An Irish miscellany

I – The Projection of the original One-inch Map of Ireland (and of Scotland)

Doubts have been raised from time to time concerning the projection used for the one-inch map of Ireland, that is the original 205-sheet series dating from 1855 and published in a number of forms, but now as a whole destined to remain the only all-Ireland one-inch series ever published. The doubts about this series, generally believed to be on Bonne's Projection, have been summarised by Professor John Andrews on pages 231-3 of *A Paper Landscape*, but to the best of my knowledge no such doubts have been expressed on the original one-inch map of Scotland, first published concurrently with the Irish series and also held to be on Bonne's Projection; the first three editions of the Scottish one-inch were all on the same projection and sheet lines.

On looking into this matter more closely I find there are two problems intertwined:

a) the projection used for the sheet line system and the associated latitude and longitude graduations; and

b) the positioning of the topographical detail on the sheets.

On question (a) the fact that the data for the projections and their origins, in particular the projected radii of the parallels of latitude of the origins, were firmly stated in OS publications leaves little space for reasonable doubt. But in 1905 the former OS Director General, Colonel Duncan Johnston, told a meeting of the British Association held in South Africa that 'the 6-inch and larger scales, and also the 1-inch maps of England and Ireland, are on what is known as the rectangular tangential projection', then describing what is certainly not the rectangular tangential projection but, although in rather vague terms, may be presumed to be Cassini's Projection; he continued, 'The 1-inch of Scotland is on a modified equal-area projection known as Flamstead's Modified.'

In considering these statements it is relevant to remember that Col. Johnston's particular sphere of interest was in reproduction methods and not geodesy, that he had been responsible for issuing the second edition of *Methods and Processes*, and that he had probably composed his paper aboard the Union-Castle liner without some requisite reference works; further that *Methods and Processes* described the projection used for the one-inch map of England and the six-inch maps of counties without naming it, that this projection (Cassini's) was always referred to by the OS as 'projection by rectangular spheroidal co-ordinates', and that the book states that the one-inch of Scotland is on a different projection, Flamstead Modified (i.e. Bonne's, see note), but does not mention the one-inch of Ireland. I therefore conclude that Johnston inserted the name of the English projection from memory, mixed up his rectangular projections in so doing, and added mention of Ireland but wrongly attached it to England instead of Scotland; and consequently I discount these references entirely.

However, for added certainty I have calculated the positions of two of the outermost points of the Irish one-inch sheet line system on the different projections, and compared them with the actual sheet graduations. The two points are the north-east corner of Sheet 21 and the south-west corner of Sheet 197, and at these extreme points there is sufficient north-south separation in the construction of the various projections to prove that the system of sheet

lines is not drawn on Cassini's Projection nor on the rectangular tangential projection, and that it can be and virtually certainly is on Bonne's Projection.

Turning to problem (b), the practical cartographer from the days of pen, ink and all sorts of paper, would probably admit that the actual drawing in of detail could involve some *ad hoc* methods, with the hopeful end that errors of position remained less than the possible paper distortion; it might therefore seem somewhat pointless to pursue this matter. However, as all the detail (other than revision material) on the series under review was reduced in from county series six-inch maps, a single basic method should have been used to effect the transfer from county Cassini projections to national Bonne projections before the matter was engraved on the one-inch scale. It may be useful here to remind readers that all the six-inch sheet lines were Cassini co-ordinate lines of their respective county projections, and all the old Irish and Scottish one-inch sheet lines were co-ordinate lines of the national Bonne's Projections; also that a transferred six-inch rectangle would theoretically not be quite rectangular on the one-inch map, but that the actual difference would be very far indeed from a visible quantity.

The correct procedure then should have been to calculate the geographical positions (latitudes and longitudes) of the corners of each six-inch sheet from their Cassini co-ordinates referred to the county origin, then to convert these positions to rectangular co-ordinates on Bonne's Projection referred to the national origin, whence the corners of the six-inch sheet would be measured out and marked in on the new one-inch plate, and the detail from that six-inch sheet reduced in to the reduced rectangle so established. I am greatly indebted to two Dublin professors who supplied me with copies of some of their research material concerning this and related matters, and both of whom included descriptions of other methods supposedly used for laying down the six-inch sheet corners. This revealing material was received after I commenced work on this paper, and I hope it will be of interest to members if I record my subsequent research step-by-step.

Professor John Andrews, now retired to Gwent, provided me with a minute written by the then Captain H StJ L Winterbotham in 1914 which first confirms my conclusion re (a) above, then states unequivocally that the geographical positions of the six-inch corners in Scotland and Ireland were correctly calculated but were wrongly converted to Cassini co-ordinates on the relevant national origin, using the familiar Clarke's formulae. If this were so the work would be out of place relative to the one-inch sheet graduations by amounts increasing with diagonal departure from the national origin, and rising to a displacement of 0.10 inch too far north at Muckle Flugga. Such an error would be easy to spot, and could have been corrected for a detached island area, but I checked a number of widely spaced trigonometrical stations on the Scottish and Irish mainlands as well as in the Shetlands, and I found no evidence of any systematic error. I therefore have to discount Winterbotham's statement, except for his odd remark that the wrong method was still in use (in 1914), even though the last of the basic one-inch sheets had been completed over a quarter of a century earlier. If he was referring to the reducing in of revision material on six-inch sheets, this opens up visions of adjoining detail being several hundredths adrift, and brings home my earlier references to ad hoc methods.

Professor Thomas Murphy had meanwhile sent me evidence of his investigations into the Irish six-inch maps, in which he had had the advantage of having seen the Ordnance Survey manuscript 'Calculation Sheet Book'. Whilst this does not contain all the OS calculations, it does give the results of their calculations, and these were compared with the results of his

own calculations. He found a systematic error in the north-south direction to be emerging between the figures he arrived at using the correct procedure I have stated above, and the figures in the OS book, and it was then suspected that the OS had used the following method: the geographical positions of the six-inch corners had been calculated from the county Cassini co-ordinates as though they had been rectangular co-ordinates on a Bonne's Projection with its origin coincident with the county origin. Re-calculation of a number of representative points by this method gave a concordance with the figures in the OS sheet book to the second place of decimals, thereby showing beyond reasonable doubt that this method had been adopted by the OS. In all these calculations the provisional positions of the origins and the county twists referred to in *Sheetlines 27*, page 7, were used.

Although we know that Bonne's Projection was fashionable at the time of the preparation of the Irish one-inch map, the use of it in this way was strictly incorrect and it is difficult to imagine exactly how this came about. However the maximum error resulting from this misuse of the projection occurs at the outermost corner of the largest county, County Cork, and is only 0.004 inch or less than half a hundredth, which is usually regarded as an acceptable degree of accuracy in drawing on paper. Whether this possible discrepancy was calculated out in 1855 can only be speculated upon.

Armed with the news of this method of calculation for the Irish counties, I returned to my happy hunting ground in class OS 2, trigonometrical records, in the Public Record Office at Kew, in the hope of finding what method was used in Scotland. Having obtained the book containing the results for the largest county area, the unified counties of Argyll and Bute, I was pleased to find it also contained all the calculations as well as the results for another large county, Sutherland. The figures for these counties showed conclusively that the correct method and not the 'Irish' method had been used to calculate the geographical positions of the six-inch corners in Scotland, those for Argyll and Bute being quoted to and correct to three places of decimals. But what emerged from the complete Sutherland figures brought yet another surprise – the final calculations provided rectangular co-ordinates on the national Bonne's Projection in units, not of feet, but of fathoms! Whilst this was somewhat gratifying to a retired hydrographic officer, it was initially rather baffling in an OS context; however, due thought suggested that this apparent quirk would enable the measurements to be directly plotted on the one-inch scale, utilising some instrument(s) graduated in scale feet at six inches to a mile. It was Ian Mumford who reminded me of the scoring machine, an early form of co-ordinatograph described and illustrated in *Methods and Processes*, in which the indications are that co-ordinates in feet could be directly read off on its brass scales when engraving new six-inch copper plates. So was yet another satisfactory solution arrived at, literally on the eve of the editor's deadline for this number of *Sheetlines*, and so for the time being I leave this subject to rest.

NOTE: *Methods and Processes* says 'The projection for the one-inch map of Scotland differs from that of England … It is the same as that used for the map of France, and sometimes called Flamstead Modified', and follows this with a description of the projection which confirms that it is the one known to us as Bonne's. I have not come across any source for the name Flamstead Modified, but Flamsteed's Projection (this spelling is correct) is one of several names which have been used for the Sinusoidal Projection, which is in fact the particular equatorial case of Bonne's Projection.

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II – Combined sheets of the Irish one-inch coloured edition

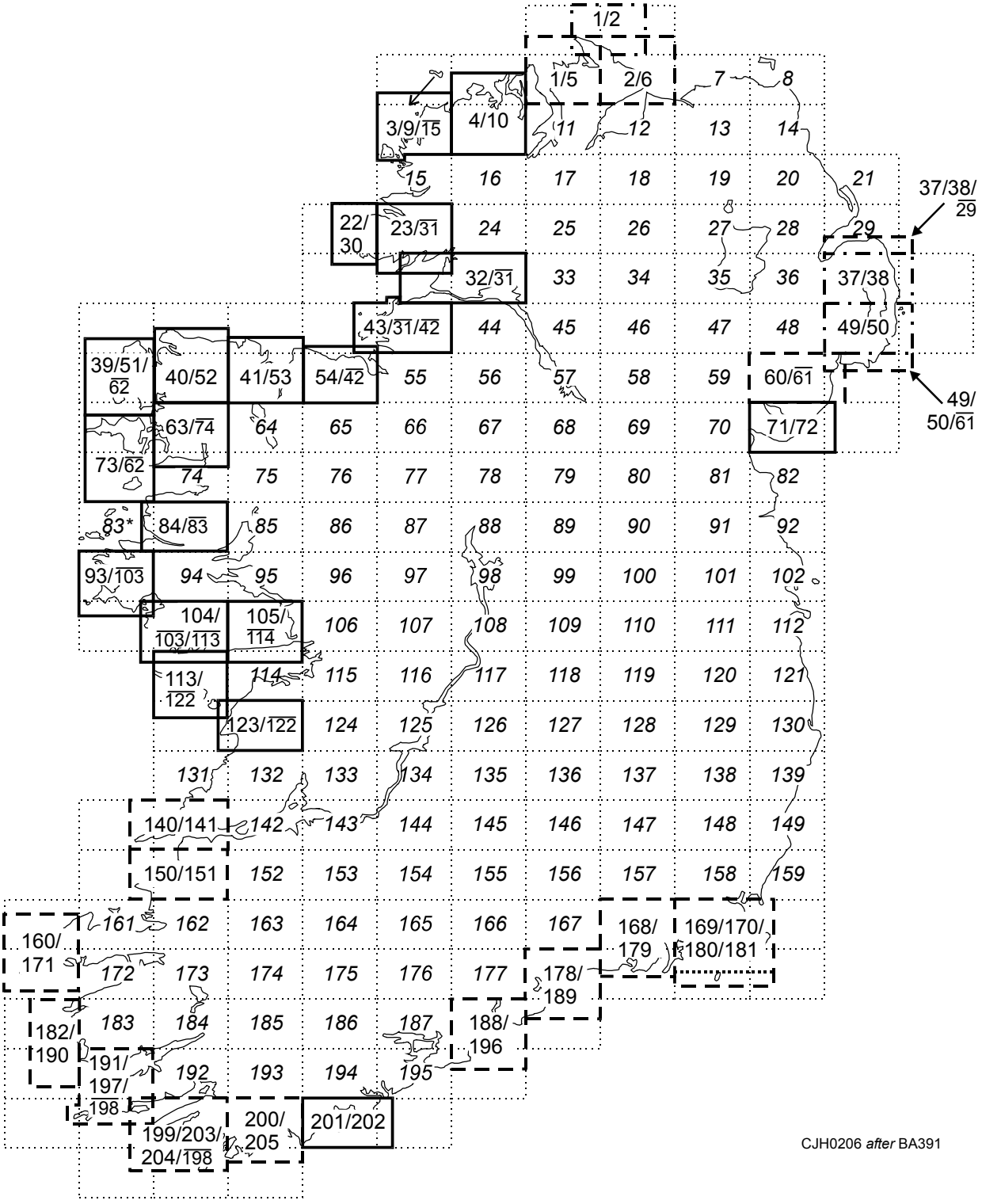
Quite a number of the more senior members of our Society will remember the late Stanley Crowe, a leading antiquarian bookseller specialising in topographical literature and maps, who long occupied premises in a Bloomsbury basement after being bombed out from the City. Many years ago I was fortunate to acquire from him a complete set of the coloured edition one-inch maps of Ireland bound in three volumes; two years later he advertised another complete set at exactly twice the price. However, it was somewhat confusing that the various combined sheets in my set differed in several respects from those depicted on the only series indexes that I could find, and eventually I had to construct my own index to my set.

Having offered to write something about this for the editor's proposed Irish-oriented number I examined the Royal Geographical Society's holdings of this edition, only to find that my set occupied an intermediate position between the array of coloured sheets as originally published and the final pattern of only a few years later. The differences between the original and later groupings of combined sheets are illustrated by the accompanying map.

The first sheets of the coloured edition were published early in 1902 and the first combined sheet, 201 & 202, appeared in May of that year. It was not until October 1903 that a second combined sheet was published, 71 & 72, followed by 49 & 50 in December and 37 & 38 in March 1904. These four sheets all comprised basic sheets extended eastwards to include relatively small portions of land. Meanwhile the coloured edition had first been completed for the south-eastern quarter of Ireland, followed by the south-western sixth and the north-eastern quarter, and it was only with the completion of the remaining north-western and western parts during 1905 and the first months of 1906 that combined sheets of varying shapes became almost universal in the coastal areas. It is evident from the writings of Professor John Andrews that this surge of interest in combined sheets occurred with the transfer of Irish coloured work from Dublin to Southampton. I should make it clear that I am only concerned here with the coloured sheets of the regular series, and not with special district sheets inspired by the Dorington Committee report.

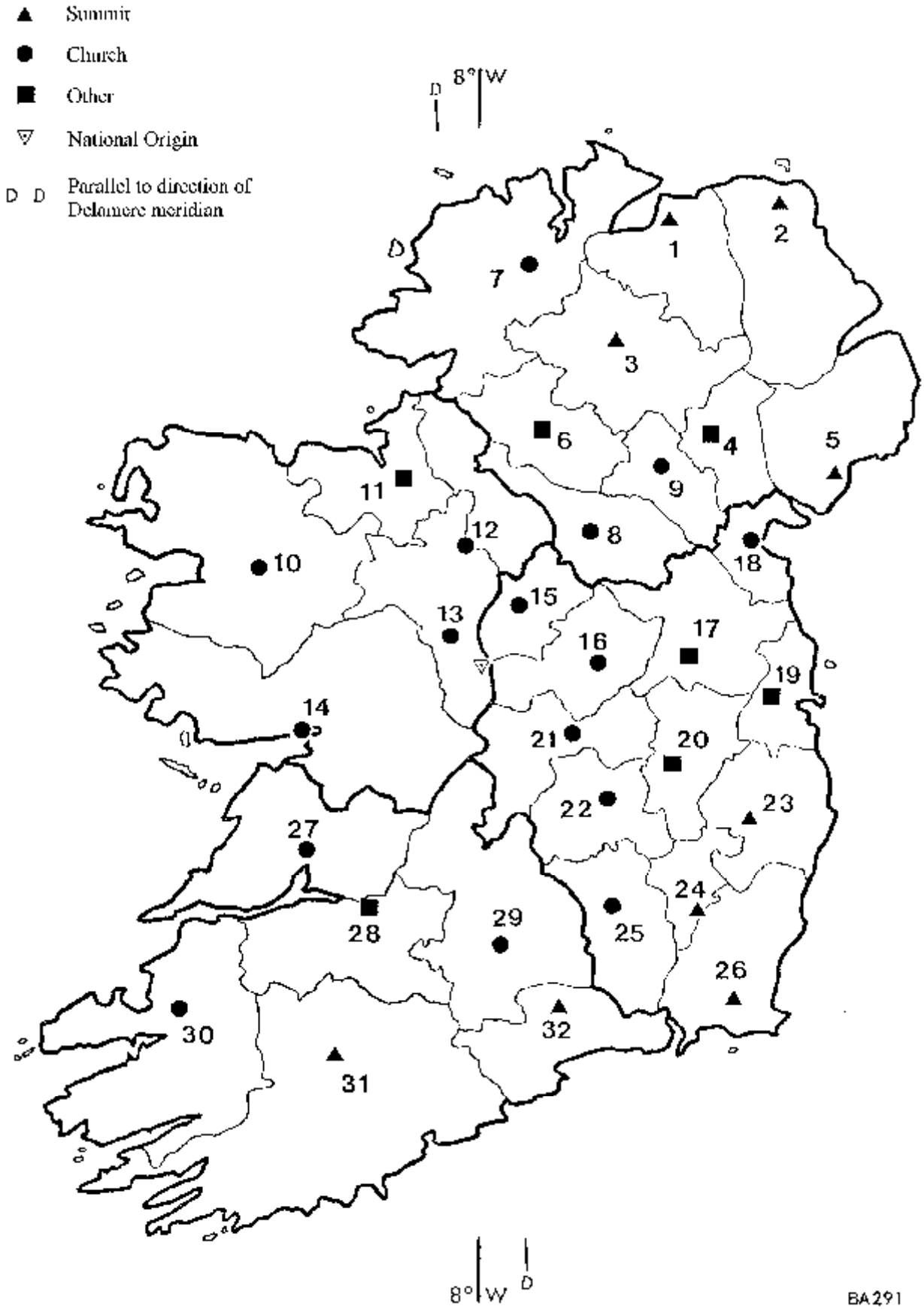
Subsequently, during 1906 and 1907, quite a number of the early-issued sheets were re-prepared, and during the course of this work many of the original basic sheets around the south-west and south coasts were replaced by additional combined sheets, together with some re-arrangement of the combined sheets on the coast of Ulster, as shown on the map. The numerical designations of the combined sheets followed the rule (with one exception, later corrected) that where portions of a basic sheet fell on more than one combined sheet, then the basic sheet number was qualified by 'Part of' or 'Pt. of' in the combined sheet designations, but where a portion of a basic sheet only appeared on one combined sheet its number was left unqualified in that sheet's designation. These distinctions are also indicated on my map.

Combined sheets of the Irish one-inch coloured edition



.....	*basic sheet layout*
———	*originally published as combined sheet*
– · – · –	*as above, but later superseded*
– – – –	*combined sheets published subsequently*
·····	*sheet line as altered in 1908*
177	*basic sheet unaffected by combination*
2/6	*combined sheet*
$\overline{198}$	*included as 'Part of' in sheet designation '&' is to be understood in designations*
*	*Sheet 83, the only basic sheet to remain published seaward of combined sheets*

County origins of Ireland



III – County Origins of Ireland

This is believed to be the first ever published map depicting the county origins of Ireland. A brief commentary on these points appeared in *Sheetlines 27* page 7. There is even less consistency in the names of the Irish origins than in those of Great Britain; but the appended table gives the most acceptable I can put forward at present, with alternative or locational names in parentheses.

Province	*Map No.*	*County*	*Origin*
Ulster	1	Londonderry	Benevenagh
	2	Antrim	Knocklayd
	3	Tyrone	Mullaghcarn
	4	Armagh	Armagh Observatory Transit
	5	Down	Slieve Donard
	6	Fermanagh	Devenish Round Tower
	7	Donegal	Letterkenny Church Spire
	8	Cavan	Cavan Church Spire
	9	Monaghan	Monaghan Church Tower
Connacht	10	Mayo	Castlebar Church Tower
	11	Sligo	Cooper's (Markree) Observatory Transit
	12	Leitrim	Carrick-on-Shannon Church Spire
	13	Roscommon	Roscommon Church
	14	Galway	Galway Church Spire
Leinster	15	Longford	Longford Church Spire
	16	Westmeath	Mullingar Church
	17	Meath	Wellington Testimonial (Trim)
	18	Louth	Dundalk Church Spire
	19	Dublin	Dublin (Dunsink) Observatory Transit
	20	Kildare	Kildare Round Tower
	21	Offaly[1]	Tullamore Church
	22	Laois[2]	Maryborough (Portlaoise) New Church
	23	Wicklow	Lugnaquilla
	24	Carlow	Mount Leinster
	25	Kilkenny	St. Mary's Church Spire, Kilkenny
	26	Wexford	Forth Mountain
Munster	27	Clare	Ennis Church Tower
	28	Limerick	Rice's Monument (Limerick)
	29	Tipperary	Cashel Church Spire
	30	Kerry	Tralee Church Spire
	31	Cork	Mount Hillary
	32	Waterford	Knockanaffrin

[1] mapped as King's County
[2] mapped as Queen's County