

A HYDROGRAPHIC APPROACH TO THE ALPS

PART II

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A HYDROGRAPHIC CLASSIFICATION OF THE ALPS

THE five Basic Watersheds may be taken as the fundamental framework which carries as branch watersheds the whole of the rest of the Alps. The nodes from which all branches emerge may be definite mountains, lesser eminences, or quite inconspicuous. The branches vary from small spurs which do not contain a single mountain, to large much branched complex systems. Some branches come to a natural end by arriving at the sea coast, or at the confluence of the two rivers they serve. These natural ends may be within the limits of the Alps, but if they extend beyond these limits the usual arbitrary decisions are required.

Each Basic Watershed along with all its Alpine branches may be considered to form a single natural system which will here be called a 'Basic System.'

It is thus possible to classify the whole Alps into five Basic Systems each based on its parent Basic Watershed :—

- I. [MEDITERRANEAN .w. ADRIATIC] BASIC SYSTEM.
- II. [ADRIATIC .w. NORTH SEA] BASIC SYSTEM.
- III. [ADRIATIC .w. BLACK SEA] BASIC SYSTEM.
- IV. [NORTH SEA .w. MEDITERRANEAN] BASIC SYSTEM.
- V. [BLACK SEA .w. NORTH SEA] BASIC SYSTEM.

The status of each is unassailable, and they can only be tampered with where their watersheds or branches extend, or tend to extend, beyond the limits of the Alps. This drawback is common to any system of classification. The systems are, in whole or in part, capable of bearing alternative titles, but they are independent of geological, ethnographical, historical, linguistic, and political factors. Their somewhat cumbersome titles are self-explanatory and informative. Attempts to find shorter alternative titles are frustrated because otherwise suitable determinants (such as the most notable peaks or passes on the respective watersheds) are already bespoken for and entrenched in other systems of classification. The cumbersome titles, if that were the only drawback, would seem a small price to pay for the increase of precision secured.

Seeing that the five Basic Systems are comparable in magnitude to the conventional 'Divisions' of the Alps, the question arises as to whether such a watershed classification can be extended to give sub-systems similar in size to Coolidge's 'Groups.'

Before dealing with this problem it will be desirable to examine the principles generally employed in determining these Groups. Most of them are based on a Main Chain or Watershed, and are marked off from each other by specially selected passes giving a series of segments end-to-end. Moderate and small branches are held to belong not only to the Main Chain but also to the Group from whose segment they arise. With regard to the larger branches a convenient pass is selected beyond which the branch develops into an independent Group. This leaves a number of truncated 'stalks' which remain the property of the Main Chain. Most of these stalks are short, as in the case of the Dauphiné Alps (to the Col du Galibier), and of the Tödi range (to Oberalp Pass); but in some cases the stalk is longer as in the case of Coolidge's 'Silvretta and Rhätikon' Group (to Fluëla Pass). E. of the Splügen Pass these principles are less in evidence. Ball virtually observes them with regard to his 'Rhætian Alps,' notwithstanding his statement that 'the entire mass is divided into two nearly equal portions by the upper valley of the Inn.'¹ Coolidge ignores the name Rhætian Alps; makes a small corner of his 'Silvretta and Rhätikon' Group jump the Inn to be tacked down onto the Reschen Scheideck; and throws his 'Ortler Group' across the Adige to obtain connection with the Main Chain. The liability for different passes to be selected as the demarcations between the Groups, and the tendency of Man to graft his politically derived names onto the Groups, have been noted.

Returning to the possibility of extending a hydrographic classification to give sub-systems comparable in size to Coolidge's Groups; this seems feasible but not without introducing a considerable measure of arbitrary decisions, and intensifying the trouble due to alternative names. Although Coolidge writes 'Let it never be forgotten that all physical divisions of the Alps are purely artificial and adopted simply for reasons of practical convenience,'² nevertheless the more the 'physical divisions' are based on definable physical features, the more truthful will be the picture of the 'Alps in Nature' if not of the 'Alps in History.'

For guide-books dealing with railways, roads, tourist and climbing centres, a system of Groups (particularly if universally accepted) may be admirable, but is not so satisfactory for those whose interest in the Alps is mainly physical. Most Climbers' Guides (books) adopt a considerable degree of hydrographic delineation in their arrangement, but their 'Groups' are in general much smaller subdivisions than those of Coolidge.

On what principles then can a further watershed classification be based? Now it is quite obvious that each Basic Watershed is made up of a chain of lesser ones, also that a change occurs whenever a fresh river basin of any kind is encountered. Most such changes are relatively unimportant, but here and there one stands out as being more drastic and comprehensive than its fellows. From the nodes where

¹ *Encyclopædia Britannica*, 1875, under 'Alps.'

² *The Alps in Nature and History*, p. 279.

these more significant changes occur it will always be found that an unusually significant branch-watershed starts from that side of the Basic Watershed on which the change has taken place. This branch, along with *all* its ramifications, can be said to constitute a 'Major Branch System.' The section of the Basic Watershed between two significant nodes, along with all *its* ramifications, can be said to form a 'Basic Section System.'

It is not so surprising, as it might at first seem, that no node on any Alpine watershed sends out considerable branches on both sides of the divide. If, as seems likely, such nodes existed in the earlier stages of denudation they could hardly be expected to retain their unity (oneness), for the cutting back is unlikely to have been at the same rate on either side, and might well be in opposite directions.³

Arbitrary decisions will of course be required to decide which nodes on a Basic Watershed deserve to be classed as more significant, and border-line cases are bound to occur.

The fact that composite watersheds can carry a variety of titles, in whole or in part, may be both a help and a hindrance to a hydrographic classification of the Alps. It helps to reduce the number of separate watersheds that have to be dealt with, and by allowing latitude of title provides plausible extrication from a dilemma. On the other hand it may conduce to abstruseness, inconsistency, quandary and the necessity for arbitrary decisions.

An arbitrary decision is frequently required when a branch watershed (Major or otherwise) forks. It is usually possible to detect, and advisable to select, as the more dominant, that branch which affords the most comprehensive watershed; *even though this may widen the terms of reference from what at first sight seems more obvious and reasonable.*

The branch that leaves its Basic Watershed at Mont Dolent (P. 3750), and carries the Aiguille d'Argentière, etc., starts quite obviously as [Drance .w. Arve], but at the Petite Fourche it forks and neither branch answers to this title. The left branch carrying the Aig. du Tour, Col de Balme, Col des Montets, Buet, and Cheval Blanc, will give the more comprehensive watershed. At the W. (lower) summit of Mont Ruan it again forks, and again the left branch will give the more comprehensive (though less robust) watershed. The whole branch can be summed up as ['Swiss' Rhone .w. 'Savoy' Rhone].

Again the title [Isère .w. Durance] would seem an admirable one for the watershed that carries most of the Dauphiné Alps, but on approaching the Rhone it forks to admit the basin of the Drôme, etc., and neither branch, though both still Alpine, will answer to this title. It therefore seems advisable to widen the scope of the watershed to [Rhone .w. Durance], notwithstanding the fact that this carries it to a natural end some distance beyond the Alpine limit. It would, however, seem superfluous to designate the watershed which carries the Eastern

³ For examples of presumed shifting of nodes, see *The Building of the Alps*. T. G. Bonney, 1912, p. 175.

Graians as [Po .w. Dora Baltea], because the title [Orco .w. Dora Baltea] covers the whole of the Alpine portion of the Branch.

Branch watersheds serving two confluents which meet within the limits of the Alps are definitely finite, but those which bifurcate when very near a major Alpine river sometimes present a dilemma. Thus [Turtmann .w. Navigenze] bifurcates at the Bella Tola to accommodate several insignificant streams, and both branches are still Alpine. It would here seem superfluous and pedantic to widen the scope of the watershed by requisitioning the Rhone itself.

It may be noted that the titles [Adriatic .w. North Sea] and [Po .w. Rhine] both cover the same Alpine Basic Watershed and define it precisely. The titles [North Sea .w. Mediterranean] as well as [Rhine .w. Rhone], however, both more than cover the same Alpine Basic Watershed.

Such difficulties are natural and inevitable, but others are of human origin and due partly to the haphazard and inconsistent way names have been applied, and partly to the alternative names which have arisen and been allowed to persist. Alternative names are common near the borderlines, on either side of which different languages prevail, or where recent changes of frontier have been established. Thus are found: Val d'Herens *or* Eringertal; Val d'Anniviers *or* Einfischtal; Toce *or* Tosa; Drave *or* Drau *or* Drava; Gröden *or* Gardena. Some rivers carry different names in different parts of their courses: Sarca *and* Mincio; Linth *and* Limmat; Gailitz *and* Schlitza. The names of many valleys differ from those of the rivers they contain: the Val d'Herens holds the Borgne; the Val d'Anniviers, the Navigenze; the Kaunsertal, the Faggen; the Stubaital, the Rutz; and the Val d'Ampezzo, the Boite. Many streams in the neighbourhood of Lake Lucerne figure on the map as Aa; around Lake Constance, as Aach *or* Ach; and further East, as Ach *or* Ache *or* Achen. All these are varieties of 'bach' or stream and require qualification, *e.g.* Engelberger-Aa; Ötztaler-Ache. Many single rivers flow through a series of valleys with different names: the Kander with its Gasterntal, Kandertal, and Frutigental; the Toce with its Val Formazza, Val Antigorio, and Val d'Ossola. Some single named valleys have been drawn across a divide to contain the heads of two main rivers flowing in opposite directions into two quite different drainage systems: thus the Austrians had their Wipptal across the Brenner with the Sill flowing N. to the Inn (hence Black Sea) and the Eisack flowing S. to the Adige (hence Adriatic); likewise their Pustertal across the Toblach Pass with the Drave flowing E. to join the Danube, and the Rienz flowing W. to join the Adige; while the Val Giudicaria has drainage to the Sarca (*i.e.* Mincio) and to the Chiese (hence Oglio). Those who feel a sense of frustration at such anomalies may be reminded that valleys are strictly defined in terms of high and low ground and that river (or glacier) action is not a necessary factor in the formation of a valley.

The establishment and persistence of all such anomalous naming is particularly detrimental to the naming of watersheds with their binary

superscriptions. River names are generally more comprehensive ; valley names are often better known ; and it may sometimes be desirable to use mongrel titles.

Such seem to be the chief handicaps to a hydrographic classification of the Alps, and they seem formidable enough, but have a way of smoothing out somewhat unexpectedly. The tracing of an intricate watershed on a large scale map showing minor tributaries is a fascinating if somewhat laborious achievement of the jig-saw variety.

An attempt will now be made to carry the watershed classification a stage further than the easily defined Basic Systems. In addition to the 'Basic Section Systems' and the 'Major Branch Systems' many of the minor offshoots, notable for hydrographic or other reasons, will be considered. The features cited are chosen primarily for their usefulness as landmarks and signposts for tracing the watersheds, and naturally well known ones will be most serviceable, but many less known features will be brought into the limelight, because of their nodal value, or their assistance in determining the position of some inconspicuous node. Hydrographically, hence as nodes, Wytttenwasserstock (E) and Piz Lunghin excel all other Alpine eminences and incidentally perform their functions without 'showing off.' By these same tokens Mont Dolent can claim superiority over Mont Blanc ; the Tête Blanche over the Dent Blanche ; the Agassizhorn over the Finsteraarhorn ; the Wilde Pfaff over the Zuckerhütl ; the Dreiherrenspitze over the Gross Venediger ; and many of the nameless, humble, and meek, over the seats of the mighty.

The four Basic Watersheds which penetrate beyond the limits of the Alps will be traced outwards from their Alpine origins towards their Alpine limits, the possible positions of which have been discussed. The name *first mentioned* in the title of any watershed will always refer to the *right side* when traced outwards from its origin.

As a general rule no attempt will be made to deal with altitudes which are constantly being redetermined in different regions at different times.

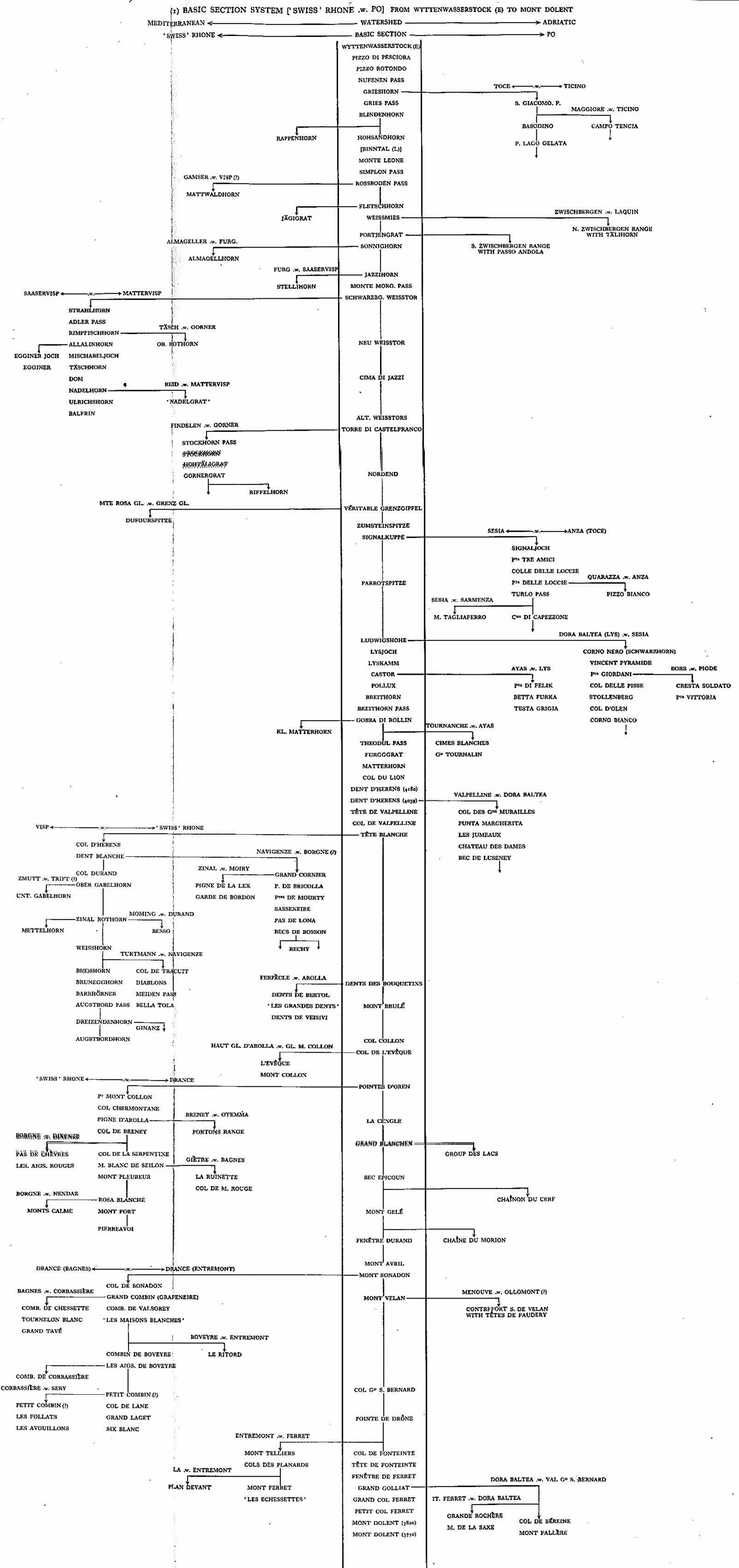
In the 'genealogical tables,' summarising each sub-system, the lengths of the horizontal lines have no relation to the lengths of the offshoots.

In an investigation of this scope errors are sure to be present. If most of them are personal, some at least will be attributable to the use of faulty, conflicting, or out-of-date, maps and guide-books.

Where frontiers are cited, they will be those functioning in 1939.

SUB-SYSTEMS OF THE [MEDITERRANEAN .W. ADRIATIC] BASIC SYSTEM

The longer rivers hence the longer branch watersheds all lie on the Mediterranean-side of the Basic Watershed. The Alpine character of the branches on the Mediterranean-side generally extends further than on the Adriatic-side. Owing to the curvature of the Basic Watershed the branches on the Mediterranean-side tend to be divergent, while those on the Adriatic side tend to be convergent, therefore the valleys on the Mediterranean-side are on the average wider and display more



and longer minor offshoots. It is therefore not surprising that the most suitable nodes for the demarcation of the Basic Section Systems happen to throw out their Major Branch Systems into the Mediterranean basin.

(1) BASIC SECTION SYSTEM [‘ SWISS ’ RHONE .w. PO] :

When the Basic Watershed is traced along its length from its origin Wytttenwasserstock (E), numerous minor changes in the local watersheds are encountered, but all previous ones are put in the shade by that which occurs in Mont Dolent for here drainage into the ‘ Swiss ’ Rhone⁴ gives way to drainage into what may be termed the ‘ Savoy ’ Rhone.⁵ Some may criticise the arbitrary selection of this node on the ground that the change is merely from one section to another section of the same river. There is no doubt, however, quite apart from political considerations, that there is a fundamental distinction between the two sections of the Rhone involved.

The Watershed

The Basic Watershed on leaving Wytttenwasserstock (E) immediately traverses Pizzo Pesciora and Pizzo Rotondo, thence, remaining comparatively low, with minor zigzags it runs generally W.S.W. carrying the Nufenen Pass, Grieshorn (where it is joined by the Swiss-Italian frontier), Gries Pass, Blindenhorn, Hohsandhorn, and the rest of the range that forms the left-side of the Binnen basin. At Monte Leone (where the frontier leaves the watershed to make the upper half of the Val Divedro, Swiss) it diverges slightly to the N. to carry the Simplon Pass and make its last near approach to the actual Rhone, but soon curves round to run S. and form the low right side of the Gamsertal. After carrying the Rossboden Pass it traverses the ‘ Fletschorn-Weissmies-Portjengrat ’ range forming the lofty lower half of the right side of the Saastal. At the Portjengrat (where the watershed is rejoined by the frontier) a further run S. provides the relatively low upper half of the right side of the Saastal containing the Sonnighorn and the Jazzihorn. A turn W. to carry the Monte Moro Pass leads to the Schwarzberg Weisstor (an important minor node). Another turn S. leads to the ‘ Weissgrat ’ with the Cima di Jazzi and the Torre di Castelfranco sandwiched between the numerous Weisstors. The watershed now suddenly becomes extremely high with the Nordend, the Véritable Grenzgipfel,⁶ the Zumsteinspitze, the Signalkuppe, and the Ludwigshohe. The ‘ Véritable Grenzgipfel ’ is not a mountain, being little more than an angle on the Eastern buttress of the ‘ chaînon ’ which culminates in the Dufourspitze. It is, however, a notable node (and entitled to its name because, unlike the Faux Grenzgipfel, it *is* on the

⁴ ‘ Swiss ’ Rhone (in *this* connection identical with Valaisian Rhone) saves the use of the somewhat cumbersome physical definition ‘ the Rhone above its entry into Lake Geneva.’

⁵ ‘ Savoy ’ Rhone likewise implies ‘ the Rhone between the head of Lake Geneva and its confluence with the Isère.’

⁶ *Les Alpes Valaisannes*, vol. III (a), 1937, pp. 176, 185 (sketch).

frontier⁷ and, with the exception of the adjacent Nordend, the highest point on the Swiss-Italian, or any other Swiss frontier). The unostentatious Ludwigshöhe, though only the sixth in height of the Monte Rosa mountains (?), is actually higher than any *mountain* in any other Basic System, and of considerable hydrographic value, though scarcely enough to initiate a Major Branch System. The Watershed now turns W. to carry the Lysjoch and traverse the Lyskamm, Castor, Pollux, and the Breithorn, gradually losing altitude but still very high. According to Kurz, the arêtes of Pollux do not conform to the frontier (or presumably the watershed), discordance occurring at the Schwarztor.⁸ Castor and Pollux are not really similar in size or shape and geologically the former is akin to the Lyskamm, whilst Pollux pertains to the Breithorn. From the summit of the Breithorn the watershed does *not* traverse the Klein Matterhorn, but turns S. to carry the Breithorn Pass and ascend the gentle Swiss slopes of the Gobba di Rollin, the actual summit of which (in Italy) is slightly higher than the Klein Matterhorn. The Breithorn Pass is not a mere out-of-the-way appendage of the Breithorn but a direct pass across the Basic Watershed. A bend N.W. with marked diminution in altitude leads to the Theodulpass and the Furgg grat. The Matterhorn (which, strictly speaking, has no Italian arête) is traversed by its two *frontier* arêtes. From the Col du Lion the watershed runs W. to the Dent d'Hérens (quite outside the present Val d'Hérens) and the Tête de Valpelline, whence a bend N.N.W. leads to the Tête Blanche (an important minor node). A bend W. leads to the Dents des Bouquetins (C. and S.), and a bend S. to Mont Brulé, whence a run W. leads to Col Collon, Col de l'Evêque, and the Pointes d'Oren. According to the latest map the Col de l'Evêque is on the frontier (and presumably the watershed?), but does not seem to function primarily as a direct passage of the same.⁹ From the Pointes d'Oren (an important minor node) the watershed runs W.S.W. forming the range that bounds the left-side of the Glacier d'Otemma with La Cengle, Bec Epicoun and Mont Gelé; thence to the Fenêtre Durand, Mont Avril, Mont Sonadon (an important minor node), Mont Vélan, Col Grand St. Bernard, Pointe de Drône, Tête de Fontainte, Fenêtre de Ferret, and S.W. to the Grand Golliat. Finally it runs N.W. carrying the two Cols Ferret and ends at the Major Node (3750 m.) just after traversing the summit (3820 m.) of Mont Dolent.

It is sometimes maintained that climbs in the Pennine Alps, in spite of their great height, are relatively tame; but a traverse of this Basic Section Watershed, keeping as near the actual crest as has as yet ever been accomplished would probably prove sufficiently exhilarating for most mountaineers. Thus are found among the more notorious passages recorded in the *Guide des Alpes Valaisannes*: The N. arête of the Weissmies from the Laquinjoch (as ascended by W. H. Paine's party).—The frontier arête between the Jägerjoch and the summit of

⁷ *Les Alpes Valaisannes*, vol. III (a), 1937, pp. 176, 185 (sketch).

⁸ *Ibid.*, p. 97.

⁹ *Guide des Alpes Valaisannes*, vol. I, 1937, pp. 346, 365.

the Nordend (descent by W. Flender's party; ascent by V. J. E. Ryan's party).—The frontier arête between the Schwarztor and the summit of the Schwarzfluh (Graham Brown's variant of E. G. Oliver's route).—The historic Furggen arête of the Matterhorn.—The frontier arête between the Col Tournanche and Dent d'Herens (Ryan's party).—The E. arête of the Grand Golliat (Kurz's suggested modification of Topham's descent).

It is interesting to note that all these difficult passages slope in the same direction relatively to the lie of the Basic Watershed.

Offshoots in the 'Swiss' Rhone basin

(a) A spur starting W. from a node midway between the Blindenhorn and the Hohsandhorn carries the Rappenhorn, whence it can be continued to form the right side of the Binntal.

(b) From the neighbourhood of the Rossboden Pass (virtually a three-way pass) a branch running first N.W. then N. forms the head and left-side of the Gamsertal, which beyond the Mattwaldhorn, has merely minor mountain interest.

(c) A spur running S.W. from the Fletschhorn contains the 'Jaggi-grat' and is of somewhat dubious watershed significance.

(d) A spur running W.N.W. from the Sonnighorn ends in the Almagellhorn, and is predominantly [Almageller .w. Furg].

(e) A spur running N.W. from the Jazzihorn is dominated by the Stellihorn, and comprehensively included under the title [Furg .w. Saaservisp].

(f) A great branch system of very high mountain qualification but comparatively low hydrographic value [Saaservisp .w. Mattervisp] runs N. from the Schwarzberg Weisstor, which is very much a pass in so far as it gives access to three valleys, though scarcely a depression. Bonney suggests that the present site of the 'Macugnaga glen' was formerly occupied by a high mountain, which has been obliterated by the cutting back of the head of the Val Anzasca, leaving the comparatively low 'Weiss-grat' and 'one-half of the old pass between the Strahlhorn and the missing peak.'¹⁰ Landmarks along the watershed are: the Strahlhorn, Adler Pass, Rimpfischhorn, Allalinhorn, Mischabel Joch, Täschhorn, Dom, Nadelhorn, Ulrichshorn, and Balfrinhorn.

On its Saaser-side a spur running N.E. from the Allalinhorn contains the Egginerjoch and the Egginer.

On its Mattervisp-side: A spur running W.N.W. from the Rimpfischhorn is dominated by the Ober Rothorn and is comprehensively covered by the title [Täschbach .w. Mattervisp].—The lofty 'Nadelgrat' runs N.N.W. from the Nadelhorn and answers to the title [Ried .w. Mattervisp].

(g) The next branch for consideration will be familiar alike to tourists and climbers, containing the Stockhorn, Hohtäligrat, and Gorner Grat. Few however will know that it starts from the inconspicuous Torre di Castelfranco, which is situated amongst the

¹⁰ *The Building of the Alps*, pp. 173, 174.

various Alt Weisstors. It seems natural to regard it as [Findelen .w. Gorner] in which case the Riffelhorn must be relegated to the status of a spur on the Gorner-side.

(h) A spur, which can either be called, or said to culminate in, the Dufourspitze runs W.N.W. from the 'Véritable Grenzgipfel,' and can be continued to include the 'Sattel' and the two Plattjes. It is true the Eastern buttress of the 'chaînon' actually drains into the Po-basin, but its extension therein is almost negligible. The spur can be regarded as either [Monte Rosa Glacier .w. Grenz Glacier], or [Gorner Glacier .w. Grenz Glacier].

(i) The Klein Matterhorn is at the N. extremity of a short spur which starts somewhat indefinitely from the snowy flank of the Gobba di Rollin and forms part of the Breithorn Plateau.

(j) A great branch system of very high mountain qualification but no great hydrographic value starts from the Tête Blanche and is most comprehensive if based on [Visp .w. Rhone], thus forming the left margin (arête faîtière) of the Visp basin. Its watershed runs N. to the Col d'Hérens and the Dent Blanche, where it turns sharp E. to the Col Durand and Ober Gabelhorn; thence N.N.E. to the Triftjoch, Zinal Rothorn, Weisshorn, Bi(e)shorn, Brunegghorn, Barrhörner, Augstbord Pass, Dreizendehorn and Augstbordhorn.

On its Visp-side: A spur running E. from the Ober Gabelhorn carries the lesser Gabelhörner and is predominantly [Zmutt .w. Trift].—A spur E. from the Zinal Rothorn carries the Mettelhorn.

On the side draining more directly to the Rhone: A branch runs N.N.W. from the Dent Blanche and carries the Grand Cornier, Pointe de Bricolla, Pointes de Mourty, Sasseneire, Pas de Lona, and Becs de Bosson. Thus far it answers to the title [Navigenze .w. Borgne], but it here bifurcates to admit the Combe de Rechy. A secondary spur from it runs N. from the Grand Cornier carrying the Pigne de la Lex and can be called [d'Anniviers .w. Moiry], or [Navigenze .w. Gouggra].—A spur W. from the Zinal Rothorn carries the Besso and is predominantly [Moming .w. Durand].—A branch starting from an inconspicuous node¹¹ between the Weisshorn and Bieshorn is predominantly [Turtmann .w. Navigenze]¹² and carries the Col de Tracuit, Diablons, Meiden Pass, and Bella Tola.—A spur N.N.W. from the Dreizendehorn accommodates the Ginanztal.

Bonney again surmises¹³ that the cirque of Zmutt, trespassing westwards, has obliterated—first a ridge which once directly connected the Obergabelhorn and the Matterhorn—subsequently a ridge directly connecting the Dent Blanche and the Dent d'Hérens. If the latter ridge ever existed the Dent d'Hérens would then have contacted the Val d'Hérens, but æons before the names were invented.

(k) From the Central summit of les Dents des Bouquetins, the branch [Ferpècle .w. Arolla] running N.N.W. contains les Dents de

¹¹ A short distance S. of the Weisshornjoch, actually between P. 4203 and P. 4108.9 in latest map.

¹² See back p. (04), l. 6.

¹³ *The Building of the Alps*, p. 175.

The Borgne drainage system is inappropriately named for hydrographic delineation. The Borgne d'Arolla joins the Borgne de Ferpècle flowing in the Val d'Herens, where it receives the Dixenze coming out of the Val d'Heremence which is a continuation of the Val des Dix. Fortunately this victim of circumstances has good neighbours on either side, which help to clear the issue by providing comprehensive watersheds to carry the subsidiary ramifications. The Drance river system on the other hand, where the Drance Ferret joins the Drance d'Entremont which in turn joins the Drance Bagnes to form *the* Drance, is admirably named for hydrographic exposition.

(n) A large and lofty branch system can be based on [Bagnes .w. Entremont]. Its watershed carries : the Col de Sonadon ; the western half of the Grand Combin¹⁴ (from the Grafeneire to the Col des Maisons Blanches) ; the Chaîne des Maisons Blanches ; the Combin de Boveyre ; les Aiguilles de Boveyre ; the Petit Combin¹⁵ ; the Col de Lane ; the Grand Laget ; and comes to a natural end at the Six Blanc.

On the Bagnes-side : A branch running N. carries the eastern half of the Grand Combin (with the Col du Croissant and Combin de Chesette), the Tournelon Blanc, and the Grand Tavé. It is covered by the title [Bagnes .w. Corbassière].—A spur E. from les Aiguilles de Boveyre carries the Combin de Corbassière.—A spur N.N.E. from the Petit Combin¹⁵ leads by les Follats to les Avouillons and is [Corbassière .w. Sery].

On the Entremont-side a spur running N.W. from a node, between the 'Chaîne des Maisons Blanches' and the Combin de Boveyre, contains le Ritord, and is covered by the title [Gl. de Boveyre .w. Entremont].

(o) The branch system [Entremont .w. Ferret] runs N. from an inconspicuous unnamed node on the W.-arête of the Pointe de Drône. On its watershed lie Mont Telliers, les Cols des Planards, Mont Ferret, and les Echesettes. On the Entremont-side a spur from a node just N. of Col Nord des Planards constitutes the right side of the Combe de La, and leads to Plan Devant.

Offshoots in the Po basin

(a) An extensive lop-sided branch system of inferior mountain qualification can be based on [Toce .w. Ticino]. Its watershed (followed at first by the Swiss-Italian frontier) starts E. from the Grieshorn, but after carrying the San Giacomo Pass turns S. to traverse Basodino, and later Pizzo Lago Gelato (just S. of which the frontier leaves the watershed to run S.E. towards Lake Lugano). It finally zigzags to its natural end W. of Lake Maggiore.

From an inconspicuous node just S.E. of the San Giacomo Pass a

¹⁴ The name Grafeneire is now reserved for the highest summit. *Guide des Alpes Valaisannes*, vol. I, 1937, p. 186.

¹⁵ *Ibid.* The plan on p. 184 places the Petit Combin just on the spur. A stereoscopic photograph of the summit rather suggests that the cornice and snow-drift may conspire to vary the issue.

long subsidiary branch on the Ticino-side follows Eastwards the curve of that river and after traversing the Campo Tencia, eventually comes to a natural end N.E. of Lake Maggiore. This branch, which can be regarded as [Lago Maggiore .w. Ticino], is remarkable for its extension Eastwards of the Basic Watershed, and is itself lop-sided with spurs and branches between various affluents of Lake Maggiore.

(b) A spur predominantly [Zwischbergen .w. Laquin] runs N.E. from the Weissmies. It constitutes the left side of the Zwischbergental and carries the Tälihorn.

(c) A spur of modest height and somewhat ambiguous hydrographic delineation runs E.N.E. from the Portjengrat. It carries the Passo d'Andola and forms part of the right side of the Zwischbergental (along which the frontier returns from its Divedro diversion).

(d) A large branch system, which near its outset has notable mountain qualification runs E. from the Signalkuppe. Its watershed carries the Signaljoch, Punta Tre Amici, Colle delle Loccie, Turlo Pass, and Cima di Capessone; thus far answering to the title [Sesia .w. Anza]. It can be rendered more comprehensively Alpine if regarded as [Sesia .w. Toce] which takes it to the W.-side of Lake Orta.

On the Sesia-side the branch [Sesia .w. Sarmenza] starts from a node just E. of the Turlo Pass and carries Monte Tagliaferro.

On the Anza-side a spur, carrying Pizzo Bianco, starts from the Punta delle Loccie and answers to the title [Quarazza .w. Anza].

(e) A great branch system, very high near its outset starts S. from the Ludwigshöhe. Predominantly [Lys .w. Sesia], but comprehensively Alpine as [Dora Baltea .w. Sesia], the watershed threads its way between the glaciers of Indren and Bors, then running S. carries the Corno Nero (Schwarzhorn), Pyramide Vincent, Punta Giordani, Colle delle Pisse, the Stollenberg, Col d'Olen, and Corno Bianco, subsequently losing its Alpine character before its identity. The unpretentious, little-famed Corno Nero would appear to be the highest mountain(?) wholly in the Adriatic basin (or in Italy).¹⁶

On the Sesia-side: A short spur runs S.S.E. from the Punta Giordani and carries the Cresta Soldato and Punta Vittoria. It separates the glaciers of Bors and Piode and ends between two initial confluent of the Sesia.—Further S. longer spurs of inferior altitude run E.

On the Dora Baltea-side subsidiary spurs are insignificant.

The branch system under consideration contains all those mountains and peaks ascribed to Monte Rosa which lie wholly in the Adriatic basin (or in Italy).

(f) From Castor a branch running S. is predominantly [Ayas .w. Lys] and carries the Punta di Perazzi (di Felik), the Bettafurka, and Testa Grigia (Grauhaupt).

(g) The actual summit of the Gobba di Rollin is on the outset of a short spur which also carries the Punta di Verra and answers to the title

¹⁶ Mont Blanc de Courmayeur (even if wholly in Italy) and Pic Louis Amédée, cannot be regarded as individual mountains.

[Ventina .w. Verra], both streams being confluent of the Evançon in Val d'Ayas.

(h) A branch starting S.S.W. from an ill-defined node between the Gobba di Rollin and the Theodul Pass soon turns S. and carries the two Cols des Cimes Blanche and the Grand Tournalin. It is essentially [Tournanche .w. d'Ayas].

Bonney notes the comparative lowness of the Main Chain (Basic Watershed) between the Breithorn and the Matterhorn, also the absence of any considerable branch Southwards from the Matterhorn. He suggests that the cutting back of the head of the Val Tournanche towards the N.E. is largely responsible.¹⁷

(i) A notable branch, running S.W. from the 'Epaule' (4039) which lies a little E. of the summit (4180) of the Dent d'Hérens, is predominantly [Valpelline (Buthier) .w. Val Tournanche], but more comprehensively [Valpelline .w. Dora Baltea]. It contains the 'Chaîne des Grandes Murailles' with Punta Margherita, Les Jumeaux, Chateau des Dames, and Becca Lusenay; all on its watershed.

(j) Of the several spurs which separate various affluents of the Valpelline perhaps the most notable is the 'Contrefort S. du Mont Vélan.' It contains the Têtes de Faudery and is essentially [Menouve .w. Ollomont].

(k) A branch which can be called [Dora Baltea .w. Val Grand St. Bernard] runs S.E. from the Grand Golliat. It carries Col de Séreine and Mont Fallère on its watershed, and the Grande Rochère Group on a spur towards the Dora Baltea.

The Basic Section System ['Swiss' Rhone .w. Po], so far as its watershed and branches towards the Rhone are concerned, almost coincides with the Swiss 'Alpes Valaisannes' which extend from the Petit Col Ferret to the Furka Pass. The branches of the System, however, penetrate further into the Adriatic (Po) basin. Ignoring the name 'Western Pennine' as an alternative for the 'Mont Blanc Group' this Basic Section System contains all the conventional Pennines, and the Western half of the Lepontines. It has, of course, the highest mountain qualification, and is one of the most extensive and best known of all the sub-sections proposed for consideration.

Apart from references the *Guide des Alps Valaisannes* has been freely consulted for the preceding section.

(2) MEDITERRANEAN MAJOR BRANCH SYSTEM ['SWISS' RHONE .w. 'SAVOY' RHONE].

It is convenient to use the name 'Savoy' Rhone for that section of the Rhone which extends from the head of Lake Geneva to its junction with the Isère, excluding the N.-side of the Lake.

Among the earliest mountains to catch the eye of many visitors to the Alps are those seen across the Lake of Geneva from the

¹⁷ *The Building of the Alps*, p. 174.

neighbourhood of Montreux, and beneath which nestles St. Gingolph. Some take the trouble to learn their names ; few care to investigate their relation to the rest of the Alps ; for most they are just mountains that happen to be there. As a matter of fact they are a ' bunch ' of mountains that decks the natural end of the watershed about to be considered. Further to the left appear the Dents du Midi which lie on a branch from this watershed. Javelle records ¹⁸ that the extreme summit of the Tour Noir, which is *on* the watershed, is visible to the E. of the Dents du Midi.

The Watershed

The Major Branch Watershed (at its outset followed by the Swiss-French frontier) starts N.W. from the node P. 3750, situated near the summit of Mont Dolent. It carries the following landmarks : Col d'Argentière, Tour Noir, Aig. de la Neuvaz, Aig. d'Argentière, the E. flank of the Aig. du Chardonnet, Grande Fourche, and Petite Fourche. Thus far it has provided the left margin of the Drance basin. It next carries the Aig. du Tour and the Col de Balme (where the frontier deserts the watershed to make the Eau Noir mainly French), then bends sharply S.W. to the low Col des Montets whence it rises to the Belvédère, the highest summit of les Aiguilles Rouges (de Chamonix). It now runs N.N.W. to the Buet, where it engages the Giffre (Sixt, etc.) basin, and the Cheval Blanc (where it is rejoined by the frontier, which has performed a small ' echo ' of these twists and turns). On arriving at the lower (W.) summit of Mont Ruan it turns sharply W. to traverse les Dents Blanches (de Champéry). It now turns N. to the Tête de Bostan, Col de Coux, Pointe de Chesèry, Col de Morgins, and the Cornettes de Bise. A final bend E. leads to a natural end at le Grammont (the frontier, however, continues N. to St. Gingolph).

Offshoots in the ' Swiss ' Rhone basin

(a) A spur running E. from the Aiguille de la Neuvaz carries les Darreys, and is covered by the title [Ferret .w. Saleinaz].

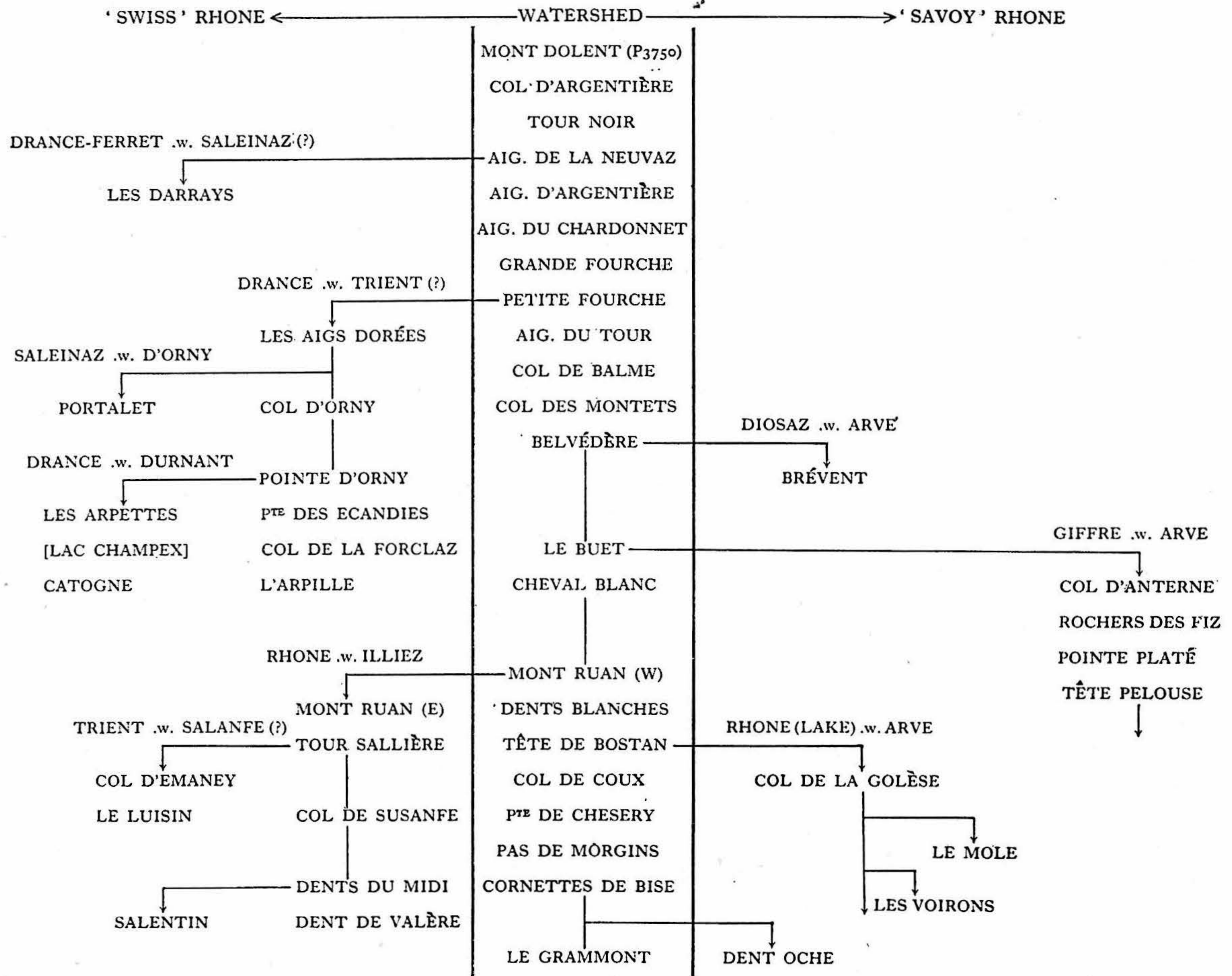
(b) A branch zigzags N.N.E. from la Petite Fourche. Its watershed, predominantly [Drance .w. Trient], carries les Aiguilles Dorées, Col d'Orny, Pointe d'Orny, Pointe des Ecandies, Col de la Forclaz and the Arpille.

On its Drance-side : A spur, predominantly [Saleinaz .w. d'Orny], runs E. from a node just S. of Col d'Orny and carries the Portalet. —A spur starting E.N.E. from the Pointe d'Orny carries les Aiguilles d'Arpette and Lake Champex, then turns N. to the Catogne. It can be called [Drance .w. Durnant].

(c) From the W. summit of Mont Ruan a notable branch starts E. carrying the higher E. summit of that mountain and the Tour Sallière, where it turns N. to the Col de Susanfe and N.E. to traverse les

¹⁸ *Souvenirs d'un Alpinist*, translated (and somewhat carpingly annotated) by W. H. Chesson, 1899, pp. 362, 363. Javelle made the first ascent of the Tour Noir in 1876.

(2) MEDITERRANEAN MAJOR BRANCH SYSTEM ['SWISS' RHONE .w. 'SAVOY' RHONE]



Dents du Midi. Its most comprehensive hydrographic title would appear to be [Rhone .w. Val d'Illiez], which involves a continuation through the Dent de Valère.

On its Rhone-side: A spur running E. from the Tour Sallière carries the Luisin and is essentially [Trient .w. Salanfe].—A spur running S.E. from the Dent du Midi ends in the Salentin.

Offshoots in the ' Savoy ' Rhone basin

(a) A south-western extension of les Aiguilles Rouges leads to the Brevént and can be called [Diosaz .w. Arve].

(b) A low branch which can be based on [Giffre .w. Arve] starts S.W. from le Buet. It carries the Col d'Anterne, Rochers des Fiz, and Pointe de Platé, where it turns N. to Tête Pelouse, then N.W. to its natural end.

(c) A longer but even lower branch runs W. from the Tête de Bostan and can be interpreted as [Rhone (Lake) .w. Arve]. It carries the Col de Golèse on its watershed, while further W. separate spurs towards the Arve carry le Mole and les Voirons.

(d) Dent Oche lies on a spur running W. from a node just N. of les Cornettes de Bise.

It will thus be seen that the Major Branch System [' Swiss ' Rhone .w. ' Savoy ' Rhone] though not very extensive has considerable mountain interest. It is perhaps the only Major Branch System of this selection that retains its Alpine characteristics throughout its length so that no problem is presented with regard to its Alpine end. All its features would be included in the conventional Mont Blanc Group (or Chain).

(3) BASIC SECTION SYSTEM [' SAVOY ' RHONE .w. Po].

This system also answers to the titles [Arve .w. Po] and [Arve .w. Dora Baltea].

The Watershed

The Basic Section Watershed (followed by the French-Italian frontier) starts from the node (P. 3750) on Mont Dolent and runs generally S.W. traversing the following landmarks: Aig. de Triolet, Aig. de Leschaux, Col des Hirondelles, les Grandes Jorasses, Aig. de Rochefort, and Col du Géant. It now turns W. to Mont Maudit, where it turns S.S.W. to carry the Col de la Brenva and reach the summit of Mont Blanc. (It is a moot point whether the frontier follows the watershed or makes a slight diversion to the Mont Blanc de Courmayeur.¹⁹) From Mont Blanc the watershed runs W. traversing the Dôme du Goûter to the Aig. de Bionnassay, where it turns almost S. carrying the Col de Miage, the Aig. de Trélatête (C), and comes to an end at the Aig. des Glaciers.

¹⁹ See Coolidge's account: *The Alps in Nature and History*, 1908, p. 95.

Offshoots in the ' Savoy ' Rhone basin

(a) The branch of high mountains containing les Courtes, les Droites, and the Aig. Verte runs W.N.W. from a node a little W. of the Aig. de Triolet.²⁰ It is predominantly, though not completely, covered by the title [Gl. d'Argentière .w. Gl. du Géant]. Separate spurs from the Aig. Verte on the Géant-side accommodate the Aig. du Moine and the Aig. du Dru.

(b) The spur containing Mont Mallet and the Aig. du Tacul runs N. from the Aig. de Rochefort and can be called [Leschaux .w. Géant].

(c) The Aig. du Géant is on the outset of a spur which runs from a node just N.E. of the Col du Géant and answers to the title [Periades .w. Géant].

(d) The branch which carries the celebrated chain of ' les Aiguilles ' runs N.N.E. from Mont Maudit, traversing the Mont Blanc du Tacul, Col du Midi, Aig. du Midi, and the well known series ending with les Charmoz. It is comprehensively covered by the title [Arveyron (Géant) .w. Arve].

(e) The row of eminences containing les Grands Mulets along with the Montagne de la Côte, can be regarded as the partially submerged watershed [Bossons .w. Taconnay], but cannot be traced from any definite node on the Basic Watershed.

(f) The Aig. du Goûter lies on a spur running N.W. from the Dôme du Goûter. It is perhaps permissible to extend it to the Tête Rousse, Mont Lachat, and the Col de Voza ; in which case it can claim to be [Arve .w. Bon Nant].

(g) A spur dominated by the Dômes de Miage runs W.S.W. from a node just S.W. of the Col de Miage. It separates the Glacier de Trélatête from certain other affluents of the Bon Nant.

Offshoots in the Po basin

(a) The three (five ?) pronged spur system which extends S.E. from Mont Blanc and is presided over by Mont Blanc de Courmayeur presents a problem. Perhaps it is best to follow Gaillard's interpretation²¹ and continue its watershed along the Péteret arête calling it [Doire .w. Brenva]. In this case the Brouillard arête becomes a spur from the Mont Blanc de Courmayeur, and the Innominata arête a spur from this spur. The Brouillard arête is essentially [Miage .w. Brouillard], and the Innominata arête [Brouillard .w. Fresnay].

(b) The Aig. de Trélatête (S) is on the outset of a spur which runs S.E. from the Central summit, and which can be called [Allée Blanche .w. Italian Miage].

²⁰ *My Climbs in the Alps and Caucasus*, A. F. Mummery. Nelson Edition, 1908 ?, p. 265.

Les Alpes de Savoie, Tome VI, 3^e Partie, E. Gaillard. Plan after p. 47.

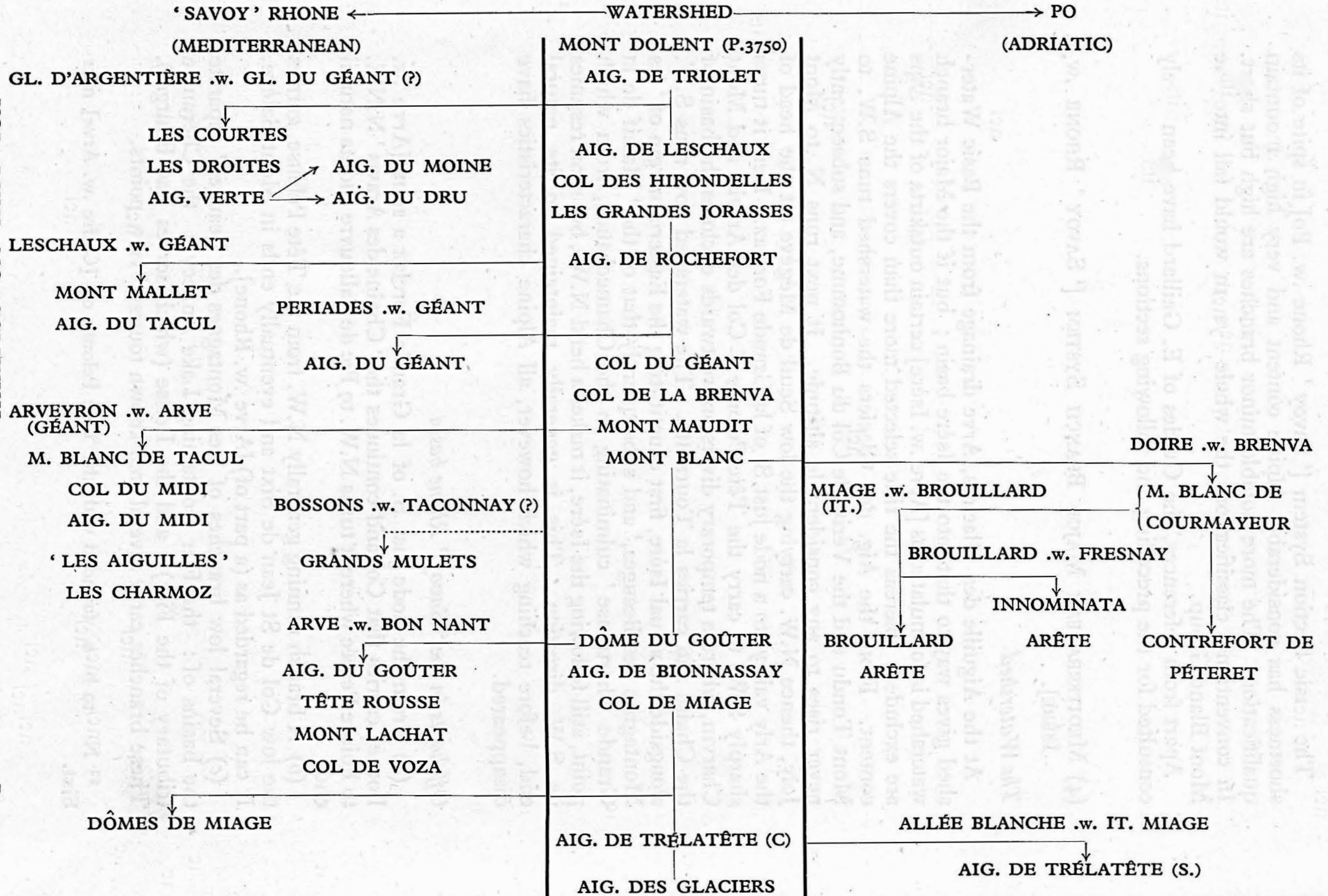
²¹ *Les Alpes de Savoie*, Tome VI, part 1, 1925. Sketch-map after p. 123.

See also Courtauld's *The Innominata face of Mont Blanc*, 1919. *A.J.* 57. pp. 131-133. (1950.)

(3) BASIC SECTION SYSTEM ['SAVOY' RHONE .w. PO]

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A HYDROGRAPHIC APPROACH TO THE ALPS



The Basic Section System [' Savoy ' Rhone .w. Po] in spite of its shortness has considerable Alpine content and very high mountain qualification. The more notable minor branches are high but short. In conventional classifications the whole System would fall into the Mont Blanc Group.

Apart from references, the Guides of E. Gaillard have been freely consulted for the preceding and following sections.

(4) MEDITERRANEAN MAJOR BRANCH SYSTEM [' SAVOY ' RHONE .w. ISÈRE].

The Watershed

At the Aiguille des Glaciers, Arve drainage from the Basic Watershed gives way to that into the Isère basin ; but if the Major branch watershed is formulated as [Arve .w. Isère] certain outskirts of the Alps are excluded, whereas the title selected more than covers the Alpine content. From the Aig. des Glaciers the watershed runs S.W. to Mont Tondu and the Véritable Col du Bonhomme, and subsequently never rises to any considerable altitude. It next runs N. to Mont Joly, thence N.W. carrying the low Seuil de Mégève (at the head of the Arly valley) to a node just S. of la Grande Forclaz. Here it turns sharply S.W. to carry the Tête Pelouse,²² Col des Aravis, and Mont Charvin, where a temporary diversion westwards encloses the basin of the Chaise and carries la Tournette. The watershed now runs S.W. alongside the actual Isère, first constituting the Eastern margin of ' les Montagnes des Beauges,' and subsequently that of the ' Massif de la Grande Chartreuse ' culminating in the Chamechaude, from which point, still following the Isère, it makes a bend N.W., but soon resumes its S.W. direction. This is generally maintained to its natural end, before reaching which however, all Alpine characteristics have disappeared.

Offshoots in the ' Savoy ' Rhone basin

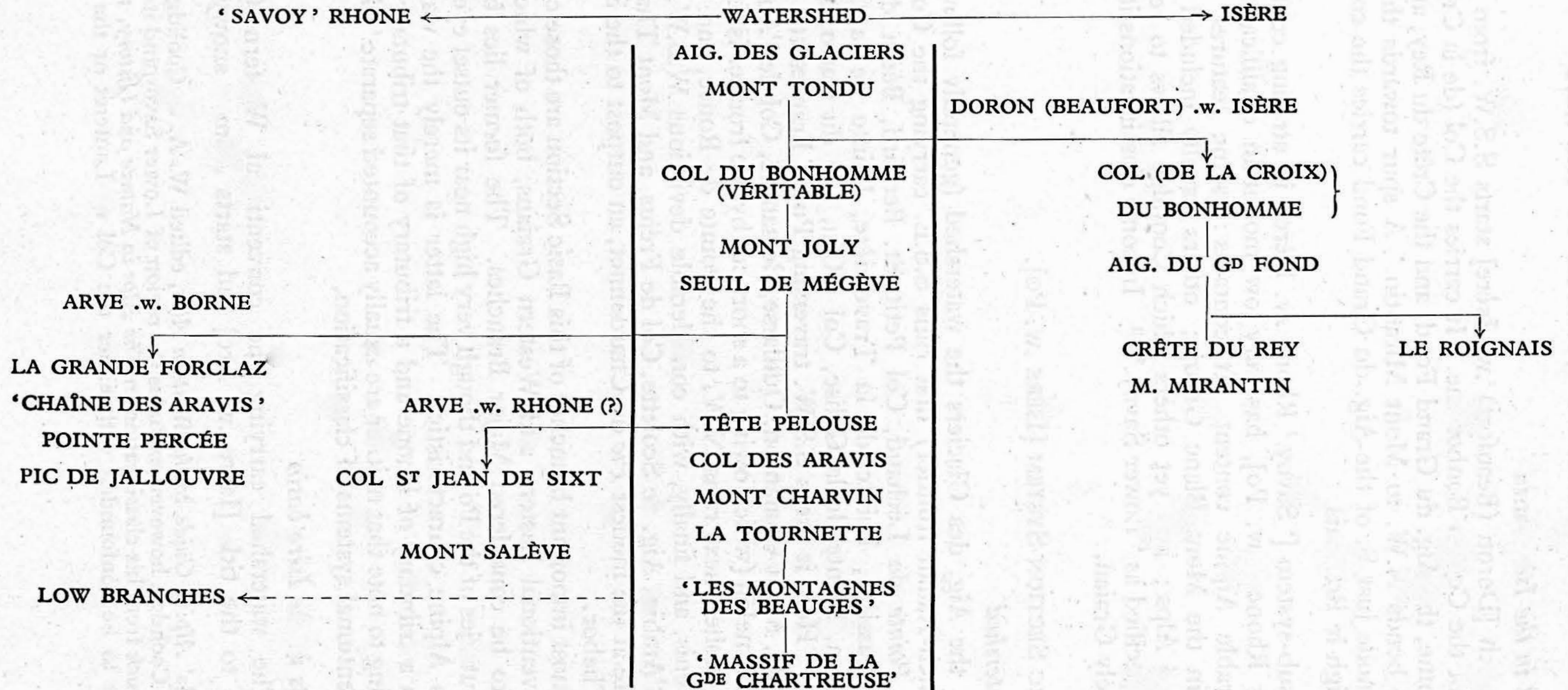
(a) From the node just S. of la Grande Forclaz a spur [Arve .w. Borne] carries that Col and continues the ' Chaîne des Aravis ' N.N.E. to Pointe Percée where it turns N.W. to Pic de Jallouvre and its natural end.

(b) A branch running generally N.W. from the Tête Pelouse, carries the low Col de St Jean de Sixt and eventually ends in Mont Salève. It can be regarded as (a part of) [Arve .w. Rhone].

(c) Several low branches of ' les Montagnes des Beauges ' separate the basins of : the Fier (containing Lake Annecy); the Chéran (a tributary of the Fier); and the Leisse (which serves Lac Bourget). These branches carry several well known tourists' view-points.

²² Not to be confounded with the Tête Pelouse on [Giffre .w. Arve] near Sixt.

(4) MEDITERRANEAN MAJOR BRANCH SYSTEM ['SAVOY' RHONE .w. ISÈRE]



Offshoot in the Isère basin

A branch [Doron (Beaufort) .w. Isère] starts S.S.W. from a node just E. of the Col du Bonhomme. It carries the Col (de la Croix) du Bonhomme, the Aig. du Grand Fond, and the Crête du Rey, at which point it bends N.W. to Mont Mirantin. A spur towards the Isère from a node just S. of the Aig. du Grand Fond carries the comparatively high le Roignais.

The sub-system ['Savoy' Rhone .w. Isère], in striking contrast to ['Savoy Rhone' .w. Po], has very low mountain qualification, but considerable Alpine content. It contains: some features usually placed in the Mont Blanc Group; others usually included in the Dauphiné Alps; and yet others which Coolidge allows to rest in a region specified as 'Lower Savoy.'²³ In some classifications it would be entirely Graian.

(5) BASIC SECTION SYSTEM [ISÈRE .w. PO].

The Watershed

From the Aig. des Glaciers the watershed (generally followed by the French-Italian frontier) first runs S.S.E. carrying the Col de la Seigne, *Pointe de Léchaud*, Col Petit St. Bernard, Becca du Lac, Grande Sassièrè, *Pointe de la Traversière*, *Pointe de la Goletta*, Tsantaleina, *Pointe de la Galise*, Col d'Oin, Col du Carro, and the Levanna. Here it turns S.S.W. traversing Punta Francesetti, *Piccola Ciamerella*, Mont Chalanson, Ouillarse, Bessanese, Col de l'Auteret,²⁴ and Rochemelon (which owing to a short cut by the frontier is in Italy). The watershed next runs N.W. to the *Pointe de Ronce*, and Col du Mont Cenis, and finally, with considerable deviations W.S.W. to les Dents d'Ambin, Aig. de Scolette, Col de Fréjus, and Mont Thabor, to terminate at the modest *Pic du Chardonnet*, an outpost to the S.W. of Mont Thabor.

The most important branches of this Basic Section are those carrying the conventional Eastern and Western Graians, both of which have claims to be considered Major Branches. The former lies between two tributaries of the Po and though very high near its outset eventually loses its Alpine characteristics. The latter is merely the watershed between a tributary of Rhone and a tributary of that tributary. It is interesting to note that neither are usually accounted separate 'Groups' in conventional systems of classification.

Offshoots in the Isère basin

(a) The watershed carrying the conventional Western Graians answers to the title [Isère .w. Arc] and starts from a snowy hump

²³ Balls' *Alpine Guide to the Western Alps*, edited W. A. B. Coolidge, 1898, p. 197. Coolidge, however, excludes the region of Lower Savoy and its mountains *as such* from his classification in *The Alps in Nature and History*, 1908.

²⁴ Not to be confounded with either the Col de Lauteret or the Col du Lauteret.

(3310) a little way S. of the Col d'Oin. It zigzags generally W.S.W. carrying the Col du Bouquetin, Grande Aiguille Rousse, Col d'Iseran, Pointe de Méan Martin, Col de la Leisse, Grande Motte, Grande Casse, Dôme de Chasseforêt, Dôme de l'Arpont, Pierre Humide, and Aiguille de Polset, from which point it curves N.W. to its natural and still Alpine end.

On its Isère-side: A branch, with Mont Pourri on its watershed and the Sommet de Bellecôte on a spur to the W., runs N.N.W. from a node just W. of the Col de la Leisse, and can be considered as the watershed in a salient of the Isère.—A spur W. from the Grande Casse contains the Grand Bec de Pralognan.—A spur N. from the Aiguille de Polset contains the Aiguille de Péclet.

On the Arc-side: A spur carrying the Pointe de Chatelard runs S.W. from the P^{te} de Méan Martin.—A spur running E. from Pierre Humide carries the Dent Parachée.

(b) A spur running N.W. from the Ouillarse carries the Pointe d'Albaron and is covered by the title [Arc .w. Avérole].

(c) A spur N.N.W. from a node between the Col de l'Auteret and Rochemelon, carries the Pointe de Charbonel, and is predominantly [Avérole .w. Ribon].

Offshoots in the Po basin

Alternative French and Italian names abound.

(a) Mont Favre and le Crammont lie on a spur which runs E. from the Pointe de Léchaud. It can be called [Thuille .w. Dora Baltea], the Thuille being the river that descends from the Petit St. Bernard.

(b) A branch running N.E. from the Becca du Lac carries the Testa del Ruitor and Mont Paramont. It can be comprehensively based on [Grisanche .w. Dora Baltea].

(c) A branch running N. from the Pointe de Traversière contains la Grande Traversière and the Bec de l'Invergnan. It is predominantly [Rhêmes .w. Grisanche].

(d) A spur running N.N.E. from the Pointe de la Goletta carries the Granta Parei.

(e) The great branch carrying the conventional Eastern Graians, and whose Alpine portion is more than covered by the title [Orco .w. Dora Baltea], zigzags E.N.E. from the Pointe de Galise, and carries on its watershed: Punta Basei, Col de Nivolet, Becca di Monciair, Cima di Charforon, Tresenta, Gran Paradiso, Punta di Ceresole, Roccia Viva, Torre di Gran S. Pietro, Punta Lavina, and Rosa di Bianchi, at which point it curves S.E. losing all its Alpine characteristics long before arriving at its natural end.

On its Orco-side: A spur running S. from a node E. of the Roccia Viva carries the Becchi di Tribulazione, which are not adjacent to the glacier of that name.

On the Dora Baltea-side: A branch running N. from the Punta Basei carries the Cima dell Auille and Punta Bioula, and answers to the title [Savara .w. Rhêmes].—A more notable one runs N. from the

Gran Paradiso and carries Mont Herbetet and the Grivola. It is predominantly [Gran Eyvia .w. Savaranche].—A spur running N. from the Gran San Pietro, is dominated by the Patri, and answers to the title [Vaille .w. Valnontey].—A branch running N.W. from a node W. of the Rosa di Bianchi can be comprehensively based on [Dora Baltea .w. Gran Eyvia] and carries the Punta Tersiva and Punta di Garin on its watershed, with Mont Emilius and the Becca di Nona on a spur towards the Dora Baltea.

(f) A branch, the Alpine part of which is covered by the title [Stura (di Lanzo) .w. Orco] runs E. from a node S. of the Levanna. It has little mountain interest except the viewpoint Monte Bellagarda.

(g) The Uja di Ciamerella lies on the outset of a branch, otherwise of mild Alpine character, which runs E. from Piccola Ciamerella and separates two confluent of the Stura di Lanzo.

(h) A branch of little Alpine interest runs E. from Rochemelon and can be called [Dora Riparia .w. Stura (Lanzo)].

Under any of the conventional interpretations, the Basic Section System [Isère .w. Po] contains most, if not all, the Graian Alps ; also a small fraction of the Cottian Alps, and (perhaps) a tiny corner of the Mont Blanc Chain. It has great Alpine content and high mountain qualification.

(6) MEDITERRANEAN MAJOR BRANCH SYSTEM [RHONE .w. DURANCE].

Most, but not all, the Alpine portion of this system would be covered by the title [Isère .w. Durance], whereas the title selected rather more than covers the Alpine content.

The Watershed

From the *Pic* du Chardonnet, the watershed first runs W.S.W. to the Col du Galibier and the *Pic* des Trois Evêches, where a sharp bend S.E. leads to the Col *du* Lauteret. It next runs, gradually attaining great altitude, S.S.W. to the Pic de Neige Cordier and Roche Faurio, thence S. to the Dôme de Neige (des Ecrins), Pic Lory (des Ecrins), Pic Coolidge, Ailefroide, Col de la Pilatte, les Bans, Pic de Verdonne, and the Mourre Froid. Altitude is now steadily lost as it works round for a long run W. to the Pic de Bure, and the Col de la Croix Haute (Lalley). Just W. of the latter the watershed makes a sharp turn S. becoming temporarily [Drôme .w. Durance], and finally runs S.W. to its Alpine end (where ?), and subsequently its natural end.

Offshoots towards the Rhone

(a) A long and widespread branch system starts from the acute angle at the *Pic* des Trois Evêches. Its watershed essentially [Isère .w. Romanche] meanders and zigzags N.W. traversing the S. peak of les Aiguilles d'Arves and the north-eastern half of les Grandes Rousses finally running S.W. from the Col des Sept Laux to the range of

Belledonne, near which the Romanche joins the Drac just before the latter joins the Isère.

On its Isère-side a spur runs N. from the S. peak of les Aigs. d'Arves and carries near its outset the Central and N. peaks of the same.

On the Romanche-side a spur from a node W. of les Aigs. d'Arves carries the Aig. du Goléon.

(b) The branch system [Romanche .w. Vénéon] though short is remarkable for the concentration of high mountains. Its watershed, starting from the Roche Faurio, runs N.W. to the Grande Ruine and the Meije, where it turns W. to le Râteau and many other lofty peaks.

On its Romanche-side a spur from a node S.E. of the Meije runs E. and carries Pic Gaspard.

On the Vénéon-side a high spur running S.W. from a node between the Meije and le Râteau is dominated by the le Plaret and answers to the title [Diable .w. Vénéon].

(c) A more extensive, if somewhat lower branch system than the previous one, can be based on [Romanche .w. Drac]. Its watershed runs W.N.W. from les Bans and carries les Rouies, Pic d'Olan, Aig. d'Olan, Col de la Haute Pisse, and la Muzelle.

On the Romanche-side a lofty branch runs N. from les Rouies and soon forks to admit the Vallon des Etages. The right 'prong' is dominated by the Cime de Clot Châtel, and the left one culminates in les Fétoules.

(d) A branch [Severaise (Gaudemar) .w. Drac] runs W.S.W. from the Pic de Verdonne and contains Sirac, and the Chaillol range.

(e) Further W. from the watershed, between the Pic de Bure and the Col de la Croix Haute, spurs project N. into the Dévoluy region of 'French Dolomites,' the highest peak being the Obiou.

(f) From the angle W. of the Col de la Croix Haute a branch temporarily [Isère .w. Drôme], but more comprehensively [Isère .w. Rhone], runs N.W. A spur on the Isère-side of this branch runs N. into the Vercors region of 'French Dolomites,' and a very short spur E. from this spur carries Mont Aiguille.

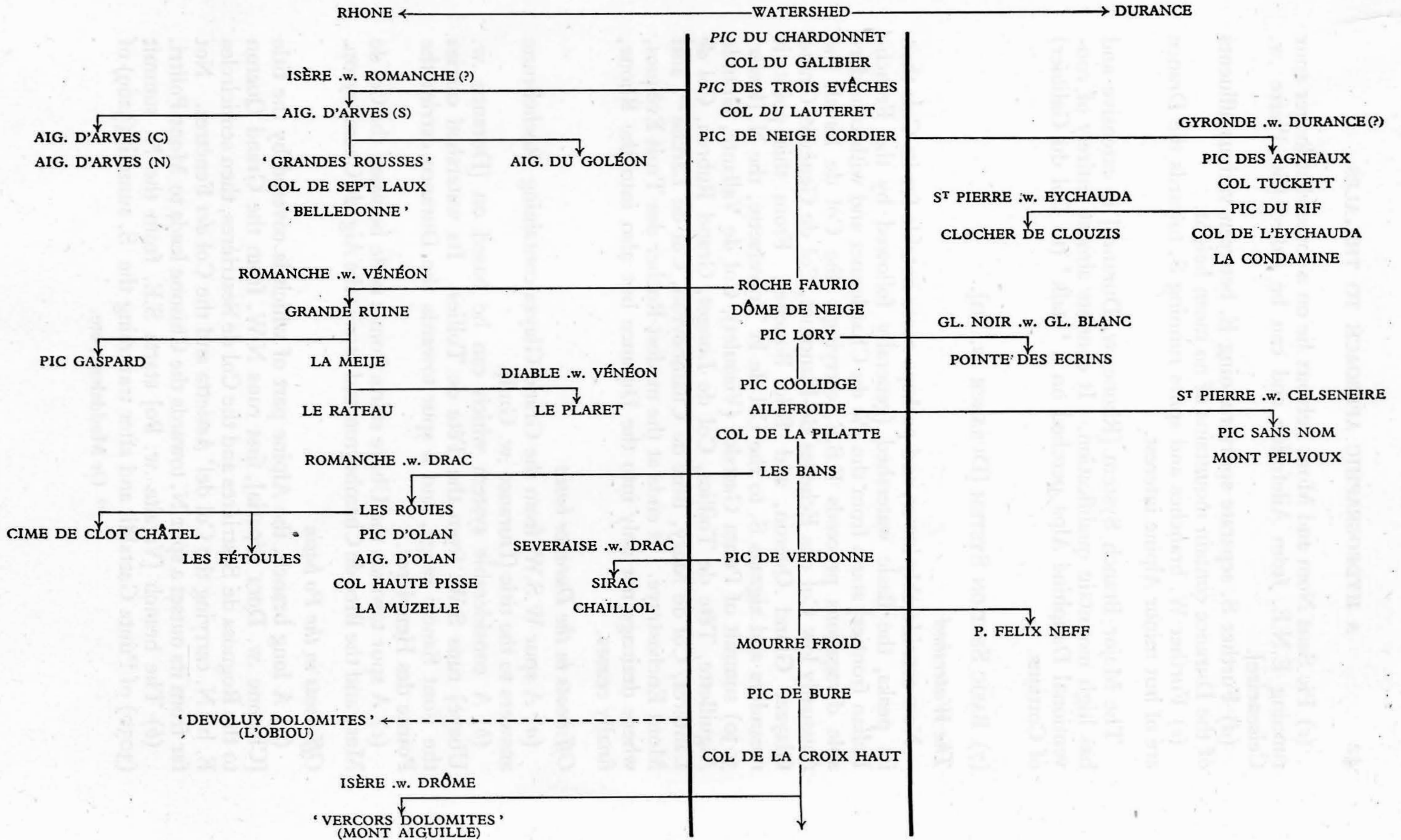
Offshoots in the Durance basin

(a) A branch starts E. from the Pic de Neige Cordier. Its watershed carries the Pic des Agneaux, the high Col Tuckett, Pic du Rif, and the Col de l'Eychauda, then turns S. to the Cime de la Condamine. It is predominantly, but by no means completely [Gyronde (Vallouise) .w. Guisane], but to call it [Gyronde .w. Durance] seems pedantic.

On its Gyronde-side a spur running S. from the Pic du Rif carries the Pic and Clocher de Clouzis and is essentially [St. Pierre .w. Eychauda].

(b) A short but high spur running N.E. from Pic Lory carries the highest Pointe and Barre des Ecrins. It can be called [Gl. Noir .w. Gl. Blanc].

(6) MEDITERRANEAN MAJOR BRANCH SYSTEM [RHONE .w. DURANCE]



(c) Pic Sans Nom and Mont Pelvoux lie on a somewhat longer spur running E.N.E. from Ailefroide and can be called [St. Pierre .w. Celseneire].

(d) Further S. separate spurs running E. between various affluents of the Durance contain mountains of no mean height.

(e) Further W. branches and spurs running S. towards the Durance are of but minor Alpine interest.

The Major Branch System [Rhône .w. Durance] is extensive and has high mountain qualification. It consists almost entirely of conventional Dauphiné Alps perched on a 'stalk' (to Col du Galibier) of Cottians.

(7) BASIC SECTION SYSTEM [DURANCE .w. PO].

The Watershed

Now considerably lower, and perhaps more notable for its Cols than its peaks, the Basic watershed (generally followed by the French-Italian frontier) starts from the *Pic* du Chardonnet and with considerable divagations proceeds E.S.E. carrying: the Col de Laval, the unusually low Col des Echelles de Planpinet, Col de Genève, Grand Glayza, Grand Queron, and Bric Bouchet. From this point it meanders and zigzags S. to the Col de la Traversette, the N. (lower, 3030) summit of Punta Gastaldi (Visoulet), Col de Vallante, Grande Aiguillette, Tête de Toillies, Col de Longet, Grand Rubren, Col de Lauteret, Col de Mary, Brec de Chambeyron, Col de Larche²⁵, and Mont Enchastraye. It ends at the modest Rocher des Trois Evêques, where drainage not only into the Durance but also into the Rhône, finally ceases.

Offshoots in the Durance basin

(a) A spur W.S.W. from the Grand Glayza containing Rochebrune answers to the title [Durance .w. Guil].

(b) A considerable system which can be based on [Durance .w. Ubaye] runs S.W. from the Tête de Tollies. Its watershed carries the Font Sancté range, and a spur towards the Durance carries the Pointe des Henvières.

(c) A spur towards the Ubaye starts from a node between the Col de Mary and the Brec de Chambeyron and carries the Aig. de Chambeyron.

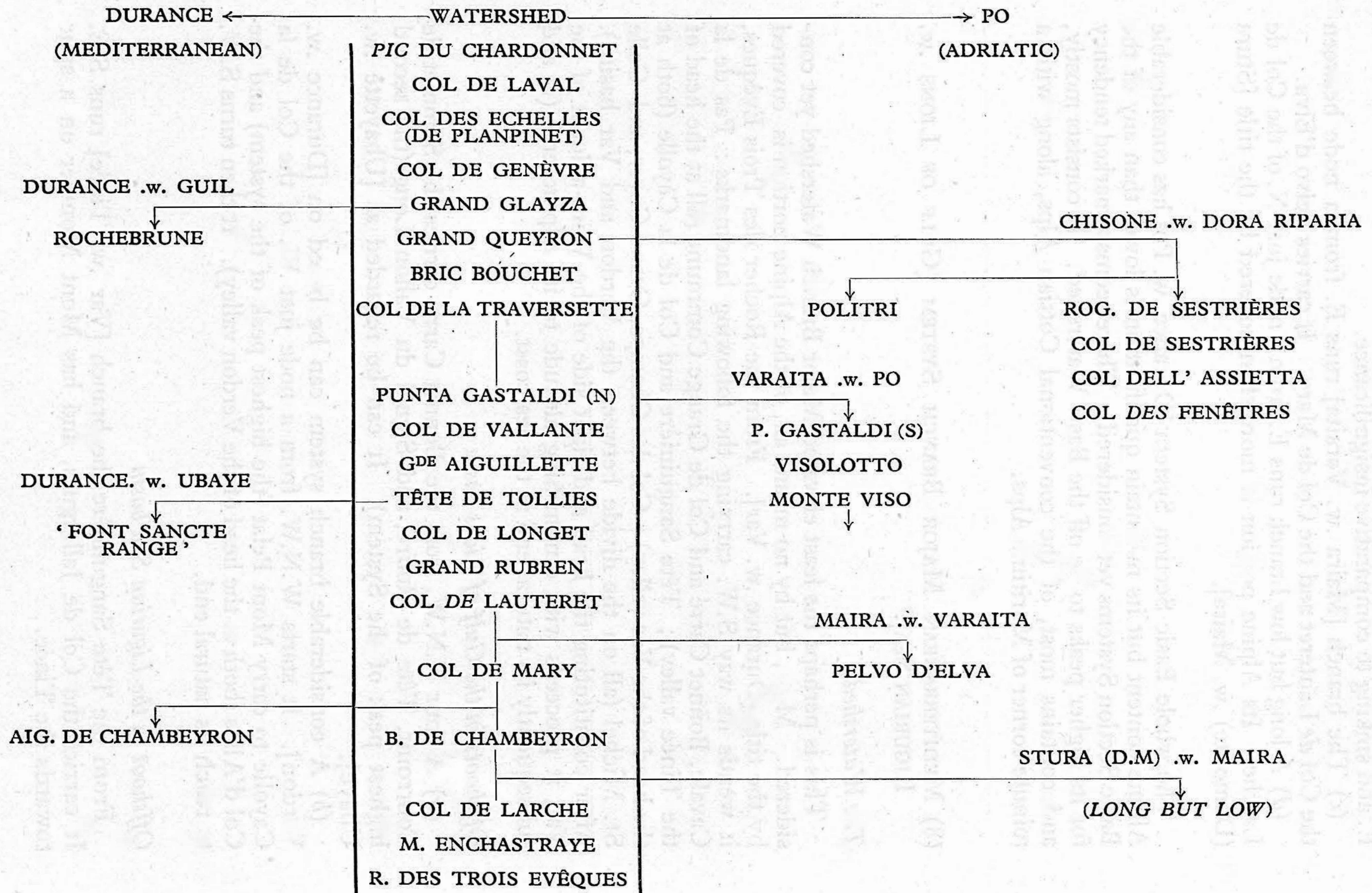
Offshoots in the Po basin

(a) A long branch, the Alpine part of which is covered by the title [Chisone .w. Dora Riparia], first runs N.W. from the Grand Queron to the Rognosa de Sestrières and the Col de Sestrières, then semicircles E. by N. carrying the Col del' Assietta and the Col *des* Fenêtres. Not far from its outset a spur N. towards the Chisone leads to Mont Politri.

(b) The branch [Varaita .w. Po] starts S.E. from the N. summit (3030) of Punta Gastaldi, and after traversing the S. summit (3269) of

²⁵ Or Maddalena, etc.

(7) BASIC SECTION SYSTEM [DURANCE .w. PO]



that mountain, carries the Visolotto and Monte Viso, before bending E. and sinking to comparative insignificance.

(c) The branch [Maira .w. Varaita] runs E. from a node between the Col *de* Lauteret and the Col de Mary. It carries Pelvo d'Elva.

(d) A long but low branch runs E. from a node just N. of the Col de Larche. Its Alpine portion is more than covered by the title [Stura (Demonte) .w. Maira].

The whole Basic Section System [Durance .w. Po] has considerable Alpine content but its mountain qualification is lower than any of the Basic Section Systems yet considered. There seems a marked tendency for its higher peaks to lie off the Basic Watershed. It consists mostly, and contains most, of the conventional Cottian Alps, along with a minute corner of Maritime Alps.

(8) MEDITERRANEAN MAJOR BRANCH SYSTEM [GULF OF LIONS .w. LIGURIAN SEA].

The Watershed

This is perhaps the least elevated Major Branch Watershed yet considered. Most, but by no means all, of the Alpine portion is covered by the title [Durance .w. Var]. From the Rocher des Trois Evêques, it wends its way S.W. carrying the following landmarks: Pas de la Cavale, Bonnet Carré and Col de Grange Commune (all at the head of the Tinée valley); Tête Sanguinière and Col de la Cayolle (both at the head of the Var valley); Col des Champs, Grand Coyer, and Colle St. Michel (all on the divide between the Verdon and Var basins). After constituting the head and right side of the Vaire-affluent of the Var, it proceeds with diminishing altitude to its Alpine end (?) and subsequently its natural end at the sea coast.

Offshoots in the Gulf of Lions basin

(a) A spur N.N.W. from the Bonnet Carré carries the Sommet de Courrouit, Tête de Roffre, and Signal du Vallon Long (the second highest peak of the System). It can be regarded as [Ubayette .w. Ubaye].

(b) A considerable branch system can be based on [Durance .w. Verdon]. It starts W.N.W. from a node just W. of the Col de la Cayolle to carry Mont Pelat (the highest peak of the system) and the Col d'Allos (both at the head of the Verdon valley). It then turns S.W. to reach its natural end.

Offshoot in the Ligurian Sea basin

From the Tête Sanguinière the branch [Var .w. Tinée] runs S.E. It carries the Col de Jallorgues, and has Mont Monnier on a spur towards the Tinée.

The Major Branch System [Gulf of Lions .w. Ligurian Sea] though having low mountain qualification has considerable Alpine content. Most of the higher peaks lie on the offshoots in the Gulf of Lions basin. Practically the whole system would be classed as Maritime Alps.

(9) BASIC SECTION SYSTEM [LIGURIAN SEA .w. PO].

The Watershed

Reasons in favour of considering that the Alps, hence the Basic Watershed, end at the Passo di Cadibona (Colle d'Altare) have been discussed (*A. J.* 57. p. 362).

From the *Rocher des Trois Evêques* the Basic Section Watershed (followed by the French-Italian frontier) runs E.S.E. to Mont Tinibras, Tête de Malinvern, Cima Mercantour, Colle delle Finestre, and Cima dei Gelas (the highest peak *on* the Section Watershed). It next runs E.N.E. to Mont Clapier and the Col de Tenda (here the frontier leaves the watershed to run S. towards the sea ; sometimes but not always following the course of the Roja). E. of the Col de Tenda the watershed turns S.E. to Monte Saccarello, and finally E.N.E. carrying the Colle di Nava and Colle. S. Bernardo to the Passo di Cadibona.

Offshoot in the Ligurian Sea basin

A notable branch system runs S. from M. Clapier. It fans out before reaching the sea coast, but the greater part of it answers to the title [Var .w. Roja] which may or may not cover the whole of its Alpine proclivities.

It carries Mont Capalet on its watershed, and the view-point Monte Bego on a spur towards the Roja.

Offshoots in the Po basin

All these lie between various confluents of the Tanaro, and it is interesting to note, that the superior watersheds are generally inferior in Alpine characteristics, whereas the more mountainous spurs have low hydrographic value.

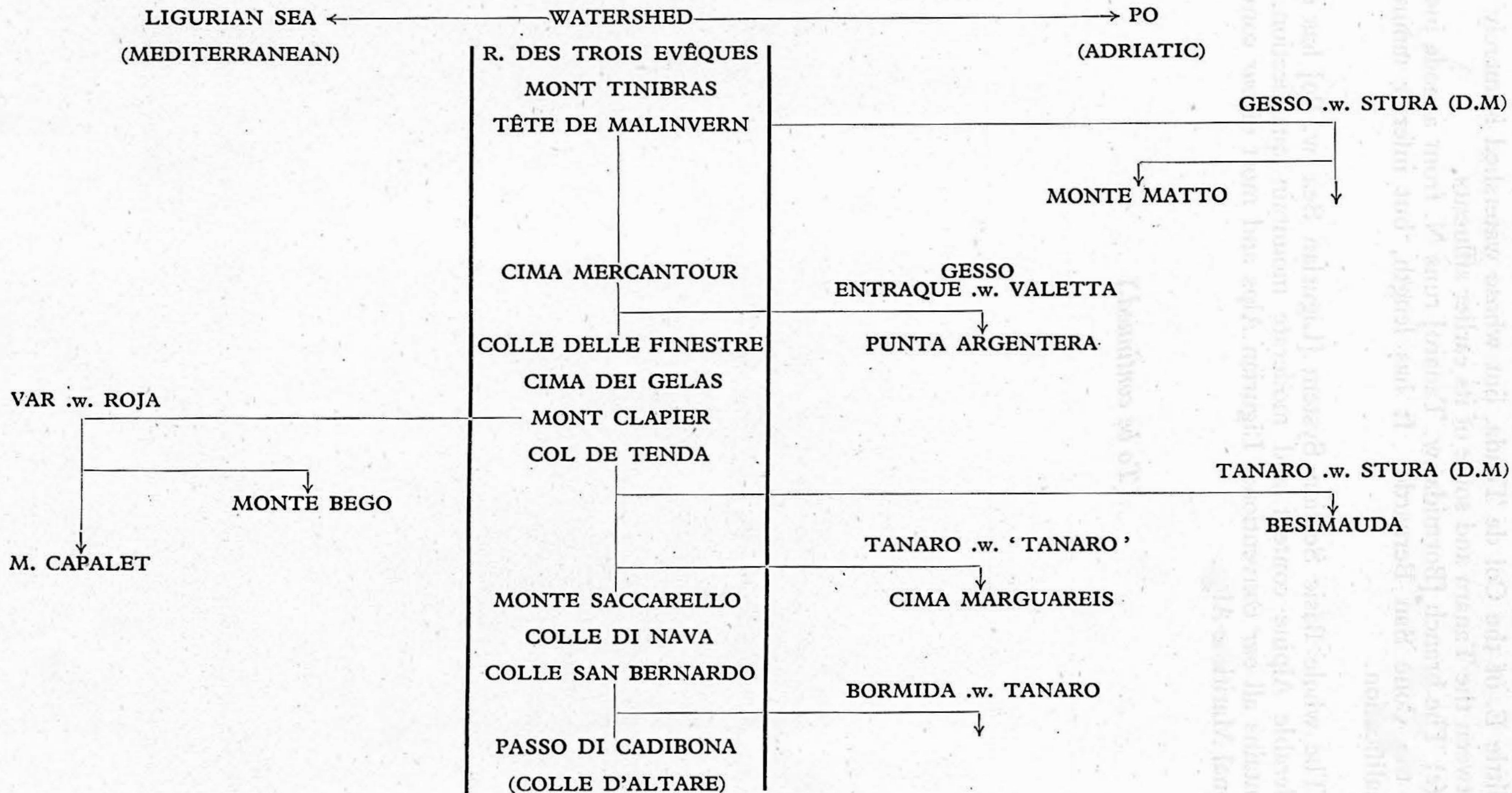
(a) The branch [Gesso .w. Stura (Demonte)] runs N.E. from the T. de Malinvern and carries Monte Matto on a spur towards the Gesso.

(b) The short mountainous spur which contains Punta Argentera (the highest peak of the System) runs N. from a node just E. of C^{ma} Mercantour. It is no more than the watershed between two confluents of the Gesso, which is only an affluent of the Stura.

(c) The branch [Tanaro .w. Stura (Demonte)] runs N. from a node just E. of the Col de Tenda. It has low mountain qualification and limited Alpine extent, but carries the famous viewpoint Besimauda, just off the watershed on the Tanaro-side.

(d) Cima Marguareis (the highest summit in the Ligurian Alps) lies near the outset of a somewhat substantial spur running E. from a node

(9) BASIC SECTION SYSTEM [LIGURIAN SEA .w. PO]



a little E. of the Col de Tenda, but whose watershed is merely that between the Tanaro and some of its earlier affluents.

(e) The branch [Bormida .w. Tanaro] runs N. from a node just E. of the Colle San Bernardo. It has length, but inferior mountain qualification.

The whole Basic Section System [Ligurian Sea .w. Po] has considerable Alpine content and moderate mountain qualification. It contains all *our* conventional Ligurian Alps and most of *our* conventional Maritime Alps.

(To be continued.)