

## THE ORDNANCE SURVEY MAPS AND THE CAIRNGORMS.

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IN the January number of the *Cairngorm Club Journal* there appears a short article by Mr. C. G. Cash on "The Ordnance Survey and the Cairngorms". The tone of the article is very friendly to the Survey, but Mr. Cash has, I think, omitted to take into account various considerations as to maps which can hardly be ignored.

Mr. Cash first complains of the Ordnance Survey one-inch maps. He says that the quality of the one-inch hachured map is excellent, but that the scale is too small. This opinion is, as to the latter point, not general. Cyclists, who want to cover a large extent of country, say the scale is too large. As a matter of fact the scale is about the average for the topographic maps of the various countries of the world, and is rather larger than the scales for the standard topographic maps of the principal European countries. This will be seen from the list on the next page, which, I think, includes most of the countries which produce topographic maps analogous to the Ordnance one-inch maps.

It thus appears that the principal topographic maps of Austria, France, Germany, Italy, and Russia are on scales rather smaller than that of the English one-inch Ordnance map, although some of the smaller European countries, such as Belgium, Denmark, etc., use rather larger scales. But no country uses for its topographic maps any scale nearly as large as that of six inches to a mile.

The English six-inch map is, in fact, in all its main features, what is technically called a "cadastral" map. Every European country draws a distinction between its cadastral and its topographic maps. The former are on large scales, and are prepared mainly for

Country.	Official Name of the Map.	Representative Fraction of the Scale.	Approximate Scale to One Mile.	Hill Features shewn by	
Austria ..	"The Austrian Staff Map"	$\frac{1}{75,000}$	abt. $\frac{3}{8}$ inch	Hachures and Contours.	
Belgium ..	"The Topographic Map of Belgium"	$\frac{1}{40,000}$	" $1\frac{1}{2}$ "	Contours.	
Denmark ..	"The Topographic Map of Denmark"	$\frac{1}{40,000}$	" $1\frac{1}{2}$ "	Do.	
England ..	"The Ordnance Survey 1-inch Map"	$\frac{1}{63,360}$	1 inch	{ 1. Outline and Contours Edition. 2. Hachured Edition.	
France ..	"The General - Staff Map of France"	$\frac{1}{80,000}$	abt. $\frac{3}{8}$ inch	Hachures.	
Germany ..	"The Map of the German Empire"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Do.	
Italy ..	"The Topographic Map of the Kingdom of Italy"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Hachures and Contours.	
Netherlands	"The Topographic Map of the Netherlands"	$\frac{1}{50,000}$	" $1\frac{1}{2}$ "	Hachures.	
Norway ..	"The Topographic Map of Norway"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Contours.	
Portugal ..	"The Topographic Map of Portugal"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Do.	
Russia ..	"The Topographic Map of European Russia"	$\frac{1}{125,000}$	" $\frac{1}{2}$ "	Hachures.	
Spain ..	"The Topographic Map of Spain"	$\frac{1}{50,000}$	" $1\frac{1}{2}$ "	Contours.	
Sweden ..	"The Topographic Map of Sweden"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Nil	{ For South Sweden. For the uncultivated northern districts.
Do. ..	"The Map of Norbottens Lan"	$\frac{1}{200,000}$	" $\frac{1}{2}$ "	Contours and Hachures	
Switzerland	"The Topographic Map of Switzerland (Dufour's Map)"	$\frac{1}{100,000}$	" $\frac{3}{8}$ "	Hachures.	
United States ..	"The United States Geological Survey"	$\frac{1}{62,500}$	" 1 "	Contours	{ For populous districts. For medium districts. For mountainous or uncultivated districts.
		$\frac{1}{125,000}$	" $\frac{1}{2}$ "		
		$\frac{1}{250,000}$	" $\frac{1}{4}$ "		

facilitating transactions in land either as to its ownership or its occupation, for the rating of the land, for the delimitation of public areas and boundaries as affecting local government and statistics, etc., and for facilitating public works such as the construction of railways. Topographic maps, on the other hand, are on small scales, and are prepared mainly for the use of travellers and for military purposes. The only difference as to this point

between Great Britain and other countries is that in other countries which have cadastral maps they are prepared by the local authorities for each district, and are retained by them—they are not published or sold to the public at all; the only maps which are published and are on sale to the public are the small-scale topographic maps which are in all those countries prepared by the General Staff of the Army. In Great Britain, on the other hand, both kinds of maps, cadastral and topographic, are prepared by the same Department, namely, the Ordnance Survey, and both kinds of maps are published and on sale to the public. But this difference does not remove the distinction in Great Britain between cadastral and topographic maps, and does not make the six-inch maps of Great Britain suitable for the use of tourists or travellers. Their bulk, to say nothing of any other consideration, has always been considered prohibitory for that purpose. Each full sheet, three feet long by two feet wide, covers an area of only six miles by four. If a tourist or traveller proposed to spend his one- or two-months' holiday in exploring the English lake district, which is, I suppose, the smallest of our home "playgrounds", and if he used the six-inch maps for so doing, he would want some 60 or 70 of them at a cost of £8 or £9, and, if he had any regard to economy, would probably have to send them about the country by goods train. The alternative would be to buy some half-a-dozen one-inch maps at a total cost of 6s., and put them in his pocket or his portmanteau. It is needless to say that in 999 cases out of 1000 the latter alternative, or even a smaller map, or no map at all, would be preferred, and that the tourist would have nothing to do with the 60 or 70 six-inch sheets. The one-inch map, in fact, is, and always has been, the Government topographic map of Great Britain, and is generally admitted to be adequate for its purpose; while the complaint most usually and justly made against the hachured edition, namely, that the heavy black hachures make the other details on the map illegible, is not mentioned by Mr. Cash at all.

Mr. Cash next complains of the six-inch maps of the higher ground. So far as the absence of contours on these

maps is concerned, the defect is fully admitted, as will be seen later on. But Mr. Cash goes much further than this. He claims that our M.P.'s should "demand and insist that all our land should be adequately and beautifully mapped", which he explains to mean that there should be for the whole country, and especially for the higher ground, a set of six-inch maps hachured like the one-inch maps; and he says that this demand has been supported by the British Association.

There is surely some mistake about this last-mentioned statement. But whether there is or not, I have no doubt whatever that the proposed method of improving the six-inch map would be an entire failure. Some of the slopes in mountainous districts are a mile or more in length, and the hachures showing those slopes on a six-inch map would be six inches long. Let anyone attempt to graduate on a map a series of vertical lines six inches long, thick near the top and dying away to nothing at the bottom, and he will see how hopeless the result on the map would be. Even in the case of the one-inch map, where the same hachures are only one inch long, it is, as has been said above, justly complained that on steep ground the map is often illegible. In fact, the only practicable method of showing hill features on a scale so large as the six-inch is by contours or by horizontal hill shading; and vertical hachures like those on the one-inch map, so far from improving the six-inch map, would ruin it.

Nor is there any general demand from the public for a hachured six-inch map. The class of people who would use it is a very limited one. The class is, no doubt, increasing, because special districts like the Cairngorms are now comparatively accessible, and annual holiday-making by all except the industrial class has become practically universal. But for by far the greater proportion even of holiday-makers the one-inch map is amply sufficient, and the Government can fairly say, in reply to demands for special maps, that it is for those specially interested in them, and not for the general tax-payer, to pay for the cost of their preparation.

But having now stated what seems to me to be the case against Mr. Cash's proposal, it is right to state the case on the other side. For there is a case on the other side, and on one point, namely, the absence of contours on the six-inch maps of the higher ground, it is a very strong one. But, first, I may mention a point which, although it cannot be followed up by any practical addition to English maps, may nevertheless supply the Cairngorm Club and Mr. Cash with an argument for their case.

Although, as has been stated, the principal topographic maps of foreign countries are on scales rather smaller than that of the English one-inch map, yet there are some half-dozen European countries, two of them among the largest, which supplement their principal map by topographic maps on scales about half-way between the English one-inch and six-inch maps. These are the following:—

Country.	Representative Fraction of the Scale.	Approximate Scale to One Mile.	Hill Features shewn by	Extent of Map.
Belgium ..	$\frac{1}{20,000}$	about 3 inches	Contours	The whole country.
Denmark ..	$\frac{1}{20,000}$	" 3 "	Contours	Do.
Germany ..	$\frac{1}{25,000}$	" 2½ "	Contours	Do.
Italy .. ..	$\frac{1}{50,000}$	" 1½ "	} Contours	For mountainous districts.
	$\frac{1}{25,000}$	" 2½ "		For less elevated districts.
Netherlands	$\frac{1}{25,000}$	" 2½ "	Hachures	The whole country.
	$\frac{1}{25,000}$	" 1½ "	} Contours	For mountainous districts.
Switzerland	$\frac{1}{50,000}$	" 2½ "		} Contours
	$\frac{1}{25,000}$			

These maps are all either completed or in progress. It should be observed that for Italy and Switzerland the larger scale, or  $\frac{1}{25,000}$  maps, although they are described as "for less elevated districts", really include much ground higher than any in Great Britain. And it will be noticed that none of the above countries except the Netherlands, which has probably no hills of any consequence, ventures to show hill features by vertical hachures even on scales half of the scale of the English six-inch map. All the other

countries use contours. Most of the above are good legible maps. Those of Switzerland are probably known to many members of the Cairngorm Club. They are, I believe, not as yet so popular as the hachured black and white map (Dufour's) on the scale of about  $\frac{5}{8}$  inch to a mile, but this is probably because many people are more accustomed to hachures than to contours; and ultimately they will, no doubt, supersede Dufour's map.

I have mentioned these maps on intermediate scales, not because there is the least chance of Mr. Cash getting them for the Cairngorms, but because they may supply him and his M.P.'s with an argument. In 1892 a Departmental Committee, after taking a great deal of expert evidence, reported on the methods, scales, etc., of the Ordnance Survey. One or two of the witnesses asked for a map of Great Britain on one of these intermediate scales of from 2 to 3 inches to a mile. But the Committee reported that they were "of opinion that the present scales of the Ordnance Survey meet all reasonable requirements of the public, and that special scales required for special purposes should be left to private enterprise". That opinion is likely to remain effective. But the Cairngorm Club and Mr. Cash can reasonably argue that a Government which refuses to give them maps more convenient for their purpose and on larger scales than the one-inch map, while Germany and Switzerland provide such maps, is at least bound to improve as much as possible the six-inch maps which it actually issues.

And on this point of contours the six-inch maps of nearly the whole of the country are admittedly defective. The best of them are those made fifty years ago, and the worst of them are those made most recently. The former include Lancashire and Yorkshire, Wigtown and Kirkcudbright, and the Island of Lewis, all of which were surveyed before 1854, and whose maps include instrumental contours up to the top of the highest mountains (about 2600 feet) and interpolated or sketched contours at intervals of from 25 to 50 feet. But in 1854 a Committee, which consisted mainly of civil engineers and geologists, reported that if

any contours were shown on the Ordnance six-inch maps they "should be instrumentally traced with accuracy, and that the system of interpolating contours should be abandoned". Their recommendation was at once adopted, and its adoption made effective mountain contouring impossible. For by common consent it would be waste of money to trace numerous instrumental contours, accurate within 2 or 3 inches, up to altitudes of 3000 or 4000 feet. From 1854 to about 1865 instrumental contours continued to be traced at intervals of 100 feet up to 1000 feet, and above that level at intervals of 250 feet to the top of all hills, but there is nothing between those intervals. To this extent the six-inch maps are contoured for the four most northern counties of England and for most of the southern counties of Scotland. But about 1865-6 there was another change in the direction of economy. The six-inch maps surveyed since about 1865-6, including those of all England and Wales south of Lancashire and Yorkshire, and those of most of the northern counties of Scotland, have no contours above an altitude of 1000 feet; while the maps of Bute, Argyll, Sutherland, and Orkney and Shetland have no contours of any kind. So that, as to this point of contours, the six-inch maps of Great Britain are on four different footings, varying from no contours at all to contours at from 25 to 50-foot intervals. The reason of this anomaly was, no doubt, the pressure on the Survey for large-scale maps 30 or 40 years ago. At that time it must be remembered that the whole of England and Wales south of Lancashire and Yorkshire had no map larger than that on the one-inch scale, some of it 40 or 50 years old. The complaint that Warwickshire and Middlesex and Devonshire should be in this position while a large proportion of the Survey vote was being expended on making large-scale maps of Sutherland and the Hebrides became gradually too strong to be resisted, and the expenditure on mountain surveys was reduced to set free funds for large-scale surveys in southern districts.

This anomalous state of the contouring on the six-inch maps of the country came before the Committee of 1892

above-mentioned. About a dozen expert witnesses complained of the inadequacy of the contouring, and most of them advocated reverting practically to the standard of 50 years ago, including interpolated or sketch contours for mountainous districts. Sir Archibald Geikie said that his geological surveyors had the greatest difficulty in carrying out their work at altitudes above 1000 feet in the absence of contours on the six-inch maps; civil engineers said that even the interpolated contours are most useful for approximately defining the catchment basins for the water supply of large towns; and a distinguished traveller said that, whether from the point of view of the geographer or of the mountaineer, it is "barbarous" to stop contours half-way up a hill. The Committee in their report recommended an intermediate course, namely, that for the whole of Great Britain contours at 250-foot intervals above the 1000-foot level should "at an early date" be inserted on the six-inch maps by water-level, on the grounds that it would make the contouring of the maps rather more uniform, that it had already been done in part for Scotland, that it is a feature required by the Geological Survey, and that it is of the greatest service for ascertaining the watersheds for high-level water supplies and occasionally for mining purposes, while, at the same time, it is a matter of general interest to the whole community. No action has hitherto been taken on that part of the Report of the Committee, principally, no doubt, owing to pressure brought on the Survey to push on the revision of its large-scale maps, some of which are very old.

But this latter work is now well advanced; and for this reason, as well as for the reason that the class of Ordnance Surveyors called "Hill Sketchers", who are trained to mountain or sketch contouring for the one-inch map, have recently completed that work for the whole of the United Kingdom, and are now available, the present seems to be a suitable time for bringing the contour work on the six-inch maps to a more satisfactory condition. But I am afraid that the contours at 250-foot intervals recommended by the Committee of 1892 would not satisfy either

Mr. Cash or the experts who gave evidence before it. The latter were practically unanimous that the contours now shown on the low ground of England and Scotland at intervals of 100 feet are nearly valueless because the intervals are too great, and the general opinion was that intervals of 50 feet should be the minimum requirement so as to be practically useful to the public. It does not, therefore, seem unreasonable to ask for contours at that interval for the whole of the six-inch maps of the country, instrumental on the lower ground, and interpolated or sketched on the higher ground. The maps would then be nearly uniform. The Swiss maps on less than half this scale have contours at intervals of 10 mètres, or about 32 feet. The new form of the revised one-inch maps of Scotland and the north of England (with the hill shading printed in brown instead of black), which was begun in 1898, and which is, I hope, being rapidly extended from north to south, already shows contours above 1000 feet at 250-foot intervals; and maps on six times that scale should clearly have the contours much closer.

I need hardly allude at any great length to the minor or more detailed errors in the six-inch maps of the Cairngorms which Mr. Cash mentions in his paper. As to the levels, he will see from the maps that they are generally shown along lines actually measured, such as the sides of the triangles, or watersheds, or the courses of streams. At these points they were readily ascertained in the course of the reduction of the surface chain measurements to their horizontal dimensions. They are not supposed to be strictly correct like the heights shown at the trigonometrical stations, and they are written on the six-inch maps not so much for use on those maps as to form a guide to the men (the "hill-sketchers") who come afterwards to sketch the ground for the contours and hachures of the one-inch map. They are not, in fact, considered an essential part of the six-inch map. Then as to the names, it should be remembered that 30 or 40 years ago the Cairngorms were hardly so much frequented as now. Members of the Cairngorm Club did not then establish themselves at comfortable quarters

in Strathspey, and devote weeks or months to exploring every rock, height, and hollow in the district. The Ordnance Surveyors were then probably dependent, for all information about the names, on being accompanied for one or two days on the ground by one or two shepherds or gillies, who might or might not be very intelligent, and might or might not have been long resident in the district. And as to the position of the names, the six-inch surveyors were trained only to the use of the theodolite and chain and not to sketching, so that they were very apt to sketch the names badly in the case of features such as heights and hollows which had not been accurately surveyed; and the same consideration applies to their sketches of unsurveyed crags or rocks. Few of them knew Gaelic; if they had, they would not have written the name of a corrie high up on the face of a hill, or a name like *Inch* Riach on the top of a ridge. The names on the one-inch maps must share these defects, because they are all taken from the six-inch maps.

In fact, the weakest point of the Survey is, as it itself readily acknowledges, the absence in most districts of qualified local assistance as to names and other valuable local information. Any assistance, such as Mr. Cash suggests might be rendered by qualified members of the Cairngorm Club, will, I am sure, be always willingly and thankfully received by the Ordnance Surveyors.