										36	34																					
Sums.	2006	170	218	2095	997	129	87		257	197	2035	1945		48		43																
Means.	29.68	47.4	29.67	53.2	44.2	32.8		38.3	36.4	36.6	34.7		1.55		1.4																	
† Total Corrections for Instrumental Errors.																																
† Corrections for Diurnal Range.																																
"Corrected Means."																																
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = *29.648*..... - *0.50*..... = *29.598*

"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = *29.675*..... - *0.65*..... = *29.572*

Mean at Station, corrected, and at 32°, = *29.588*

Correction for Height, feet, above Mean Sea-level, = *1.01*

Mean, reduced to 32°, and Sea-level, = *29.680*

Highest Reading, corrected for Index error, on the *10* th, = *30.400*

Lowest Do., Do., on the *1* th, = *28.300*

Difference, or Monthly Range, = *1.600*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *29* th, = *59.0*

Lowest in Month, corrected for Index errors, on the *21* th, = *16.0*

Difference, or Monthly Range, = *43.0*

"Corrected Mean" of all the Highest, (Col. 5), = *44.2*

"Corrected Mean" of all the Lowest, (Col. 6), = *32.8*

Difference, or Mean Daily Range, = *11.4*

** Calculated Mean Temperature of Month, = *38.5*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, =

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =

"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =

Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *37.5*

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *35.6*

†† Computed Temperature of Dew-point, = *33.0*

†† Do. Elastic Force of Vapour, = *1.88*

†† Do. Weight of Vapour in a Cubic Foot of Air, = *84*

†† Relative Humidity, (Saturation = 100), = *84*

RAIN fell on *17* Days; Amount in Inches, = *2.08*

WIND.		SUMMARY.							
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
A.M.	10	1	2	2	2	1	1	2	155
P.M.	8	1	2	1	3	1	1	4	140
Mean.	9	1	2	2	2	1	1	3	147
	11								2.15

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

William Munro

(Signed)

INSTRUCTIONS

FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different Returns; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a day for sun, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every instance, that it was taken, if not at 9 o'clock.

Barometer.—Weather-glasses and Aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a Standard.

Two moderate-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment whatever. Its scale-inches are not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument, so that the mercury strikes the top of the tube, a sharp tap is produced. If this is prevented by air it may be removed to the cistern, and get rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good light, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the Sun's direct rays nor the heat of a fire.

In taking an Observation. The attached Thermometer is first noted: the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from merely local influences. The lids forming the sides and doors of the Boxes are arranged so as to open to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-sticks, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "Maximum" Thermometers are recommended; printed Directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when the spirit distils by high temperature, it will be found in the part of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate, and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the Thermometers for registering the greatest heat from the Sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or renewed, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blacked boxes, whose sides protect the bulbs from the wind. The "Maximum" should be freely exposed to the Sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the glass, in an open situation. Snow must not be allowed to cover either of them. Thermometers, nor the Sun's heat to affect the alcohol by distillation.

Protection of Thermometers.—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a Standard Thermometer. When such Thermometers are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being re-tested. The self-registering, and especially the "Minimum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Society.

The Hygrometer consists of two Thermometers usually, but not necessarily mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached; the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging the side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the top of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. This the Thermometer will be read 39°·9, 40°·0, or 40°·1; again, 40°·4, 40°·3, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°; or 40°·1, respectively. So also 40°·1, and 40°·4 or 40°·8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of Observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

Wind.—A wind-vane ought to be elevated 12 feet at least, above surrounding objects. When it oscillates incessantly the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. The Council would strongly recommend that every Observatory be furnished with a Hemispherical-Cup Anemometer—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise partly from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

Snow-falls.—For convenience, be registered in the rain columns, under the following conditions:—When a snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Lake Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus being unable to judge of their amount, we ought not to take them into account in the cloud column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half-covered by clouds, 5 is entered as the observation, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example) will indicate that the upper strata of clouds travel with extreme velocity from S.W.; and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2, cir.-sc., (c/g) will indicate that the higher regions are covered to the "amount" of 4-tenths with stratus clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the cumulo-stratus kind.

Smoke.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column.

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil, its amount and constancy; the Council recommend that observations in this interesting department be made at 9 A.M. by Thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground projected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea-observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Ozone.—Mention whether Schönbein's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus, ozone, as an entry in the schedule, will indicate that the ozone-paper is tried as 4·3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4·4; i.e., that it is blowing fresh.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off for the purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-margin. Additional remarks may be made on the margin.

Observations in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the Society.

The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that the should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

ENGLAND, 9th December 1865.
(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	First in Flower.	In Leaf.	First in Blossom.	First in Fruit.	First in Ripeness.
Alder.					
Aspen.					
Beech.					
Birch.					
Elm.					
Larch.					
Oak.					
Sycamore or Plane.					

SHRUBS, ETC.	First in Blossom.	First in Fruit.	First in Ripeness.
Raspberry.			
Black Currant.			
Cherry.			
Gean.			
Hawthorn.			
Holly.			
Laburnum.			
Lilac.			
Myrtle.			
Mountain Ash or Rowan.			
Rhododendron.			
Rhododendron Ponticum.			
Whin.			

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., or in perfection; whether any have suffered from blight, disease, etc. Whether Epizootic disease prevails among Cattle; and the Agricultural condition of the district generally.

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo.		
Curlew.		
House Martin.		
Lapwing.		
Plover.		
Sand Martin.		
Starling.		
Swan.		
Rail or Corn Crane.		
Other Birds, naming them.		

PRUNTS.	First in Blossom.	First in Fruit.	First in Ripeness.
Apple.			
Black Currant.			
Cherry.			
Gean.			
Hawthorn.			
Holly.			
Laburnum.			
Lilac.			
Myrtle.			
Mountain Ash or Rowan.			
Rhododendron.			
Rhododendron Ponticum.			
Whin.			

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST

Inserted March 1866

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 56' 02" Long. 3° 2' 40" W Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of April 1886.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, &c. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer No. _____	No. of hours in which it fell.	Amount in inches.	0 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
		Barometer. * No. _____	Attach- ed Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No. _____	Min. No. _____	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force	Direc- tion.	Force				Velocity, (0-10), and Direc- tion.	Amount, (0-10), and Species.	Velocity, (0-10), and Direc- tion.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.					No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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		Inches.	°	Inches.	°	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____					No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteor.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
h.	" hail.	sq.	" squalls.
l.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t-s.	" thunder-storm.
li. sl.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-4.	Common Designation.	Estimated Force, 0-4.	Common Designation.	Estimated Force, 0-4.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0-5	Very light air	2-3	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction \pm = 29.846
for Temp. (Col. 2), = 2.9.91..... = 0.65.....
"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm = 29.836
for Temp. (Col. 4), = 2.9.907..... = 0.71.....
Mean at Station, corrected, and at 32°, = 29.841
Correction for height, feet, above Mean Sea-level, = 10.1
Mean, reduced to 32°, and Sea-level, = 29.942
Highest Reading, corrected for Index error, on the 23 th, = 30.550
Lowest Do., Do., on the 16 th, = 29.300
Difference, or Monthly Range, = 1.250

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 22 th, = 65.0
Lowest in Month, corrected for Index errors, on the 24 th, = 26.0
Difference, or Monthly Range, = 39.0
"Corrected Mean" of all the Highest, (Col. 5), = 52.3
"Corrected Mean" of all the Lowest, (Col. 6), = 37.7
Difference, or Mean Daily Range, = 14.6
** Calculated Mean Temperature of Month, = 45.0

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the th, =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for index errors), on the th, ... =
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 44.2

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 42.1

† Computed Temperature of Dew-Point, = 39.6

† Do. Elastic Force of Vapour, = 2.44

† Do. Weight of Vapour in a Cubic Foot of Air, =

† Relative Humidity, (Saturation = 100), = 84

RAIN fell on 14 Days; Amount in Inches, = 1.89

WIND.	SUMMARY.									
	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	3	13	4	2		5	2	1		150
P.M.	2	11	7	2		4	3	1		163
Mean.	3	12	5	4	0	4	3	1	0	156

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N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Returned by

J. M. McAuslane
A. Hill

(Signed)

WITH REMARKS ON THE USE OF INSTRUMENTS.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time) only twice a day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the uniform punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

Barometer.—*Weather glasses* and *Aneroids*, though administratively adopted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *under-line* on this little piston-rod is brought, by the adjusting screw, to *form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary setting* must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

In taking an *Observation*, the attached Thermometer is first noted: this tube must then be gently tipped and the adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Baromet.

Self Registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "*Minimium*," Thermometers are recommended; instructions for their use may be obtained with each instrument. The "*Minimium*," Thermometer of Rutherford is recommended when graduated on the glass tube, and affixed to a frame separate from the "*Minimium*." This Thermometer is liable to two arrangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by sucking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

Verification of Thermometer.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be removed from their position on the scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the *α Minimum* Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

Reading of the Thermometer—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the thermometer will be read -38.9 , 39.0 , 40.0 , or 40.1 ; or again, 40.4 , 40.5 , or 40.6 , according as it indicates a little under, an exact coincidence, or a little over 40.0 , or 40.5 ; under an exact coincidence, or a little over 40.0 , or 40.5 , respectively. So also 40.3 , and 40.3 , more or less must be registered 40.2 or 40.3 , and 40.7 or 40.8 respectively. In reading Rutherford's *Man. and *M. Man. Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the thermometer, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.**

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council would strongly recommend that every observatory be furnished with a Hemispherical-Cup Anemometer;—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, say the least, unsatisfactory.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—when a Snow shower occurs it must be noted in the "Remarks," and the latter S must be affixed to the depth of rain received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register *observations* only; not holding that partakes of the nature of deduction or inference.

Observations of the clls are made at 9 A.M. and at sunset, as illustrating the conditions and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity

Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should, entered in the proper column.

Underground Thermometers.—As the germination and health of crops and plants great depend on the temperature of the soil,—its amount and equality—the Council recommend that observations in this interesting department be made at 9 a.m., by thermometers placed in 1 foot, their bulbs being sunk to 3, 12, and 22 inches, and tinsens above ground protected from the sun's rays, and fitted in sloping tin collars, to prevent rain-water being conveyed to bulbs by the stems or wooden frames. Mention must be made also geological formation and agricultural condition of the soil which these Thermometers are placed,

Ozone.—Mention was made by Schüpbach of Moffatt's papers and need. The paper is affixed by a pin to a board in the thermometer box, and the notation registered at 9 A.M. and 9 P.M. It is desired that these locations be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—this 3° S., as an ozone entry in the schedule, will indicate that the ozone paper is turned at 3° S. on the scale, that the wind from the N.W., and that its force on the scale 0—6 is 4½, that it is blowing fresh.

obscurior.—The *Temple* column is too grove, but can be altered to *obscurior*.—Some of those valuable observations that can be taken at those places for which rules can be given are not very assigned. The use of contractions only, therefore, to be taken every advantage of; and a list of such are recognised and in use at Greenwich and Southampton, is given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of cloudlike colour of the sky, etc. Remarks ought to be made on the turnings of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable dis of snow, hail, or rain, the hour of storms, and remarkable fire maximum, as well as such notes as storms of wind attaining their maximum, when lofty hills are on winds as have been hit at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

The Council recommend that *temu day* observations be taken, —viz., on the 21st days of March, June, September, and December.

(By Order) A. B.

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SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	First in Generality.	MICROSCOPIC DETAILS.	First Arrival.	Department.
Burberry		Apple,			Cuckoo,		
Bouree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			Horse-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Sand-Martin,		
Holly,		Peach,			Flover,		
Laburnum,		Pear,			Starling,		
Lilac,		Plum,			Swan,		
Mezerion,		Strawberry,			Rail or Corn Crake,		
Mountain Ash or Rowan,							
Rhododendron Ponticum,							
Red Flowering Currant,							
Whin,							

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, disease, etc. Whether Epizootic diseases prevail among cattle; and the Agricultural condition of the district generally.

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55°56'00" N, Long. 3°2'40" W, Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of May 1866.

The Hours of Observation are of Greenwich Time.

No.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			Temperature of WELL at Depth of feet. No. _____	SEA. Temperature at 1 fathom, and Drift.	OZONE. 0—10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. <i>Mention the hour at which Storms began and ended.</i>	Days of Month.			
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.													
		Barometer. * No. _____	Attach- ed Ther- mometer.	Barometer. No. _____	Attach- ed Ther- mometer.	Max. No. _____	Min. No. _____	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Dirrec- tion.	Force	Dirrec- tion.	Force	Velocity, (0—10), and Dirrec- tion.	Amount, (0—10), and Species.	Velocity, (0—10), and Dirrec- tion.	Amount, (0—10), and Species.	No. 9 inches.	No. 12 inches.		No. 22 inches.										
		inches.	°	inches.	°	No. _____	No. _____	No. _____	No. _____	°	°	°	°	°	°	°	°	°	°	°	°	°	°		°	°	°						°		
	1	29.84	50	29.70	50	46	35	39.37	39	37	36	34	SE	2	SE	2						3										Rainbow on the 6th	1		
	2	29.64	50	29.53	50	48	31	41.39	41	39	36	34	SE	2	SE	2						2										Starts shooting on the 19th	2		
	3	29.50	50	29.60	50	50	34	44.40	44	40	41	40	W	1	W	1						1										Heavy shower of Hail.	3		
	4	29.70	51	29.78	53	55	41	46.43	46	43	46	43	SW	1	W	1						3										* Thunder on the 29th	4		
	5	29.82	56	30.	55	56	40	49.45	49	45	47	44	SW	1	W	1						4													
	6	30.16	55	30.22	58	59	41		52	48	49	45	W	1	W	1						2													
	7	30.18	58	30.	58	61	40		53	50	50	47	W	1	W	1						7													
	8	29.80	56	29.59	60	53	45		48	44	50	49	SW	2	SW	2																			
	9	29.53	58	29.57	59	58	42		53	48	48	45	SW	2	W	2						6													
	10	29.64	58	29.80	60	59	41		54	49	49	48	W	2	W	2						4													
	11	29.24	56	29.36	57	56	41		47	46	45	43	E	1	SE	1	80	.80				1													
	12	29.70	55	29.94	56	55	40		47	45	48	45	SE	1	SE	1		.16				2													
	13	30.04	55	30.13	58	54	38		47	45	46	43	SE	1	SE	1						-													
	14	30.20	56	30.23	57	55	40		47	43	48	44	SE	1	SE	1						2													
	15	30.28	55	30.40	56	46	31		47	43	43	40	SE	1	SE	1						2													
	16	30.34	54	30.23	56	59	38		43	40	47	44	SE	1	SW	1						2													
	17	30.20	58	30.18	58	62	40		49	46	54	50	SE	1	SE	1						4													
	18	30.10	57	30.10	60	66	40		54	50	50	46	SW	1	SE	1						6													
	19	30.13	60	30.20	60	69	39		57	53	54	50	SE	1	SE	1						5													
	20	30.30	60	30.40	64	70	44		53	50	56	49	SE	1	SE	2						7													
	21	30.50	61	30.47	60	67	38		59	57	45	41	SE	2	SE	1						7													
	22	30.46	60	30.42	62	68	39		56	57	57	45	SE	1	SE	1						12													
	23	30.22	61	30.18	63	73	44		58	57	54	49	SE	1	SE	1						14													
	24	30.10	60	30.04	60	66	35		54	48	47	44	SE	1	SE	1						14													
	25	30.08	60	29.90	61	64	36		53	47	50	46	SE	1	SE	1						14													
	26	29.85	60	29.80	60	72	43		53	50	54	48	SE	1	SW	1						12													
	27	29.70	62	29.64	61	62	38		57	48	50	44	SW	2	W	1						11													
	28	29.74	60	29.68	59	60	38		52	45	44	42	SW	1	W	1						6													
	29	29.72	57	29.89	59	56	35		47	40	42	40	W	1	SW	-						3													
	30	29.89	57	29.90	58	61	41		52	45	57	45	W	1	SE	1						6													
	31	29.93	58	29.95	58	59	45		56	47	48	44	SE	2	E	1						7													
	Sums.	29.53	211	29.45	245	297	283		21167	239				39	36		129																		
	Means.	29.53	568	29.963	57.9	596	39.1		50.7460	47.7442				1.26	1.16																				
	Total Corrections for Instrumental Errors.																																		
	Corrections for Diurnal Range.																																		
	Corrected Means.																																		
	No. of Columns.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
cl.	" cirrus.	ms.	" meteors.
ci. cu.	" cirro-cumulus.	n.	" nimbus.
ci. s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu. s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sheet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
h. l.	" hail.	sq.	" squall.
l.	" lightning.	th.	" thunder.
li. cl.	" light clouds.	th. s.	" thunder-storm.
li. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ for Temp. (Col. 2), = 29.877
Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = 29.894
Mean at Station, corrected, and at 32°, = 29.880
Correction for height, feet, above Mean Sea-level, = 1.01
Mean, reduced to 32°, and Sea-level, = 29.981
Highest Reading, corrected for Index error, on the 21th, = 30.500
Lowest Do., Do., on the 11th, = 29.240
Difference, or Monthly Range, = 1.260

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 22th, = 73.0
Lowest in Month, corrected for Index errors, on the 2th, 16th, = 31.0
Difference, or Monthly Range, = 42.0
Corrected Mean" of all the Highest, (Col. 5), = 59.6
Corrected Mean" of all the Lowest, (Col. 6), = 39.1
Difference, or Mean Daily Range, = 20.5
Calculated Mean, = 49.4
S.-R. Thermometer, in Sun, Highest, (corrected, for Index errors), on the 22th, = 73.0
S.-R. Thermometer, in Sun, Lowest, (corrected, for Index errors), on the 2th, 16th, = 31.0
S.-R. Thermometer, in Sun, Mean, on grass, = 49.4
Difference of above Means or Range ("exposed"), = 42.0

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 49.2
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 45.1
Computed Temperature of Dew-Point, = 40.7
Do. Elastic Force of Vapour, = 2.55
Do. Weight of Vapour in a Cubic Foot of Air, = 73
Relative Humidity, (Saturation = 100), = 73
RAIN fell on 6 Days; Amount in Inches, = 1.29

WIND. SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	95	1	1	24	7	1	1	26			
P.M.	113	2	1	1	19	3	1	16			
Mean.	104	2	1	22	8	2	1	21			

B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

Wm. McAuslane

(Signed)

Wm. McAuslane

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different Returns; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incompatible, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers in some few cases may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

Barometer.—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-inches* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather; and thus, by the aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; stem passes freely through the lid and case of the cistern. When their coincidences being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When a screw, to form one *straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *seize* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

In taking an *Observation*, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern adjusted carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *columns* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when the part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*," should be freely exposed to the sun, and the "*Minimum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are not graduated on the stem, but merely on an attached scale, under-go repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering and especially the "*Maximum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the *water-glass* must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the *padding* must be of medium fineness, and fastened at the neck of the bulb by a cotton, which also supplies it with water. It must be seen to by the observer that the *muslin* is always *clean and moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by putting the boxwood frame out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°.0, or 40°.5, respectively. So also 40°.3, and 40°.7, or 40°.8 respectively. In reading Rutherford's "*Mac*," and "*Min*," Thermometers, the indication of that end of the *tube* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only; as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. The Council would strongly recommend that every observatory be furnished with a Hæmaphysal-Cup Anemometer;—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs it must be noted in the "Remarks," and the latter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed, in every column, the observer cannot be too careful to register *observations only*; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated, from the greater or less obscuration of the sky, *overhead* (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *cloud's* column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky is *entirely* covered by clouds, 5 is entered as the *obscurado*, and so on, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity," S. W. (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of "2," (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

Sunshine.—The number of hours in which the sun's rays cast shadows, should be entered in the proper column.

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made by a *dry bulb* thermometer placed in the earth, their bulbs being sunk to 12 and 22 inches, and the stems above ground protected from the sun's rays, and fired with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden figures. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend, that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Ozone.—Mention whether Schönbach's or Moffitt's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 5°, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted 5°; on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4°, i.e., that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the appearance of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, either was unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin.

Observations in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *form day* observations be taken;—viz., on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

Enacted, 26th December 1865.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In flower.	First appearance.	In leaf.	Divested of leaves.	CROPS.	Planting.	Seeding or sowing.	Harvesting or above ground.	In flower.	First Cut
Alder.					Barley.					
Ash.					Bore or Pig.					
Beech.					Oats.					
Birch.					Wheat.					
Elm.					Beans.					
Larch.					Leasey.					
Lime.					Potatoes.					
Oak.					Rye Grass.					
Sycamore or Plane.										

SUBRUBS, ETC.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.	First in blossom.
Barberry.										
Boureaux or Elder.										
Broom.										
Hazel.										
Hawthorn.										
Holly.										
Lime.										
Mazeton.										
Mountain Ash or Bogan.										
Red Flowering Elm.										
Rhododendron Ponticum.										
Whin.										

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 36' 0", Long. 3° 24' 0", Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 95 feet, above Ground 4 feet. During the MONTH of June 1866.

The Hours of Observation are of Greenwich Time.

DUTY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer. No. —	No. of hours in which it fell.	Amount in inches.	0 A.M.		P.M.		9 h. A.M.							
		Barometer. * No. —	Attached Ther. meter	Barometer. No. —	Attach- ed Ther. meter	Max. No. —	Min. No. —	Max. in Sun's rays No. —	Min. on Grass. No. —	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.				Velocity, (0—6), and Direction.	Amount, (0—10), and Species.	Velocity, (0—6), and Direction.	Amount, (0—10), and Species.	No. 3 inches.	No. 12 inches.					No. 22 inches.	
																																inches.
		1	29.94	58	29.96	57	53	46			57	45	47	45	SE	2	SE	1														
2	29.95	57	29.98	59	53	48			48	47	48	47	SE	1	SE	1														was very thick & foggy	2	
3	29.94	58	30.	60	52	50			57	50	57	50	SE	1	SE	1														Thunder heard on the 6th 16 th	3	
4	30.	58	29.90	59	62	48			54	52	57	50	SE	1	SE	1														and 26 th but no lightning seen	4	
5	29.80	60	29.90	63	68	48			54	53	57	54	SE	1	SE	1														Rainbow seen on the 15th & 17th	5	
6	29.94	65	29.93	65	64	48			63	58	54	53	SE	2	SE	1														the whole month has been	6	
7	30.	60	30.04	62	63	57			58	56	60	53	SE	1	S	1														very dry but particularly	7	
8	30.10	63	30.23	64	70	48			60	58	57	57	SE	2	SE	2														the last half of it, has been	8	
9	30.26	64	30.00	60	67	54			60	55	56	54	SE	1	S	1														Excessive hot with tempests	9	
10	29.90	65	29.84	66	70	50			65	59	53	53	SE	2	SE	3														scorching, sun shine and	10	
11	29.89	64	29.73	64	64	50			58	53	53	50	SE	2	SE	2														a little rain on the last day	11	
12	29.68	62	29.60	61	63	50			59	54	53	50	SE	1	S	2														of it which was much wanted	12	
13	29.70	63	29.80	63	67	48			60	54	54	50	SE	1	SE	1																13
14	29.84	61	29.80	64	62	46			59	53	56	57	SE	1	SE	2																14
15	29.80	60	29.80	62	66	45			55	57	57	47	SE	1	SE	2																15
16	29.53	60	29.30	60	60	44			50	46	49	44	SE	2	SE	2																16
17	29.54	61	29.59	60	62	37			53	48	46	41	SE	2	SE	2																17
18	29.54	58	29.45	60	65	34			52	45	43	38	SE	1	SE	1																18
19	29.58	58	29.74	60	67	38			55	49	48	44	S	1	S	1																19
20	29.94	60	29.70	64	66	52			57	52	57	53	S	1	S	2																20
21	29.70	63	29.80	64	67	53			65	59	60	54	SE	3	SE	2																21
22	29.85	65	30.	66	71	58			66	57	62	57	SE	2	SE	2																22
23	30.10	67	30.14	66	74	58			66	59	61	56	SE	2	SE	1																23
24	30.24	68	30.24	68	82	53			67	59	65	59	S	1	SE	1																24
25	30.24	66	30.13	68	74	53			60	57	60	54	S	1	SE	1																25
26	30.14	69	30.08	69	81	56			67	62	64	59	S	1	SE	1																26
27	30.	70	30.02	70	82	56			70	54	66	62	SE	1	SE	1																27
28	30.10	66	30.15	69	63	54			59	54	54	54	SE	2	SE	1																28
29	30.06	65	29.93	66	64	52			56	54	54	54	S	1	S	1																29
30	29.80	65	29.50	66	75	52			59	57	53	52	SE	3	SE	2																30
31																																31
Sums.	2713	74	2631	105	215	285			257	116	113	67		42	43																	
Means.	29.90	62.6	29.87	63.5	67.0	49.5			58.6	53.9	54.8	51.6		1.40	1.43																	
Total Corrections for Instrumental Errors.																																
Corrections for Diurnal Range.																																
"Corrected Means."																																
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteor.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
h.	" hail.	sgs.	" squalls.
l.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t-s.	" thunder-storm.
li. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction \pm = 29.812
for Temp. (Col. 2), = 29.40.4 - 0.9.2
"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm = 29.783
for Temp. (Col. 4), = 29.8.7.7 - 0.94
Mean at Station, corrected, and at 32°, = 29.798
Correction for height, feet, above Mean Sea-level, = 101
Mean, reduced to 32°, and Sea-level, = 29.897
Highest Reading, corrected for Index error, on the 46th, = 30.240
Lowest Do., Do., on the 17th, = 29.300
Difference, or Monthly Range, = 0.940

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17th, = 82.5
Lowest in Month, corrected for Index errors, on the 18th, = 34.0
Difference, or Monthly Range, = 48.5
"Corrected Mean" of all the Highest, (Col. 5), = 67.0
"Corrected Mean" of all the Lowest, (Col. 6), = 49.5
Difference, or Mean Daily Range, = 17.5
** Calculated Mean Temperature of Month, = 58.2

S.-R. [redacted] in Sun, Highest, (corrected, for [redacted]) = [redacted]
[redacted] Bulb, Max. in Sun, = [redacted]
[redacted] for Index errors, on the [redacted] th, = [redacted]
[redacted] Bulb Min. on grass, = [redacted]
[redacted] (Col. 11), = [redacted]

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 56.7
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.8
Computed Temperature of Dew-Point, = 49.1
Do. Elastic Force of Vapour, = 351
Do. Weight of Vapour in a Cubic Foot of Air, = [redacted]
Relative Humidity, (Saturation = 100), = 76
RAIN fell on 9 Days; Amount in Inches, = 1.0

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		7	2		2	3	9	6			1.40
P.M.		3	4	1	2	3	9	5	2		1.43
Mean.		5	3	1	2	3	9	6	1		1.41

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

Wm. McQuarrie

(Signed)

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55°56'0" Long. 3°02'40", Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of July 1866.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, &c. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
		9 h. A.M.		9 h. P.M.		Max. in Shade, 4 feet above Ground.	Exposed Black Bulbs. No. —	Max. in Sun's rays.	Min. on Grass.	9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.			Temperature of WELL at Depth of feet. No. —																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		Barometer. * No. —	Attach- ed Ther- mometer No. —	Barometer. No. —	Attach- ed Ther- mometer No. —					Dry bulb. No. —	Wet bulb. No. —	Dry bulb. No. —	Wet bulb. No. —	Direc- tion.	Force.	Direc- tion.	Force.			Velocity (0—6), and Direc- tion.	Amount, (0—10), and Species.	Velocity (0—6), and Direc- tion.	Amount, (0—10), and Species.	No. —	No. —	No. —						No. —	No. —	No. —																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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1	29.40	2	29.30	60	65	44			62	59	53	49	SW	2	SW	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\frac{1}{100}$ for Temp. (Col. 2), = 29.813
Corrected Mean " of Barometer at 9 P.M., minus the Correction $\frac{1}{100}$ for Temp. (Col. 4), = 29.818
Mean at Station, corrected, and at 32°, = 29.816
Correction for height, feet, above Mean Sea-level, = 101
Mean, reduced to 32°, and Sea-level, = 29.917
Highest Reading, corrected for Index error, on the 24 th, 25... = 30.250
Lowest Do., Do., on the th, = 29.100
Difference, or Monthly Range, = 1.150

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 12 th, = 84.0
Lowest in Month, corrected for Index errors, on the 3 th, = 43.0
Difference, or Monthly Range, = 41.0
"Corrected Mean" of all the Highest, (Col. 5), = 66.5
"Corrected Mean" of all the Lowest, (Col. 6), = 51.1
Difference, or Mean Daily Range, = 15.4
* Calculated Mean Temperature of Month, = 58.8

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the th, =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 57.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 54.1
Computed Temperature of Dew-Point, = 50.5
Do. Elastic Force of Vapour, = 370
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = 77
RAIN fell on 12 Days; Amount in Inches, = 3.52

WIND.		SUMMARY.				
Direction	N NE E SE S SW W NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.		
A.M.	5	6	1	1.45		
P.M.	6	10	1	1.16		
Mean.	5	9	1	1.30		

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified

W. Marshall

(Signed)

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance to the "Scottish Meteorological Society" has proposed to itself to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

Barometrical.—Weather glasses and aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a Standard.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. A. de la Roche, of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-inches are not true inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by the aid of a screw acting on the bottom, the surface of the liquid contained therein can be adjusted to the zero-point of the scale; whereas their coincidence being indicated by a little ivory peg, whose stem passes freely through the lid and end of the cistern. When the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a sharp tap is produced. If this is prevented by air it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *balin*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular and exposed to neither the sun's direct rays nor the heat of a fire.

In taking an Observation, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern adjusted carefully made. By means of lowering the eye, it must be brought into the plane of the back and front of the index—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zamboni's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily rectified by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be displaced from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made or renewed, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being re-tested. The self-registering, and especially the "Minimum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen by the observer that the muslin is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed, evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered, by pulling the boxed frame out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading might be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.3, 39.4, or 40.1; or, again, 40.4, 40.5, or 40.6; according as it indicates a little under, an exact coincidence with, or a little over 40, or 40.5, respectively. So also 40.4, and 40.5; more or less must be registered 40.2 or 40.3 and 40.7 or 40.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of Observing Temperature.—The Hygrometer is read at 9 a.m. and 9 p.m. The self-registering Thermometers are read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 p.m. on the 2nd, and extending till 9 p.m. on the 3rd.

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, &c.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council would strongly recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly from unfavourable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—when a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, and indeed in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

homoclouds of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky, or *cloud (i. e., within 90° or 30° of the zenith)*. The strata of clouds that appear near the horizon are viewed obliquely; and thus, being made to judge of their amount, we ought not to take them into account in the clouds column, though their appearance and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity

and Direction,"—, (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud"

column, an entry of $\frac{2}{4}$, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *extenuatus* kind.

Shading.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. *Underground Thermometers*.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 a.m., by 12 and 22 inches, and the stems above ground, protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and general natural condition of the soil in which these Thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the time of observation; and continuing to observe for particular purposes.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Ozone.—Mention whether Schomburgk's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—this 3rd, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as 4th on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 a.m. and 9 p.m. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin.

Observations in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *year day* observations be taken;—*Viz.*, on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

Edinburgh, 9th December 1865.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leafy in Spring.	Leafy in Summer.	Dyed of Leaves.	CROPS (mentioning variety.)	Planting or Sowing.	Aperting or Plowing.	In Pasture or Ground.	First Cut.
Alder.					Barley.				
Aspen.					Bare or High.				
Beech.					Oats.				
Birch.					Wheat.				
Elm.					Beans.				
Larch.					Potatoes.				
Lime.					Turnips.				
Oak.					Rye Grass.				
Sycamore or Plane.									

SHRUBS, ETC.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Barberry.					Apple.				
Boulevard or Elder.					Black Currant.				
Broom.					Cherry.				
Hazel.					Gean.				
Hawthorn.					Gooseberry.				
Holly.					Peach.				
Laburnum.					Pear.				
Lilac.					Plum.				
Mezerion.					Strawberry.				
Mountain Ash or Rowan.									
Red Flowering Currant.									
Rhododendron Ponticum.									
Whin.									

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, disease, etc. Whether Hay, Potatoes, disease prevails among cattle; and the Agricultural condition of the district generally.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

M. ALEXANDER BUCHAN,

To

July 1866

Enrich

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at

County of

Mid Lothian

in Lat. $55^{\circ}56'0''$ Long. $3^{\circ}2'40''$ Distance from Sea

one mile.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.

During the MONTH of August 1866.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		Barometer. No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.			Direction.	Force.	9 h. A.M.	9 h. P.M.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No. 3 inches.						No. 12 inches.	No. 29 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.607
for Temp. (Col. 2), = 29.607 - 0.007 = 29.600
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.573
for Temp. (Col. 4), = 29.573 - 0.007 = 29.566
Mean at Station, corrected, and at 32°, = 29.590
Correction for Height, feet, above Mean Sea-level, = 10.1
Mean, reduced to 32°, and Sea-level, = 29.691
Highest Reading, corrected for Index error, on the 13th, = 30.160
Lowest Do., Do., on the 7th, = 29.000
Difference, or Monthly Range, = 1.160

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 26th, = 70.0
Lowest in Month, corrected for Index errors, on the 17th, = 43.0
Difference, or Monthly Range, = 27.0
"Corrected Mean" of all the Highest, (Col. 5), = 62.7
"Corrected Mean" of all the Lowest, (Col. 6), = 49.8
Difference, or Mean Daily Range, = 12.9
** Calculated Mean Temperature of Month, = 56.2

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the 13th, = 70.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 62.7
Lowest at Night, Black Bulb, (corrected for Index errors), on the 17th, = 43.0
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = 49.8
Difference of above Means or Range ("exposed"), = 12.9

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 55.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 52.4
†† Computed Temperature of Dew-point, = 49.9
†† Do. Elastic Force of Vapour, = 35.9
†† Do. Weight of Vapour in a Cubic Foot of Air, = 8.3
†† Relative Humidity, (Saturation = 100), = 83
RAIN fell on 21 Days; Amount in Inches, = 3.58

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	2	1	1	4	14	6	1		1.35	
P.M.	2	2	1	1	6	9	9			1.54	
Mean.	2	2	1	1	5	11	8	1	0	1.44	

2.06

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

W. Meauslane

(Signed)

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Inveresk*, County of *Edinburgh*, in Lat. *55° 56' 09"*, Long. *3° 2' 40" W*, Distance from Sea *one* mile.Height of Cistern of the Barometer above Mean Sea-level *90* feet, above Ground *4* feet.During the MONTH of *September* 186*6*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			TEMPERATURE OF WELL at Depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.					
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.														
		Barometer. No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	Readings of the H-Cup Anemometer. No.	No. of hours in which it fell.	Amount in inches.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.						No. 22 inches.				
		Inches.	Inches.																																	
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.						No.	No.	No.	No.	No.
	1	29.64	63	29.60	60	63	47			55	51	54	53	SE	2	SE	1			36					2						Rain has fallen on 22 days this month, the quantity fallen in gauge 2.69 inches Rainbow on the 10 th , 12 th and 19 th Lunar Halo on the 25 th Gales of wind on the 21 st & 25 th					
	2	29.35	60	29.45	60	61	45			52	49	50	48	S	1	S	1			10					1											
	3	29.58	60	29.66	60	60	45			51	49	48	44	W	2	W	1			01					6											
	4	29.60	60	29.31	64	61	51			52	51	53	51	W	1	SE	1			20					5											
	5	29.23	61	29.23	65	60	43			55	52	52	50	SE	1	SE	1			-					2											
	6	29.46	68	29.38	64	64	51			53	48	56	54	SE	2	S	1			05					6											
	7	29.40	62	29.68	64	58	49			51	50	54	52	SE	1	SE	1			-					-							7				
	8	29.78	60	29.80	64	58	43			51	50	54	52	SE	1	SE	1			02					1							8				
	9	29.80	61	29.50	64	63	53			54	57	53	53	SE	1	SE	2			04					2							9				
	10	29.28	61	29.33	65	66	51			58	56	53	53	SE	2	SE	1			03					3							10				
	11	29.14	60	29.68	63	65	47			53	51	54	52	S	2	S	1			02					2							11				
	12	29.84	60	29.70	62	57	49			50	47	50	47	S	1	S	1			04					1							12				
	13	29.60	60	29.46	62	60	49			52	51	52	49	S	1	S	1			20					2							13				
	14	29.08	61	29.23	62	59	49			54	51	50	47	SE	2	SE	4			04					4							14				
	15	29.46	60	29.36	60	59	44			54	50	47	44	SE	2	SE	2			02					4							15				
	16	29.30	60	29.33	60	57	42			50	48	44	41	W	1	W	1			10					3							16				
	17	29.54	58	29.44	60	58	42			49	45	48	45	W	1	W	2			-					6							17				
	18	29.85	60	29.57	60	56	48			50	47	49	47	W	1	W	4			10					4							18				
	19	29.50	60	29.60	61	60	46			54	51	57	47	SE	2	SE	3			02					3							19				
	20	29.60	60	29.26	62	60	42			52	49	50	47	SE	3	SE	4			16					2							20				
	21	29.25	58	29.10	60	53	45			49	46	49	45	SE	3	SE	5			05					3							21				
	22	29.10	56	29.17	58	56	37			49	44	44	41	SE	3	SE	2			-					3							22				
	23	29.30	54	29.50	60	53	34			49	45	40	39	SE	1	SE	1			-					5							23				
	24	29.50	56	29.69	58	57	44			45	42	47	43	SE	1	SE	1			01					3							24				
	25	29.73	53	29.63	60	58	52			53	50	56	51	S	2	SE	5			-					3							25				
	26	29.70	54	29.80	62	61	47			53	53	53	49	S	2	S	2			-					4							26				
	27	29.84	60	29.87	60	60	42			51	49	51	48	SE	1	SE	1			-					2							27				
	28	29.98	54	29.91	61	53	45			45	43	50	48	SE	1	SE	2			50					5							28				
	29	29.80	58	30.	60	53	47			54	54	50	49	SE	1	SE	1			68					5							29				
	30	30.15	60	30.21	62	59	40			54	53	54	52	SE	1	SE	1			04					2							30				
	31																																31			
	Sums.	16 38	28 6	16 73	4 3	27 6	17 5			5 27	2 24	4 7	5 5							279													NOTATION USED IN GENERAL REMARKS. a. denotes aurora. m. denotes meteor. ci. " cirrus. ms. " meteors. ci-cu. " cirro-cumulus. n. " nimbus. ci-s. " cirro-stratus. r. " rain. cu. " cumulus. h. r. " heavy rain. cu-s. " cumulo-stratus. c. h. r. " continued heavy rain. dew. " dew. s. " stratus. f. " fog. sc. " scud. fr. " frost. sl. " sleet. h.-fr. " hoar-frost. sn. " snow. h. " haze. so. ha. " solar halo. h. d. " heavy dew. sq. " squall. hl. " hail. sqs. " squalls. l. " lightning. t. " thunder. li. cl. " light clouds. t.-s. " thunder-storm. li. sh. " light showers. w. " wind. lu. co. " lunar corona. g. " gale of wind. lu. ha. " lunar halo.			
	Means.	29.553	59.3	29.552	61.4	59.2	45.8			51.9	49.3	50.7	48.1																				TABLE FOR ESTIMATING FORCE OF WIND. Esti- Esti- Esti- mated mated mated Force, Force, Force, 0-6. 0-6. 0-6. Common Common Common Designation. Designation. Designation. 0 Calm 1-5 Light breeze 4 Blowing hard 0-5 Very light air 2-3 Fresh breeze 5 Blowing a gale 1-1 Light air 3-4 Very fresh 6 Violent gale			
	+ Total Corrections for Instrumental Errors.																																			
	+ Corrections for Diurnal Range.																																			
	"Corrected Means."																																			
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteors.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sps.	" squalls.
l.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t-s.	" thunder-storm.
li. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0-5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ for Temp. (Col. 2), = *29.472*"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ for Temp. (Col. 4), = *29.471*Mean at Station, corrected, and at 32°, = *29.472*Correction for Height, feet, above Mean Sea-level, = *10.1*Mean, reduced to 32°, and Sea-level, = *29.573*Highest Reading, corrected for Index error, on the 30th, = *30.210*Lowest Do., Do., on the 21th, = *29.100*Difference, or Monthly Range, = *1.110*S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 10th, = *66.0*Lowest in Month, corrected for Index errors, on the 23th, = *34.0*Difference, or Monthly Range, = *32.0*"Corrected Mean" of all the Highest, (Col. 5), = *59.2*"Corrected Mean" of all the Lowest, (Col. 6), = *45.8*Difference, or Mean Daily Range, = *13.4*** Calculated Mean Temperature of Month, = *52.6*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the th, =

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =

"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =

Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *51.3*Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *48.7*** Computed Temperature of Dew-point, = *46.0*** Do. Elastic Force of Vapour, = *30.2*** Do. Weight of Vapour in a Cubic Foot of Air, = *82*** Relative Humidity, (Saturation = 100), = *82*RAIN fell on *24* Days; Amount in Inches, = *2.79*

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
A.M.		1	3	1	3	7	11	5		1.57
P.M.		1	4	1	2	8	10	4		1.83
Mean.		1	3	1	3	7	10	5	0	1.70

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N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by*William McAlister*

(Signed)

WITH REMARKS ON THE USE OF INSTRUMENTS.

noncondensate of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes ought to be noted among the *features*. The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset,

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column “Velocity and Direction,” $6, S.W.$, (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second “Cloud” column, an entry of $\frac{2}{3}, \text{cu-st.}$ (*cu-ft*) will indicate that the higher regions are covered to the “amount” of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

Sunshine.—The number of hours in which objects in the sun’s rays cast shadows, should be entered in the proper column.

Underground Thermometers—As the germination and health of crops and plants greatly depend on the temperature of the soil, its amount and constancy; the Council resolved that observations in this interesting department be made at 9 A.M. by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the entrance of piers and rocks round the coast, where it is not influenced by the tide of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Ozone.—Mention whether Schönbien's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus give as an *ozone* entry in the schedule, will indicate that the ozone paper is fixed as $2 \frac{1}{2}$ on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is “4,” i.e., that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Remarks.—The “*Remarks*” column is too narrow, but it can be avoided so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great differences ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometre, thunderstorms, and remarkable falls of snow, hail, or rain the hour of

storms of wind attaining the maximum, as well as such storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns offset from one another, or in two ruled off for the purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side of the margin.

"Observations in connection with the periodic return of the seasons," possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and in the case of crops, to specified, sorted year to year, and on a selected piece of ground or farm.

(By Order.) A. B.

Sept. 1866

BOOK-POST

Secretary of the Meteorological Society of Scotland.

EDINBURGH.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, diseases, etc. Whether zoonotic disease prevails among Cattle; and the Agricultural condition of the district generally.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55°56'0" Long. 3°24'0" Distance from Sea one mile.Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of October 1866.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.			
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.			Temperature of WELL at Depth of feet. No. _____	Temperature at 1 fathom, and Density.				 0—10. 9 A.M. 9 P.M.		
		Barometer. " No. _____	Attach- ed Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No. _____	Min. No. _____	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force			Direc- tion.	Force	Velocity, (0—6), and Direc- tion.	Amount, (0—10), and Species.	Velocity, (0—6), and Direc- tion.	Amount, (0—10), and Species.	No. _____ 3 inches.								No. _____ 12 inches.	No. _____ 22 inches.
Inches.	"	Inches.	"																														
1	30.16	61	30.13	66	57	50			57	50	52	51	NE	1	NE	1		—									Aurora seen on the 7 th & 30 th	1					
2	30.14	60	30.19	60	53	52			51	51	52	57	NE	1	NE	1		—									Stars Shooting on the 7 th	2					
3	30.15	59	30.12	62	57	51			53	53	55	53	NE	1	NE	1		.074									gale of wind on the 24 th & 29 th	3					
4	30.15	60	30.22	60	57	57			52	52	52	57	NE	1	NE	1		—											4				
5	30.33	60	30.40	60	56	51			53	53	52	51	NE	1	NE	1		.06											5				
6	30.50	60	30.52	60	53	45			52	52	49	47	SE	1	SE	1		—											6				
7	30.45	60	30.45	60	57	42			54	51	48	46	SE	2	SE	2		—											7				
8	30.43	58	30.37	59	53	39			47	46	46	45	S	1	S	1		—											8				
9	30.38	56	30.32	58	52	42			46	46	43	42	S	1	SE	1		—											9				
10	30.28	56	30.24	59	49	41			47	47	44	42	SE	1	SE	1		—											10				
11	30.20	56	30.24	59	53	46			46	43	48	47	SE	1	SE	1		—											11				
12	30.10	55	29.89	58	51	45			48	47	46	44	S	1	S	1		—											12				
13	29.80	55	29.90	54	52	35			50	48	40	39	SE	1	SE	1		.20											13				
14	30.04	53	30.10	55	47	38			42	39	43	41	NE	1	NE	1		—											14				
15	30.04	52	30.13	65	52	35			45	43	40	38	SE	2	SE	1		—											15				
16	30.20	55	30.17	58	50	35			37	36	39	37	SE	1	SE	1		—											16				
17	30.04	53	29.94	56	54	42			42	40	49	44	SE	1	S	4		—											17				
18	29.92	55	29.84	58	54	50			50	47	52	49	SE	1	SE	2		.074											18				
19	29.88	57	29.95	64	60	49			54	52	57	54	SE	4	SE	3		.13											19				
20	30.14	58	30.13	64	61	53			54	52	54	57	S	1	S	1		—											20				
21	29.92	58	29.90	66	59	54			57	53	56	54	S	1	S	1		—											21				
22	29.82	63	29.95	69	57	44			54	52	49	46	SE	1	SE	1		—											22				
23	30.	60	29.87	66	55	57			48	46	54	57	SE	1	SE	1		—											23				
24	29.60	60	29.70	59	56	34			54	52	40	38	S	5	S	1		.20											24				
25	29.74	52	29.80	54	53	30			40	39	36	34	S	1	SE	1		.05											25				
26	29.87	50	29.94	48	53	42			36	34	50	48	SE	1	SE	1		.07											26				
27	29.84	54	29.86	57	54	42			50	48	50	48	S	1	S	1		.074											27				
28	29.94	56	30.15	64	53	40			45	42	44	42	SE	2	SE	1		—											28				
29	30.	60	29.74	61	50	48			44	41	51	50	SE	4	SE	5		—											29				
30	29.40	60	29.90	62	54	37			40	38	40	38	NE	1	NE	1		.30											30				
31	29.94	57	29.69	59	53	43			43	41	53	49	SE	1	SE	4		.07											31				
Sums.	15°	21°	17°	25°	13°	11°			24°	19°	24°	18°		43		430		1.10												NOTATION USED IN GENERAL REMARKS. a. denotes aurora. m. denotes meteor. ci. " cirrus. ms. " meteors. ci-cu. " cirro-cumulus. h. " nimbus. ci-s. " cirro-stratus. r. " rain. cu. " cumulus. h. r. " heavy rain. cu-s. " cumulo-stratus. c. h. r. " continued heavy rain. d. " dew. s. " stratus. f. " fog. sc. " squall. fr. " frost. sl. " sleet. h-fr. " hoar-frost. sh. " snow. h. " haze. so. ha. " solar halo. h. d. " heavy dew. sq. " squall. hl. " hail. sqs. " squalls. l. " lightning. t. " thunder. li. cl. " light clouds. t-s. " thunder-storm. li. sh. " light showers. w. " wind. lu. co. " lunar corona. w. " gale of wind. lu. ha. " lunar halo. w. " violent gale.			
Means.	30.048	57.1	30.056	58.1	54.4	43.8			47.9	46.3	47.9	45.8		1.40		1.40														TABLE FOR ESTIMATING FORCE OF WIND. Esti- mated Force, 0—6. Common Designation. Esti- mated Force, 0—6. Common Designation. Esti- mated Force, 0—6. Common Designation. 0 Calm 0.5 Very light air 1 Light air 1.5 Light breeze 2 Fresh breeze 2.5 Very fresh 3 Light breeze 4 Blowing hard 5 Blowing a gale 6 Violent gale			
† Total Corrections for Instrumental Errors.																																	
† Corrections for Diurnal Range.																																	
"Corrected Means."																																	
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 30.048 - 0.76... = 29.288

“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 30.056 - 0.79... = 29.266

Mean at Station, corrected, and at 32°, = 29.274

Correction for Height, feet, above Mean Sea-level, = 1.0

Mean, reduced to 32°, and Sea-level, = 30.275

Highest Reading, corrected for Index error, on the 6th, = 30.525

Lowest Do., Do., on the 30th, = 29.400

Difference, or Monthly Range, = 1.125

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 2nd th, = 61.0

Lowest in Month, corrected for Index errors, on the 25th, = 30.0

Difference, or Monthly Range, = 31.0

“Corrected Mean” of all the Highest, (Col. 5), = 54.4

“Corrected Mean” of all the Lowest, (Col. 6), = 43.8

Difference, or Mean Daily Range, = 10.6

** Calculated Mean Temperature of Month, = 49.1

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the 1st th, = 140

“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 140

Lowest at Night, Black Bulb, (corrected for Index errors), on the 1st th, = 140

“Corrected Mean,” (Col. 8), of Black Bulb Min. on grass, = 140

Difference of above Means or Range (“exposed”), = 140

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 47.9

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 46.0

†† Computed Temperature of Dew-point, = 43.9

†† Do. Elastic Force of Vapour, = 2.86

†† Do. Weight of Vapour in a Cubic Foot of Air, = 87

†† Relative Humidity, (Saturation = 100), = 87

RAIN fell on // Days; Amount in Inches, = 1.10

WIND.		SUMMARY.					
Direction.	N	NE	E	SE	S	SW	W
A.M.		4	1	3	8	9	6
P.M.	1	4	1	2	7	6	3
Mean.	1	4	1	3	7	6	1

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

William Manslane

(Signed)

WITH REMARKS ON THE USE OF INSTRUMENTS.

the nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less centralization of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds' column*, though their appearances and changes ought to be noted among the *Remarks*.¹ The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and $4\frac{1}{2}$ on sunset. Observations of the clouds are made at 9 A.M. at sunrise,

column, an entry of $\frac{4}{2}$, st. cu-st., (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further-obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

soil—its amount and constancy; the Council recommended that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and general condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 12th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

bottoms of wells onig4, when practicable, to be taken, and the depth of the well and of the water noted.

Ozone.—Mention whether Schönbén's or Moffat's papers are used.—Moffat's are preferred. The paper is affixed by a pin to a board and the pneumoneter box; and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner.—Thus 334, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to the magnetic condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of the highest snow-line in winter ought to be recorded.

and upper strata of clouds, the colour of the sky. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms, and the direction and force of the wind. Particular notice on storms as having attained their maximum, as well as such notes on storms as have been timed at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 3 P.M. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off for purposes from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or in the side-margin. Additional remarks may be made on the margin.

The Council recommend that *term-day* observations be taken on a selected piece of ground or farm.

—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

EDINBURGH, 9th December 1863.

EDINBURGH, 9th December 1863.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit ripe generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Berry,		Apple.			Cuckoo.		
Bourtee or Elder.		Black Currant.			Curlew.		
Broom.		Cherry.			House-Swallow.		
Hazel.		Gemm.			Lapwing.		
Hawthorn.		Gooseberry.			Plover.		
Holly.		Peach.			Sand-Martin.		
Laburnum.		Pear.			Starling.		
Lilac.		Plum.			Swan.		
Mazeron.		Strawberry.			Rail or Corn Crane.		
Mountain Ash or Rowan.					Other Birds, naming them—		
Red Flowering Currant.							
Rhododendron Ponticum.							
Whin.							

Typhoid, Typhus, etc., whether plentiful, or in perfection; and the Agri-
cultural condition of the district generally.

BOOK-POST

EDINBURGH.

Secretary of the Meteorological Society of Scotland

Mr ALEXANDER BUCHAN,

Tg

11 March
Oct 1966

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Inveresk*, County of *Edinburgh* in Lat. $55^{\circ}36'0''$ Long. $3^{\circ}2'40''$ Distance from Sea *one* milesHeight of Cistern of the Barometer above Mean Sea-level *90* feet, above Ground *4* feet.During the MONTH of *November* 186*6*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				SUNSHINE.	THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.							
		9 h. A.M.		9 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.			9 h. A.M.													
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H-Cup Anemometer.	No. of hours in which it fell.	Amount in inches.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well at Depth of feet.	Temperature at 1 fathom, and Density.	0-10.	As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.					
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					
	1	29.60	58	29.40	58	54	43			53	50	43	41	SW	4	SW	2														Aurora seen on the 8 th 9 th 14 th	1				
	2	29.72	58	29.40	58	54	37			44	43	43	42	S	1	SW	1														19 th 26 th and 27 th	2				
	3	29.74	53	29.70	57	46	37			40	40	38	37	SW	1	SW	1														Rainbow seen on the 11 th and 23 rd	3				
	4	29.60	53	29.40	56	48	40			47	46	46	45	SW	2	SW	1														Faint Halo seen on the 22 nd	4				
	5	29.60	54	29.63	53	52	43			46	45	45	44	SW	5	SW	4														Gales of Wind occurred on the 5 th 7 th and 8 th	5				
	6	29.64	54	29.73	56	56	42			46	45	46	45	SW	4	SW	4																	6		
	7	29.45	53	29.80	60	56	42			53	53	44	42	SW	5	SW	5															Stars shooting on the 1 st 3 rd 8 th	7			
	8	29.30	58	29.40	54	56	37			52	50	40	38	SW	5	SW	4															11 th 13 th & 14 th The number	8			
	9	29.68	52	30	52	50	28			45	42	32	31	SW	2	SW	1															seen shooting on the night of	9			
	10	30	50	29.70	53	51	37			31	30	40	38	SW	2	SW	1															The 12 th from 12 o'clock to 2	10			
	11	29.40	50	29.60	56	52	38			44	44	44	41	SW	2	SW	3															next morning was most	11			
	12	29.64	51	29.43	56	50	40			43	40	44	42	SW	2	SW	2															enormous that no person	12			
	13	29.30	52	29.48	53	47	37			41	40	40	38	SW	2	SW	1															could count them, from 2	13			
	14	29.70	50	29.95	51	45	32			38	35	36	33	SW	1	SW	1															to 3.30 I counted 302, all	14			
	15	29.86	50	29.30	52	46	39			40	38	44	43	SW	2	SW	1															shooting from east to west	15			
	16	29.30	50	29.80	60	43	25			39	39	32	30	SW	1	SW	2															with one or two exceptions	16			
	17	30.06	48	29.90	60	42	35			26	25	37	36	SW	1	SW	1															The most magnificent one	17			
	18	29.60	49	29.80	60	40	29			38	36	30	29	SW	1	SW	1															seen was at 19 minutes before	18			
	19	29.90	46	30.03	50	36	34			30	30	32	30	SW	2	SW	2															3 o'clock, it lighted up the	19			
	20	30.18	45	30.04	57	40	32			30	30	34	32	SW	1	SW	1															whole heavens was of a most	20			
	21	30	50	30.06	56	44	38			38	37	39	38	SW	1	SW	1															brilliant blue & light colours	21			
	22	30.08	50	29.90	52	45	38			40	38	41	38	SW	1	SW	1															and burst in the western	22			
	23	29.57	50	29.67	60	45	31			41	40	36	35	SW	1	SW	1															sky and left a tail behind	23			
	24	29.78	50	29.30	60	46	35			35	33	37	35	SW	1	SW	2															of a white cloudy ap-	24			
	25	29.26	50	29.60	53	43	33			40	38	38	37	SW	1	SW	1															pearance, which was visible	25			
	26	29.90	50	29.70	53	45	38			35	32	44	42	SW	1	SW	2															for half an hour after -	26			
	27	29.88	57	30	52	46	35			42	39	39	37	SW	1	SW	1																	27		
	28	30.10	50	30.14	51	46	28			40	38	42	40	SW	1	SW	1																	28		
	29	30.10	48	30.05	52	45	35			30	30	41	39	SW	1	SW	1																	29		
	30	29.90	50	29.88	50	44	27			42	39	39	38	SW	3	SW	2																	30		
	31																																			31
	Sums.	210	3	226	15	20	16			1	26	28	23		58	52																				
	Means.	29.703	51.2	29.756	55.1	46.9	35.6			40.5	38.9	39.5	37.8		1.93	1.73																				
	+ Total Corrections for Instrumental Errors.																																			
	+ Corrections for Diurnal Range.																																			
	"Corrected Means."																																			
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = *29.643*
for Temp. (Col. 2), = *29.643* - *0.000*...
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = *29.686*
for Temp. (Col. 4), = *29.686* - *0.000*...
Mean at Station, corrected, and at 32°, = *29.664*
Correction for Height, feet, above Mean Sea-level, = *10.1*
Mean, reduced to 32°, and Sea-level, = *29.765*
Highest Reading, corrected for Index error, on the 20th, = *30.180*
Lowest Do., Do., on the 7th, = *29.260*
Difference, or Monthly Range, = *0.920*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 7th, = *56.0*
Lowest in Month, corrected for Index errors, on the 16th, = *25.0*
Difference, or Monthly Range, = *31.0*
"Corrected Mean" of all the Highest, (Col. 5), = *46.9*
"Corrected Mean" of all the Lowest, (Col. 6), = *35.6*
Difference, or Mean Daily Range, = *11.3*
** Calculated Mean Temperature of Month, = *41.2*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index errors), on the 11th, =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the 11th, =
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *40.0*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *38.4*
Computed Temperature of Dew-point, = *36.3*
Do. Elastic Force of Vapour, = *2.15*
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = *87*
RAIN fell on 8 Days; Amount in Inches, = *2.57*

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		2	2			2	10	12	2		1.93
P.M.		1	3			1	10	12	2		1.73
Mean.		2	2	0	0	2	10	12	2	0	1.83

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

W. Maunsell

(Signed)

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 56' 0" N Long. 3° 2' 40" W, Distance from Sea one mile.
Height of Cistern of the Barometer above Mean Sea-level Thirty feet, above Ground four feet. During the MONTH of December 1886.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.				CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS.		Days of Month.			
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.									
		Baromet.	Attach- ed Ther- mometer	Baromet.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity, (0-5), and Direction.	Amount, (0-10), and Species.	Velocity, (0-5), and Direction.	Amount, (0-10), and Species.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature at Surface and Depth.	0 A.M.	0 P.M.							
		* No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.				
	1	29.89	50	29.74	50	40	31			35	35	32	30	SW	1	SW	1							1									This month has been very open and mild, though and Hybrid Roses still in good flower	1			
	2	29.66	50	29.50	49	37	32			33	31	32	31	SW	1	SW	1																	2			
	3	29.20	50	29.20	51	51	40			45	43	46	45	SW	4	W	2		.21					1/2										3			
	4	29.30	50	29.40	50	43	40			43	41	42	40	SW		SW	4		.10															4			
	5	29.50	50	29.59	60	46	36			41	39	41	39	SW	4	SW	2		.02															5			
	6	29.70	48	29.10	52	42	37			38	37	38	37	SW	1	SW	2		.21															6			
	7	28.82	49	29.70	50	48	28			43	40	31	29	SW	5	SW	2		.32															7			
	8	20.10	47	30.30	49	36	28			28	27	28	27	W	1	W	1							2										8			
	9	29.84	50	29.54	57	50	37			48	47	46	44	SW	4	W	4		.21															9			
	10	30.00	50	30.20	59	46	28			44	42	37	35	SW	1	SW	1							2										10			
	11	30.28	50	30.20	56	40	30			31	30	35	34	SW	1	W	1																	11			
	12	29.60	50	29.50	60	44	34			36	35	38	37	SW	1	SW	2		.22															12			
	13	29.22	52	29.13	60	45	34			41	40	36	35	SW	1	SW	1		.10															13			
	14	29.12	53	29.20	54	44	36			42	40	39	38	SW	1	SW	1		.14						2									14			
	15	29.23	50	29.30	52	42	37			40	39	38	38	SW	1	SW	1							1										15			
	16	29.43	52	29.80	53	41	32			40	39	33	32	SW	1	SW	1		.05					3										16			
	17	29.83	54	29.84	55	50	44			45	44	44	42	SW	4	SW	2																	17			
	18	29.85	55	29.63	58	54	38			50	48	48	44	SW	4	SW	5		.15					1										18			
	19	29.90	55	30.20	63	46	39			39	36	41	38	W	5	W	2							1										19			
	20	30.20	55	30.10	60	50	43			44	41	44	41	SW	2	SW	2							2										20			
	21	30.20	59	30.30	58	53	33			50	47	37	34	SW	4	SW	1							1										21			
	22	30.36	50	30.23	57	51	40			34	33	45	42	SW	1	W	1							4										22			
	23	30.20	51	30.10	63	52	44			43	40	48	45	SW	1	SW	2							4										23			
	24	30.10	56	30.07	60	52	42			44	43	47	44	SW	2	SW	1							5										24			
	25	29.74	56	29.80	60	51	39			46	43	41	39	SW	2	SW	2		.10					1										25			
	26	29.70	55	29.40	63	47	34			42	40	38	36	SW	2	SW	2		.24															26			
	27	29.53	54	29.64	61	46	39			39	37	44	41	SW	1	SW	1							1										27			
	28	29.64	54	29.50	57	45	42			44	43	42	40	SW	2	SW	2		.14					2										28			
	29	29.35	56	28.99	56	50	34			45	43	40	38	W	4	W	2		.20					1										29			
	30	28.90	54	28.94	53	39	30			37	35	34	33	W	1	W	1		.22					1/2										30			
	31	29.45	45	29.40	48	34	20			32	32	28	28	SW	1	SW	1		.12															31			
	Sums.	208	6	203	18	17	17			2	18	28	22		65	54			27																		
	Means.	29.672	52	29.657	56	456	355			407	390	391	373		2.10	1.70																					
	† Total Corrections for Instrumental Errors.																																				
	† Corrections for Diurnal Range.																																				
	"Corrected Means."																																				
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
cl.	" cirrus.	ms.	" meteor.
cl. cu.	" cirro-cumulus.	n.	" nimbus.
cl. s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu. s.	" cumulo-stratus.	e. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. h.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sqs.	" squall.
l.	" lightning.	t.	" thunder.
l. cl.	" light clouds.	t. s.	" thunder storm.
l. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\dagger\dagger$ for Temp. (Col. 2), = 29.610
"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\dagger\dagger$ for Temp. (Col. 4), = 29.584
Mean at Station, corrected, and at 32°, = 29.597
Correction for height, feet, above Mean Sea-level, = 101
Mean, reduced to 32°, and Sea-level, = 29.698
Highest Reading, corrected for Index error, on the 27 th, = 30.360
Lowest Do., Do., on the 7 th, = 28.820
Difference, or Monthly Range, = 1.540

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 19 th, = 54.0
Lowest in Month, corrected for Index errors, on the 31 th, = 20.0
Difference, or Monthly Range, = 34.0
"Corrected Mean" of all the Highest, (Col. 5), = 45.6
"Corrected Mean" of all the Lowest, (Col. 6), = 35.5
D. [redacted] Month, = 10.1
S.-R. [redacted] in Sun, Highest, (corrected, for [redacted]) = 40.5
Bulb, Max. in Sun, = 40.5
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = 20.0
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = 20.0
Difference of above Means or Range ("exposed"), = 20.0

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 39.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 38.2
†† Computed Temperature of Dew-Point, = 36.0
†† Do. Elastic Force of Vapour, = 2.12
†† Do. Weight of Vapour in a Cubic Foot of Air, = 86
†† Relative Humidity, (Saturation = 100), = 86
RAIN fell on 17 Days; Amount in Inches, = 2.75

WIND.		SUMMARY.									
Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.			1	1	3	22	4			2.10	
P.M.			1	1	4	15	9	1		1.70	
Mean.	0	0	1	1	4	18	6	1		1.90	

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

W. M. Maclean

(Signed)

