

DEPTH CLASSIFICATION

25 LIBRARY CLASSIFICATION AS DISCIPLINE *

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Discusses the call of social pressure for the prompt and pinpoint communication of nascent micro thought and for this purpose for an ever-on-the-alert discipline of library classification. Points out the relation with machinery for search. Shows the entry of this discipline into the spiral of scientific method, with its own normative principles, postulates, and devices. Defines 'new Classification'. After stressing the importance of the avoidance of homonyms and synonyms among class numbers, discusses notational organisation including telescoping and zone devices. Traces the history of the removal of rigidity. Indicates a set of unsolved problems. Outlines a scheme for the construction of schedules of properties, values, materials, commodities, and services. Calls for the acceptance of a single universal scheme instead of a special scheme for each subject. Develops the theme of abstract classification and recommends the use of mathematical methods in the work on it. Concludes with an appeal for provision for research in the subject.

for an International Seminar of about a month's duration on Depth Classification to consolidate the results of recent years and formulate a line of work for the future. At the request of the indefatigable Secretary-General, I worked out some details for the Seminar, calculated to lessen the current wastage of enormous manpower of first-rate quality; and he had it published in the Review of documentation. My heart was gladdened and I am sure that the FID too was glad when at least a Study Conference of a week's duration was arranged by Aslib with the co-operation of the Classification Research Group and the University of London School of Librarianship and Archives.

0 INTRODUCTION

Library classification is a discipline which has at once a charming field of theory and a vast field for application. Progress in any one of these two fields is not possible and will not be lasting, unless it keeps step with the progress in the other. This is often overlooked by a person without sufficient experience either in theory or in application. If that person is a "committee man" with some influence, he may even dam progress both in theory and application with slogans like "academic". Some such fate, perhaps, foundered the resolution passed during the Brussels Conference of 1955 calling on the F. I. D. to arrange

1 BACKGROUND

In a Conference supported by papers and discussions by a number of persons with full faith in the potentiality of library classification for social good and with equal conviction, born of actual experience, of the intimate, irremovable interdependence of theory and practice, the task of the opening address is only to set the background against which an interchange of views may most readily be focussed to derive the best possible results in the limited time available for the Conference. Fortunately, this is not difficult because most of what is required to be said has

* Based on the opening address to the International Study Conference on Information Retrieval held at Dorking, England, 13 - 17 May 1957

been already said in a series of publications during the last few years. My task is therefore little more than to pick out a few pertinent points.

11 Tools of Classification-Design

Within a single generation, classification-design has marched from the "Work-Shop Stage" to the "Laboratory Stage". The rule-of-thumb and the hit-or-miss methods of the pioneers are now part of history. The tools of the classificationist are now complex. A new terminology had to establish itself, in spite of the inertial resistance met with at the beginning. In my visit to the Library Schools in Great Britain during December last, I was struck by the spontaneity of the students in working with terms such as Phase-, Facet-, and Zone-Analysis, Seminal Mnemonics, and Chain Procedure. I was equally struck by the ease with which they could work with the postulate of the Five Fundamental Categories. These terms and the tools denoted by them have already become matters of reflex action with the new generation entering the profession.

12 Pressure by Service to Specialist Readers

This awareness to the need for new tools for classification-design could not come so long as the profession's main pre-occupation was service to the general reader. For, the pressure due to it could be met with superficial classification. On the other hand, the pressure caused by service to specialist readers can not be met except with depth-classification. And the design of depth-classification requires complex tools. The pressure by service to specialist readers is now pervading into every nook and corner of the universe of knowledge.

13 Reaction of the Human Mind

The design of depth classification requires that more must be known about how the human mind reacts to the turbulence in the universe of knowledge and the modes of new formations in it. Is their analysis into Denudation, Lamination, and Loose Assemblage totally exhaus-

tive? Do the corresponding techniques of Sharpening of Isolate, Facet-Analysis, Phase Analysis, and ultimate Synthesis effect a sequence of subjects in accord with the reactions of the human mind to that turbulence? These are some of the fundamental issues to be decided. It is for this reason that I had suggested that the International Seminar should partly consist of specialists in different areas of knowledge, both pure and applied. A few months ago, there was some confirmation that facet-analysis was in accord with the way in which the mind of specialists works. This confirmation was brought by D J Foskett after contacting and working with specialists in Occupational Medicine. What they had themselves done before calling for his expert help was in substance some facet-analysis in crude form. Their mind having spontaneously worked that way already, Foskett found it easy to tidy up and sharpen the isolates in the facets concerned. And what is more significant, he could get ready acceptance for the systematic and conscious use of facet-analysis. Are there other elements in the turbulence in the universe of knowledge? Are there other features in the reaction of the human mind to this turbulence? Do they call for other new tools for use in classification design?

14 All-Out Analytico-Synthetic Approach

It is quest for knowledge of these kinds which goes on, and should go on, continuously within the discipline of library classification. In this quest, the advantage of a division of labour has already been sensed. In this, the share of the Classifier backed by Reference Librarian is to apply a current scheme of classification to actual service-conditions with an awareness to its defects, to the new formations in the universe of knowledge disclosing those defects, and the reactions of minds of the specialists served. Removing all such defects, solving design-problems, and shaping the scheme of the future fall to the share of the Classificationist backed by specialists in diverse subjects. These have already progressed from simple enumeration to all-out analytico-synthetic approach in the short span of thirty years.

15 Sociological Pressure

This is not an isolated or a freak happening. This is a vital necessity if humanity is to be saved from ever-mounting want, by the replacement of research-in-parallel by research-in-series. Research-in-parallel by isolated men of genius, born at intervals, is no longer sufficient to escape the disastrous consequences of population-pressure over-reaching the capacity of natural and near-natural commodities of the slow surface-transport, and of the native managerial ability of a few men of flair. Food, clothing, and shelter should be made artificially by the synthesis of extracts from unconsumable and even poisonous raw materials. Supersonic speed has to become the rule to bring commodities from the points of production to those of consumption. Power should be produced by the fusion of hydrogen atoms, so plentiful in sea water. Cultivated management should eliminate every kind of waste to make the above-mentioned projects succeed. One of the crucial points in management is the maximal use of the research-potential of humanity.

16 Conservation of
Research-Potential

In regard to the locus of research potential, it has to be garnered even from the little patches scattered, down to the end of the first and even of the second quartile in the descending intellectual scale. Secondly, no fraction of the research-potential should be spent away in unnecessary and unintended repetitive work. Management should be on its guard against the repetition of research, not only in a subject as a whole, but even on any isolate in any facet of it, which has already been developed in the facet of some other subject. During the last one or two decades, the management of many an enterprise is discovering that there is much leakage in this matter. Work done by somebody on some project lies buried in some report or periodicals and in ignorance of it man-power is spent on redoing it. This happens, not only in regard to work done in different enterprises, but also in regard to work done in one and the same enterprise and even under one and the same roof.

17 Communication and
Classification

This leakage is due to defect in communication. Management is now realising that prompt, pin-pointed communication is essential to eliminate such a wastage. To secure maximal use of research-potential, such a communication is most urgent and must be fully exhaustive in respect of nascent thought — nascent micro thought - just emerging in the wave-front of knowledge at this point or that. 'Documentation' is the term used to denote such a communication. Documentation consists of two stages of work - organising the documents and the entries of them in a bibliography, catalogue, or other similar list and their retrieval when needed. Depth classification is the means of their organisation in a helpful manner. A system of class index entries by Chain Procedure if one of the means of retrieval. These entries put us readily in possession of all the class numbers to be looked up in a particular retrieval.

18 Machinery for Retrieval

Machinery, extending from the simple punched card operated by a knitting needle on to a super-electronic one, can also be used for retrieval. The design of such a machinery falls within the province of the engineers, except in the case of the simple punched card. Machinery can do the work at great speed; but it is more costly; and it requires a vast quantity of minimum turn-over to become economical. It is for the management-specialist to decide on the wisdom of its installation in a particular place, after investigating the economics involving the cost of setting up, maintenance, and replacement due to obsolescence, extent of use, and all the other relevant factors. The classificationist and the engineer should collaborate in regard to the machinery. It is only from this angle that I can say a few words on the subject. All the steps in classification from facet-analysis to translation of isolate ideas into isolate numbers should be done by a classifier prior to coding the numbers for the machinery. The only step in classification not needed by the machinery is the one of arranging the facets in a preferred sequence and synthesising the isolate numbers and the basic

class number into the class number. The classificationist should take into account the special needs of the engineer, if any in the designing of the isolate numbers and the basic class numbers. Reciprocally, the engineer too should see to it that his demands do not unduly curtail the freedom of the classificationist in his classification-design. For it has to serve also certain other purposes in library service, such as

1 the arrangement of documents and their main entries, which need a synthesised class number for each document and not merely the basic and the isolate numbers pertaining to it;

2 the very work of classifying, which can be done with greater ease and precision with the aid of the concepts of the five fundamental categories, phases, rounds, levels, zones;

3 the reference service to readers, the most vital and delicate part of which is to work with the reader and find out in a systematic way the different facets in the topic of his interest at the moment and the isolates in each of them and also displaying before them a helpful panorama of documents and entries; and possibly also disclosing fallow regions in the universe of knowledge awaiting cultivation; one way this has been happening is the possible formation of a synthesised class numbers on which no document exists.

The sphere in which mutual accommodation and understanding is needed is that of the notation. For, the engineer would prefer as short a base as possible for notation to minimise the cost and the complication in the machinery involved in reducing the numbers to his preferred binary scale and he has no value for seminal, alphabetical, or scheduled mnemonics for expressiveness in the numbers. On the other hand, the classificationist is in need of all the freedom which a mixed notation can give; he has to make his base of notation as long as possible to make the synthesised class number as short as possible and to enable him to give the greatest possible autonomy to the classifier - and this is necessary to minimise reference back to him - autonomy in dealing with the ever-turbulent universe of knowledge throwing forth at all times and in all facets either newer or sharper isolates, the classificationist has to exploit all the three kinds of

mnemonics to the maximum extent. To facilitate mental ease for the reference librarian, the classificationist has also to make class numbers as fully expressive of the make-up of the thought-units as possible.

Having said what little I can in brief and general terms, about machinery for retrieval, I pass on to some details in the strict domain of library classification.

2 Scientific Method and Abstract Classification

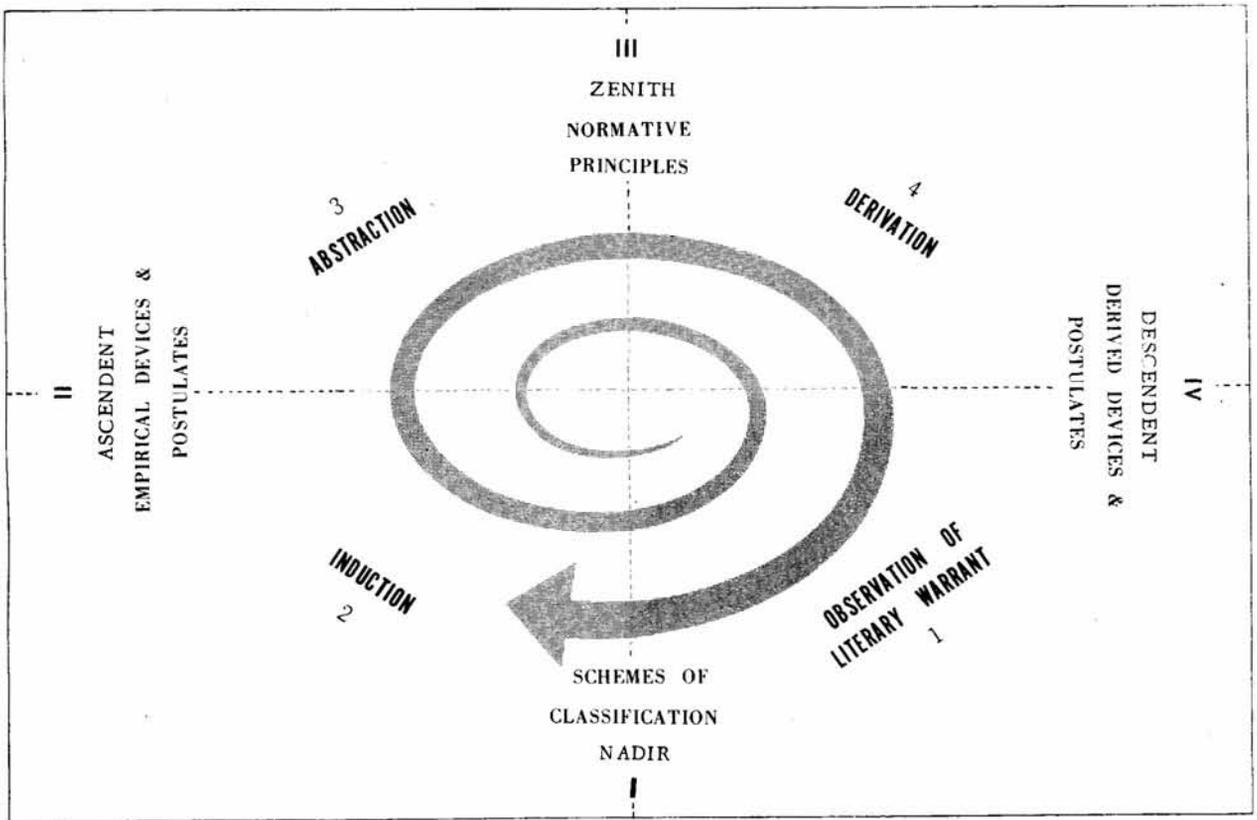
The first point I should like to make is that development of the discipline of library classification has already entered into the spiral of scientific method. The cycle implied in the spiral was first completed by W C Berwick Sayers as early as 1918, when he set forth the first draft of a set of canons of classification. Bliss re-examined them later. After the separation of work in the idea plane, verbal plane, and notational plane, the canons for each of the planes have been separated out and simplified by me. These number 15 in the idea plane, 4 in the verbal plane, and 9 in the notational plane, apart from the 5 additional canons pertaining to the physical and linguistic or other embodiment of thought. (see annexure 1). In addition to these 33 normative principles special to classification, there are, of course, the Five Laws governing every branch of library science (see annexure 2) and more general principles of an even more general nature such as the Law of Parsimony and the Law of Impartiality, common to any context. We have also enunciated 8 Principles for securing helpful sequence (see annexure 3), 6 devices for securing hospitality in array (see annexure 4), and 5 devices for securing hospitality in chain (see annexure 5). The first set of this group pertain to the idea plane while the next two sets pertain to the notational plane. Further, we have found that an analytico-synthetic scheme of classification implies a few postulates. The Colon Classification, for example, has been so far seen to imply 21 postulates. (see annexure 6).

21 Spiral of Scientific Method

The stage has thus been set for the adoption of a systematic pursuit in designing

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SPIRAL OF SCIENTIFIC METHOD



a scheme of classification. The spiral of scientific method, schematically represented in the accompanying diagram, visualises that systematic pursuit. It should recognize the normative principles at the zenith, the schemes of classification at the nadir, the empirical devices and postulates at the ascension, and the derived devices and postulates at the descension. The quadrant marked 'Observation of Literary Warrant' is of vital importance. We owe to Wyndham Hulme the crisp term 'literary warrant' to denote the quantity of expressed and embodied knowledge in any given field, waiting to be organised. Ever since J Mills brought it to my knowledge in 1954, I have been enjoying the economy it brings in thought and expression. An implication of such a systematic pursuit is that a set of normative principles, in the form of stated canons of classification and principles for securing a more or less helpful sequence, should be adhered to.

Different schemes of classification, within the limits set by the normative principles, should be designed only in accordance with a self-consistent and sufficient set of postulates and devices applicable to the idea plane and notational plane, stated explicitly by the designer concerned.

22 Stability in Normative Principles

The designers of classification schemes should respect another implication of the discipline of scientific method. It is not to change an accepted set of normative principles light-heartedly. They should be changed only if overwhelming factors arising out of unexpected changes in the way of reaction of the human mind in the social purposes of classification compel change. Changes in literary warrant alone will not call for a change.

The exigencies in the work of a particular designer should not be taken to be sufficient reason to force a change.

23 Change in a Set of Devices

The position is different in respect of the devices. These pertain to the notational plane. To implement in the notational plane all the findings by the analysis of documents in the idea plane, there is bound to be need now and then to hit upon and forge new notational devices. In fact, it is the difference in notational devices that distinguishes one scheme from another in most cases. Change in notational devices may imply also change in the postulates made for regulating work in the notational plane.

24 Postulates for the Idea Plane

Perhaps, the postulates pertaining to the idea plane come midway between the over-all normative principles on the one side and the devices and postulates pertaining to the notational plane on the other. They are dependent less on the design of classification than on the happenings in the universe of knowledge in respect of its development and structure. New factors calling for a change in the postulates for the idea plane are not likely to happen frequently. However, sufficient work has not yet been done in the subject for a coherent set of postulates to have taken shape. It is as a step in contributing to their being given such a shape that I ventured to introduce in the course for the Degree of Master of Library Science instituted in India in 1947, the subject "Universe of Knowledge: Development and structures". The experience of teaching the subject has brought conviction that that approach to the postulates for the idea plane is fruitful and is worth pursuing further. I had intended to record the experience in a book on the subject. But I have not yet found facilities to bring out that book.

25 Function of Banks

It appears to me that the normative principles of classification shown at the zenith of

the spiral of scientific method are like banks of a river. Just as a river ceases to exist and the water gets wasted, if the banks are breached, the design of classification will run amuck and lead to wastage if the normative principles are broken. To conserve the manpower for classification-design, to which society is not yet prepared to spare many men of ability, it is necessary for us to accept such a self-imposed discipline. This statement is made subject to the fact that neither rules nor methods are necessary or possible in the case of a man of genius who creates a scheme of classification with the aid of innate intuition and brings out the scheme whole as an egg. The self-imposed discipline is only for the pedestrian designer of whom we want plenty to carry forward a scheme created by some genius, in response to the changes in literary warrant represented by quadrant 1 in the spiral of scientific method.

251 Re-alignment of Banks

Occasionally, need arises to re-align the banks of a river to make it more useful. So also, there may be need, rather on rare occasions, to change the normative principles. The occasion for a change is likely to arise only when a sufficient number of new schemes cutting across the normative principles have been designed by truly creative classificationists thrown forth by society under the pressure of violent changes in the way of the human mind's reaction or in the social purpose of classification. Till that happens and new banks are built, the existing banks should not be breached by routine designers of classification.

26 What is a New Classification?

In the light of what has been stated in section 21 and its subdivisions, a scheme of classification is new, if and only if it is either based on a new set of normative principles (which will be rare), or on a new set of postulates and devices (which will be recurrent). For example, Decimal Classification and Library of Congress Classification are new relatively to each other, because DC uses the decimal-fraction device and LC uses the gap-device, but not because

their sequences of basic classes or of the isolates in a facet are different. Again, DC and Expansive Classification are not new relatively to each other, because they both conform to the same normative principles and devices and the mere variation in the enumerated sequences of the use of Arabic numerals instead of Roman capitals does not amount to essential difference. DC and Colon Classification are new relatively to each other, because DC does not use facet device or conform to the Canon of Mixed Notation, whereas CC does both. For this reason DC and Universal Decimal Classification are also new relatively to each other, in spite of UDC having adopted DC as its core and having fettered itself thereby. I remember to have seen in the Pentagon in Washington a scheme in which the Canon of Decreasing Extension has been replaced by its opposite viz. the Canon of Increasing Extension. I believe it has stultified itself. However, it is a new scheme relatively to any commonly known scheme. One of the implications of J Farradane's approach appears to be to uphold the Pentagon Classification in this respect. It may be repeated again that a new scheme is not created merely by either changing the species of digits used for the notation or by re-permuting the sequences of basic classes or the isolates in a facet.

261 Improvement of Scheme

Change in the digits used for notation, re-permutation of the sequences of the basic classes and of the isolates in some or all facets, and change in the sequence of facets in some cases may lead to improvement in a scheme, though not amounting to a new scheme. So also, providing additional facets and providing additional arrays within a facet are ever-continuing processes of improving a scheme, if it is to keep pace with the development in the universe of knowledge as recorded by literary warrant. Some improvement in a scheme is also possible with the aid of exegetics—that is by a new interpretation of the normative principles, postulates and devices, brought to light as possible interpretations by newly developing literary warrant. Scientific method would welcome this method of exploiting the resilience of existing normative principles, postulates, and devices. In fact this method

should be exhausted, before venturing to change the principle, postulates, and devices, even as it is the practice in the application of scientific method in the development of all other disciplines.

27 Design-in-Series

Acceptance of all these implications of scientific method as applied to classification-design will conserve the man-power available for the work. The present dissipation of that man-power caused by tinkering with superficialities can be brought under control. The work of designing and improving schemes of classification can proceed harmoniously and profitably "In-Series", rather than disharmoniously and wastefully "In-Parallel". Since World War II, there has been a perceptible realisation of the advantages of research-in-series over research-in-parallel in many fields of knowledge both applied and pure. This has indeed become a social necessity as shown in sections 15 and 16. This applies equally in the field of library classification.

28 Examination of Normative Principles and Postulates

The whole system of canons and postulates, currently used, should be critically examined. The Canon of Modulation is perhaps the vaguest one depending on flair in its application. The Canon of Expressiveness is one whose limitations should be investigated. The Principle of Favoured Category Device in the enumeration of isolates in an array is also dependent on vague experience and flair; and some thought should be devoted to it. Conflict may arise in the choice between the various Principles for securing conformity to the Canon of Helpful Sequence. The *Prolegomena* (ed 2) claims to state them in the order of preference to be used in case of such conflict. This order of preference should be critically examined. The postulates too need examination.

It will be helpful to come to a decision once for all on such proposals as (i) 'Economic Limit' to length of class number as against the Canon of Relativity and of Expressiveness, and (ii) pronouncibility of a class number of letters as

against the freedom to construct schedules of isolates in conformity to the Canons of Mnemonics, decimal-fraction, facet and zone devices, and efficiency table, without thinking of the combination of letters that should come in the finally synthesised class number.

3 Notational Organisation

To get the maximum benefit out of library classification along each of the lines mentioned in the latter half of section 18 and possibly along other lines too, it is necessary to organise the notation of a scheme of classification with care. This is also necessary to make possible in the most economical way the implementation in the notational plane of all the findings in the idea plane. While, no doubt, the notational plane should subordinate itself to the idea plane, we have come across instances of the notational plane inviting attention to helpful concepts or facets in idea plane, overlooked all along. The distinction between anteriorising and posteriorising common isolates, featured space and time being recognised as second level manifestations of space and time respectively, and the helpfulness of recognising new "distillate" basic classes such as Pure Management in the sense of running an enterprise, Pure theory of Conduct of Meetings, and Pure theory of Standardisation, are some examples of that kind. Thought devoted to notational plane on its own right has also settled some notational practices about which there has been only a drifting all along.

31 Avoidance of Homonymy and Synonymy

So long as class numbers are to be used to mechanise arrangement of documents and/or their main entries in a preferred sequence and so long as they are to be used for arrangement of entries in international bibliographies, the system of class numbers of a scheme should not admit of homonyms and synonyms. Not only should there be no homonym or synonym among schedules of isolates; they should not get created in the synthesis of isolates either. The Canon of Local Variation is strictly for use within a single library or within a single group or system of libraries only. The concepts of Mother Country, Favoured Country, Favoured

Language, Favoured System of Philosophy, and Favoured Category of certain other kinds are to be used only to satisfy that canon by giving precedence to documents covering favoured categories and by shortening their call numbers. There may also be variation in the sequence of facets in a facet formula to satisfy the Canon of Local Variation. But the need for this variation will be far less than the one previously mentioned. Again, in a given library or group or system of libraries, Local Variation should be made in one and only one way. No homonym or synonym should be created by the simultaneous use of alternative ways of local variation. Whenever variation in facet formula is made for local purposes, it should be prominently stated and brought to notice in all possible ways, so as to compel attention. UDC has openly flouted this requirement in the use of classification for international communication. This has been pointed out by K A Isaac and myself. FID should be persuaded to see this, as it is an influential international body responsible for the perpetuation of this error by UDC.

32 Alphabetical Device and the Law of Parsimony

The choice between alphabetical sequence and any other sequence for a given universe of categories has been for long left without any explicitly stated guiding principle. It is desirable to fix this matter somewhat as follows: If no other sequence is more helpful than alphabetical sequence within a given universe of isolates, then only the alphabetical device should be used to individualise the isolates. Thereby, the load on schedule-making is eliminated. This is a legitimate situation for allowing the Law of Parsimony to have its way in reducing the number and length of schedules.

33 Octave Device vs Group Device

In the light of the Law of Parsimony, the criterion for choice between octave device and group device has been fixed as follows for the case when the base consists of 8 significant digits, and one octavising digit.

When the number of categories is		Economic number of significant digits
greater than	but not greater than	
	24	1
24	256	2
256	2,560	3
2,560	24,576	4
24,576	229,376	5
$(n+1)8^{(n-1)}$	$(n+2)8^n$	n

The generalised equation giving the first of such critical numbers has been found to be $2 \lceil \log_n m \rceil = m-1$, where $\lceil x \rceil$ is the greatest integer contained in x . Similar critical numbers for a base of 23 digits, which is what we get of Roman capitals omitting I and O and setting apart Z as the octavising digit, are 69, 2416, 61335, ... $(n+2)23^n$. The use of these findings has been demonstrated by D B Krishna Rao in its application to Agriculture. Incidentally, it may be stated that he has also found advantage in using alphabetical device or code numbers prevailing among specialists, in carrying classification to arrays of higher orders, which usually attract only micro documents.

34 Telescoping of Arrays

Telescoping of consecutive arrays will satisfy the Law of Parsimony. But this should not be done unless there is a certainty that the hospitality in any of the arrays will not be arrested thereby at any future time.

35 Zone Device

A base of mixed notation taken along with the setting apart of the last digit of each species as octavising digit gives several zones in an array. It is possible in certain circumstances, to specialise these zones in the accommodation of sets of isolates of increasing concreteness, such as those that belong, in the idea plane, to different levels of the same fundamental category. The result is telescoping consecutive facets, as viewed from the idea plane, into a single facet as viewed from the notational plane.

This device was brought to light while working with D Langridge on the design of a scheme of classification for Pure Management in the sense of the total running of an enterprise. This has given some satisfaction to the Law of Parsimony. But this device needs more of experimentation before it can be finalised.

36 Packeted Number

It has been found that a device is necessary to show where the part of an isolate number, got by subject device, begins and where it ends. It has been found that this requires two special digits, one as the Starter of that portion and the other as the Arrester of it. The two square brackets have been recommended for adoption in UDC; while the two circular brackets have been used for the purpose in CC. It has been found that the ordinal value of the starter should be higher than that of any of the substantive digits used in the scheme, and that of the arrester smaller than that of the least of the connecting symbols. Incidentally, the addition of these two digits increases the base of the notation enormously, as the starter is not a significant digit. The potentiality of this windfall is just now being exploited.

37 Efficiency Table

The way in which the versatility table developed some years ago was used by B C Vickery in a letter, has led to the concept of "Efficiency Table" which is of considerable help in discovering fallow zones in an array and finding use for them. This is providing neat ways for constructing schedules in several

facets, with quite a large number of isolates. This requires systematic exploitation.

38 Non-Expressive Telescoping

A compact form of schedule, being developed by E J Coates, appears to involve telescoping of arrays as well as facets done more drastically than those shown in 34 and 35. There is no specialisation of zones; this implies that no clue is got from the digits about the level of the facet or of the order of the array, as viewed from the idea plane, from which the categories represented by the various digits are taken. This by itself may not lead to serious trouble though the loss of expressiveness is a loss of comfort. But the danger to the Canon of Hospitality in Array appears to need investigation. For, this would demand more of prophetic ability in the designer of the schedules.

4 Removal of Rigidity

One of the chief driving forces in the development of the discipline of library classification has been the aesthetic urge to remove rigidity in the idea plane as well as the notational plane.

The earliest rigidity to be removed was that due to the tradition of dichotomy. It ruled the idea plane for long. It seems to have reached its height in the days of Kant. With the advent of library classification bringing notation in its train, has now removed its rule. In this matter the effect of notation was to remove rigidity than to impose it on the idea plane. Some of the later rigidities were those imposed by the notational plane. These were successively removed by the new notational devices *viz* decimal-fraction, octave, facet, and phase devices. Some of the rigidities in the idea plane were also brought to light by work and improvement in the notational plane. For example, this led to the distinction between characteristic and quasi-characteristic, common isolate and special isolate, anteriorising isolate and posteriorising isolate, and isolates needing enumeration and not needing it.

41 Rigidity in Facet-Formula

The facet device originally imposed a residual rigidity, by its fixing a compulsory facet formula

on each basic class. This rigidity manifested itself by the cluttering together of connecting symbols in the class number of a document in which two or more intermediate facets were absent. This led to the realisation that the facets belonged to specific thought expressed and embodied and not to the basic class to which it belonged. This problem was pursued for many years. This ultimately led to the helpful postulates about the Five Fundamental categories—Personality, Matter, Energy, Space and Time, each with its own distinctive connecting symbol. The facets were no longer obligatory in a document. They were seen to be optional.

42 Rigidity in the Number of Facets

Then, literary warrant led to the sensing of the rigidity due to not distinguishing between different "Wholes" on the one hand and different kinds of "Parts" of a typical whole on the other, in a universe of concrete isolates, which were best regarded as manifestations of the fundamental category Personality. The homonymous nature of the term "Part" confused the issue for some time. A suggestion found in a letter from B C Vickery led to the resolution of this homonym into "portion", "organ", and "constituent". It was seen that (1) "portion" could be ignored, (2) "organ" should be treated as belonging to a new facet forming the next "level" of manifestation of personality, and (3) "constituent" should be consigned to matter facet. Thus arose the concept of "level"

43 Persistence of Rigidity in Number of Facets

In a similar way, the pressure of literary warrant led to the recognition of the possibility of a document presenting several Rounds of the first three fundamental categories in succession. This removed some more of the rigidity still persisting.

44 Concept of Postulates

The terms denoting the fundamental categories were mistaken for metaphysical entities by some and for restricted physical entities by others. The term 'personality'

gave special difficulty to many. Difficulties were experienced in putting across these terms as well as the other terms like level and round. Recently, it was found that this difficulty could be by-passed by regarding them as postulated terms, which prove helpful and which would acquire a meaning when they are used together in definite contexts usually set by the thought-content of a document. While teaching in the British library schools in December last, it was found that this device of postulates was quite helpful in putting across to the students the whole process of analytico-synthetic classification and demonstrating it with particular documents. Annexure 6 gives the postulates framed so far. These must be tested in regard to mutual consistency, tautology, and sufficiency.

45 Rigidity in Levels of Facets

A certain amount of rigidity had to be expected to rise out of the use of the same connecting symbol for all levels of personality. What will happen if a document did not present two or more of the intermediate levels? Cluttering of commas certainly. But literary warrant did not press this problem, since all the intermediate levels had to be mentioned to satisfy the Canon of Modulation, as extended to levels. In the case of hierarchy of organs, they should, or at any rate could, be so extended. The difficulty was thus hushed up, until the concept of levels could be extended to an abstract entity in association with which 'organ' was not intelligible. This extension of this concept of level was difficult and delayed. But while working on the Management Schedule last year, a use and a meaning were found to the term 'level'. Sets of isolates taken in the sequence of decreasing concreteness lent themselves to be treated as levels. Such a treatment proved helpful. For example, isolates on the basis of Working Conditions as characteristic and those on the basis of Elements in Work Study as characteristic could be treated as two different levels in the sequence of decreasing concreteness. So also, isolates on the basis of Type of Employee according to Personal Attributes as characteristic, those on the basis of Grades of Salary and Status of Employee as characteristic, and those on the basis of Elements of Personnel Work as characteristic - e g

Job evaluation, Wages, Safety measures, Service conditions, Employee services, Industrial relation, Labour market, and Labour agency — could be treated as three different levels in the sequence of decreasing concreteness. Here literary warrant exists demanding the omission of intermediate levels, leading to the cluttering of connecting symbols. The Zone Device, described in section 35, is applicable here, since the penultimate and the last octaves of zone 2 are not likely to be needed for isolates to be got by chronological and subject devices to accommodate specials and systems. Perhaps, systems may appear in course of time; in that case, the last zone of packeted isolate numbers may be used to accommodate them. Each level may be allotted to a different zone in the array — in the sequence of their increasing concreteness in accordance with the Principle of Inversion. The zone device implements in the notational plane the formation of levels in the idea plane without the risk of cluttering together of many connecting symbols. The zone device is applicable also to a universe of concrete entities. If additional levels have to be interpolated in exceptional cases, the initial digit in any of its isolate numbers should be of the same species as in the facet having its immediate universe. This will work so long as literary warrant compels the insertion of the isolate number of the immediate universe before the new level is inserted. This idea has come only just now. It should be tested by application to several cases. The rigidity thus removed is one imposed on the idea plane by the notational plane and it has been appropriately removed by a device in the notational plane.

46 Difficulties Caused by Verbal Plane

In the application of the zone device in the design of management classification, much difficulty was caused by the verbal plane. This is typical of what may happen in many subjects. It is connected with the sizing up of the isolates based on a characteristic as manifestations of one fundamental category or other. For example, in the case of Personnel Management, mentioned in the preceding section, no difficulty is experienced in taking the isolates on the basis of Type of Employee character-

istic or of Grade of Employee characteristic. They are easily taken to be personality isolates. But there is a tendency to take the isolates on the basis of Elements of Personnel Work as energy isolates instead of personality isolates. This is the result of the terms used to denote the isolates in the verbal plane. Such difficulties due to natural language can be overcome only by constant practice and wide experience. Once the classificationist settles the issue, the classifiers will not be bothered by this difficulty in their day-to-day work.

47 Difficulties due to Pure vs Applied Subject

Many a document is so loose in its construction that there is difficulty in the choice of its host basic class between an applied one or its pure basis. Even in the classification of macro thought, this difficulty has been met in deciding between History and Political Science, Economic History and Economic Theory, Technology and Chemistry, and so on. This difficulty is more intense in the classification of micro thought. The intensity becomes even greater as between a traditional main class and a new main class of the distillate type concerned with pure methodology, such as pure management, pure theory of meeting, pure theory of standardisation, pure communication-theory, public-relation-theory, and so on, as stated in section 3. This is a sector in the discipline of classification requiring much of fundamental work.

48 Unsolved Problems

There are many such unsolved problems. Unsolved problems behave like the horizon. They continue to be prolific. The more of them we solve, the more new ones appear. Dirt becomes more visible in a clean place than in a dirty place. Our sensitiveness to dirt increases with the cleaning we do. So it is with regard to the difficulties in the discipline of library classification.

5 Routine Design of Schedules

The distinction between an enumerative classification such as DC and an all-out

analytico-synthetic classification such as CC is that the former has a monolithic schedule and has to start enumeration of classes from the very beginning, whereas the latter relegates enumeration to the basic classes and to isolates and thus becomes multilithic. Enumeration has to be done in the case of common isolates, quasi common or seminal isolates, isolates of materials, commodities, and services and the related isolates of enterprises, and several special basic classes. Anteriorising common isolates and the posteriorising isolates for diverse common isolates of time and space have been studied in detail and have reached a fairly satisfactory stage. The schedule of mnemonic isolates of energy was the first to be sensed. It is giving satisfaction; and yet it requires more work to make it more serviceable. But hardly anything has been done about the other kinds of posteriorising common isolates, the other seminal isolates, and the material isolates.

51 Common Isolates of Properties

Many of the difficulties now met with in the natural sciences and their applications will stand solved, if a comprehensive schedule is worked out for properties of materials. This should include mensurational properties such as length, area, volume, and other indications of size, shapes of all possible varieties; physical properties such as weight, density, state of matter, elasticities of diverse kinds, viscosity, capillarity, acoustic and vibrational properties, thermal properties of various kinds such as conduction, critical points, specific heat, etc; radiational properties including colour, permeability to hard rays, and so on, electrical and magnetic properties of all kinds, isotopic properties, radio-activity, etc; chemical properties including those of physical chemistry such as solubility, osmotic speed etc, stereochemistry, atomic weight, valency, chemical affinity, etc; and bio properties. In CC, the isolate numbers in these cases will begin with a Roman small. Of the 23 digits, excluding i, l, and o, a should be reserved for denoting disjunctive treatment of several properties and z should be reserved as octavising digit. The remaining 21 digits may be allocated somewhat as follows: b and c for menstrual properties; d to m for physical properties; n to v for chemical properties; and w to y for bio proper-

ties. The second order array of each of these can use the entire base except the first zone. About 1,200 physical properties can then be individualised by isolate numbers with two significant digits; and if we set apart Z as an octavising digit, the number of physical properties that can be so represented with two significant digits will be about 2,000. Similar hospitality can be found for the other classes of properties. The work in the notational plane is thus already completed to receive them. What has to be done is their enumeration and grouping in a helpful sequence and grouping this is the work to be done in the idea plane. I mention this as a sample of routine work to be done in the design of classification schemes. If this work is completed in the idea plane, any scheme can fit up the notation according to its notational system. I wish it is possible for this Conference to set up an organisation for completing this work in the idea plane at an early date.

52 Common Isolates of Values

Similar work has also to be done on the schedule of posteriorising common isolates of value correlated to the humanities and social sciences.

53 Common Isolates of Energy

Three years ago, I attempted to construct a schedule of posteriorising common isolates of energy. At that time, the difficulties in the notational plane had not been solved to the extent to which they are now. There was not sufficient clarity in the idea plane either. It is my feeling that the time will become ripe to take up this work only after we complete the schedules for properties and values.

54 Common Isolates of Personality

A similar remark applies also to the schedule of posteriorising common isolates of personality. In addition, they have to be fitted with appropriate schedules of isolates of energy as well as of matter perhaps. Whether these isolates will be

common to all the personality isolates or whether they will have to be differential ones, it is not now possible to assert.

55 Isolates of Materials, Commodities, and Services

To meet the pressure from the industries in the least wasteful way — that is to avoid doing something temporarily from time to time and scratch it off equally often — in addition to the schedule of common isolates of properties, we should also work out the schedule for materials, semi-commodities, commodities and services of all kinds. These are innumerable. But the large base given by mixed notation including packet notation, makes the notational plane quite hospitable for these isolates. To make the idea definite, I illustrate with the notational set up as it might be in CC. The first zone is not available as it has to accommodate posteriorising common isolates. It is proposed to set apart the octaves in the second zone for accommodating the favoured materials of particular enterprises. This leaves the third and the fourth zones available to accommodate the exhaustive basic schedule. As usual, it will be wise to set apart the first and the last digit to meet disjunctive incidence and for octavising device. The first order array will then have 232 isolate numbers. Can we throw all the materials etc into 232 convenient groups. The arrays of the second order will have 53,824 isolate numbers. Can we throw all the materials etc into 53,824 convenient subgroups. In the formation of groups and subgroups, sought filiations among the materials etc should be borne in mind. Perhaps we may reach specific materials etc in the third order arrays. These arrays will have 12,487,168 isolate numbers. In the attempt to provide for sought filiations, some of these isolate numbers may have to be left unused. Roughly speaking, the number of materials, semicommodities, commodities, and services, that can be individualised with three significant digits and not more than four digits including octavising ones, is of the order of 10^7 or ten millions. Particular variants of a material etc will need for their accommodation an isolate number calling for extension into the fourth order array. But, as

stated in section 33, the digits for the fourth order array may perhaps be best got by alphabetic device using the trade names or code symbols which are current. An immediate piece of work to be done systematically is thus in the idea plane. That is to make a list of all kinds of materials, semi-commodities, commodities and services, to check up if they are within the limit of ten millions, to form them into filiatory subgroups and groups, and to arrange the groups, the subgroups, and the materials etc in a filiatory sequence. If this is done, any scheme can fit it with its own notation. I very much wish that this Conference is able to bring about an organisation to complete this task as quickly as possible.

56 Special Isolates

If the tasks indicated in sections 51 to 55 are completed, the number of special isolates to be scheduled for the various facets of the various basic classes will be comparatively few; and each such schedule will also be comparatively short; many of them may not have more than a dozen isolates each. These can be built with ease as and when need arises, if they are not already done in current editions of the schemes.

57 Organic Substances

The most baffling subject area from the point of view of classification-design is organic chemistry including biochemistry. The rate of growth of literature is immense in this area. It is also basic for industry. But this factor does not baffle classification. It is the personality facet of this subject that baffles. The isolates in that facet are the organic substances including biosubstances. Their number is bewilderingly large. Perhaps, the analysis set forth in section 55 will enable us to meet the number as such. Even if the number of substances exceeds ten millions, we can manage to meet the situation by extending into the fourth order array. Then, we can accommodate as many as twice 10^9 substances. The real trouble is in getting the substances thrown into sought groups and subgroups, and into a helpful sequence to the satisfaction of the specialists in the various

applied and pure fields. Can this be done? Then fitting with isolate numbers may not be difficult.

6 Future Trend

I believe that we have had enough of the discussion of the issue of special vs universal classification. It is time that we agree upon universal classification. In the past, this issue was clouded by the absence of a sufficiently advanced discipline of library classification, with a clear separation of work in the idea, verbal, and notational planes, with a dynamic approach based on helpful normative principles, postulates, and devices, and provision for watching the flow of literary warrant and carrying the schedules to greater depths. I think that we have now made sufficient progress in these matters to clear that cloud. Secondly, the Canon of Local Variation removes the resistance given by individual libraries or groups of libraries to the adoption of a universal classification.

61 Frivolous Plea

The frivolous plea, born of ignorance due to lack of actual experience of classifying and put up now and again by garrulous 'committee men' should no longer mislead people into beliefs such as, the school library needs a special 'simple classification', or the rural library needs a special 'simple classification'. It should carry no weight if the Canon of Relativity is remembered and if it is put across to the lay-management that in such simple libraries, the books are simple and call only for simple class numbers even though the universal scheme has the potentiality for depth classification of specialised books. The Method of Osmosis has set at rest the equally faulty plea for resisting re-classification as an impracticable task.

62 Avoidance of Illusion

The answer to the question "What is a new scheme?" arrived at in section 26 deserves careful study. If it goes deep into the mind, the illusion of creating a special classification

by a re-arrangement of isolates or by a change in the species of digits used, will disappear. All those who have the urge to work in the field of a special classification will have sufficient opportunity within a universal scheme. Those who have the influence to get money provided for this kind of work -- and they will have an integrated personality -- will be putting their weight on the right side, if they do not fritter away their energies and resources on de novo special schemes.

63 Constructive Work

This appeal does not imply freezing of original work in library classification. There is endless opportunity for original work in solving the unsolved problems in the idea plane as well as the notational plane, which crop up from time to time. There is endless opportunity also in constructing and completing the isolates in the special fields of knowledge in the light of the newly developing literary warrant. This kind of constructive work is a continuing process as the development of knowledge itself is a continuing process.

7 Abstract Classification

Apart from working with literary warrant as the concrete basis, there is also scope and need for theoretical research in library classification. There is need for making intellectual experiments in library classification. This can be done by varying the postulates, by introducing new postulates, by dropping some postulates, or by varying the devices used. Classification-design based on different systems and postulates, devices without direct or immediate correlation to literary warrant is Abstract Classification. For this kind of work on abstract classification, there is a rich precedent in the development of mathematics as an abstract tool. It is developed both to meet actual demand from fields of application and freely without any immediately visible opportunity for application. To illustrate, there are many kinds of algebras designed by varying the axioms and the postulates. Similarly there are many geometries and calculuses built on a purely abstract basis. But sooner or later, the developments in the physical, biological, and the social sciences have found them to be just

the tools needed. The relation of the early work of Riemann and its later use by Einstein is well-known. But for the development of statistical calculus by Karl Pearson and his co-workers as an abstract discipline, the social sciences could not have entered the spiral of scientific method and got themselves enriched at the rate at which they are now doing for the good of humanity.

71 My Faith

So also my faith is that the time has now come for the advance guard in the field of library classification to go on inventing several new schemes of abstract classification. Sooner or later, they will meet a concrete want created by newly developing literary warrant. My plea is that there should be provision for the periodical mutual stimulus of persons engaged in abstract classification through the media of periodicals on the subject and through conferences of the present kind. My appeal is that universities should provide chairs for classification, so that abstract classification may be developed for the pure joy of it ostensibly, but in reality to prepare the ground for making the organisation of the new kind of recorded nascent thought of the future efficient, without the need to fumble about after it has accumulated to a great mass.

72 Use of Mathematics

I have a feeling that abstract classification will make better progress if it marches hand in hand with mathematics. Library classification is essentially a problem in mapping or transformation. It maps a multi-dimensional space on a uni-dimensional one. It transforms a pattern of n dimensions into a pattern of one dimension. But this kind of transformation is needed in many sectors of knowledge. They all get their common method developed in association with mathematics. Then each discipline works out its own version of this transformation. The discipline of management for example has developed its Linear Programming. Introduction to linear programming by A Charne and others is an interesting book on this subject. Its basic problem is but a version of the basic problem in classification. An alliance of mathematics and abstract classification will, I am sure, lead to mutual enrichment.

8 Organisation for Research
and Development

Research in the discipline of library classification can contribute not a little to productivity-drive and to the conservation and maximal use of the the research-potential of humanity. The industries, the Foundations formed by them, and the governments should provide finance for research. Society should spare a sufficient number of able persons for research in this subject also. Universities should maintain chairs and research fellowships in this subject.

81 Field for Cultivation

The field for cultivation is vast and never-ending. There is need for systematic research, as a continuing process, to keep library classification abreast of the literary warrant getting newly created by the never-ending new formations in the universe of knowledge. There is also scope for research in the fundamentals and the tools of classification-design, as much as in any other traditional discipline. Abstract classification is a new territory for development. Its development is necessary to prepare library classification to meet unexpected, sudden developments in the universe of knowledge, like the one in nuclear physics and engineering taking rapid strides in our own day. May the fields in the territory of library classification be for ever kept in active cultivation!

ANNEXURE 1

Canons of Classification
for characteristics

- 1 Differentiation
 - 2 Concomitance
 - 3 Relevance
 - 4 Ascertainability
 - 5 Permanence
 - 6 Relevant sequence
 - 7 Consistency
- for array
- 8 Exhaustiveness
 - 9 Exclusiveness
 - 10 Helpful sequence
 - 11 Consistent sequence

for chain

- 12 Decreasing extension
- 13 Modulation

for filiatory sequence

- 14 Subordinate classes
- 15 Co-ordinate classes

for terminology

- 16 Currency
- 17 Reticence
- 18 Enumeration
- 19 Context

for notation

- 20 Relativity
- 21 Expressiveness
- 22 Mixedness
- 23 Hospitality in array
- 24 Hospitality in chain
- 25 Mnemonics
- 26 Verbal mnemonics
- 27 Scheduled mnemonics
- 28 Seminal mnemonics

for books

- 29 Classics
- 30 Local variation
- 31 Book number
- 32 Collection number
- 33 Distinctiveness

ANNEXURE 2

Laws of Library Science

- 1 Documents are for use
- 2 Every reader his document
- 3 Every document its reader
- 4 Save the time of the reader
- 5 Library is a growing organism

ANNEXURE 3

Principles for Helpful Sequence

- 1 Increasing quantity
- 2 Later in time
- 3 Later in evolution
- 4 Spacial contiguity
- 5 Increasing Complexity
- 6 Canonical sequence
- 7 Favoured category
- 8 Alphabetical sequence

LIBRARY CLASSIFICATION AS DISCIPLINE

ANNEXURE 4

Devices for Hospitality in Array

- 1 Interpolation
- 2 Octave
- 3 Chronological
- 4 Alphabetical
- 5 Common isolate
- 6 Subject

ANNEXURE 5

Devices for Hospitality in Chain

- 1 Gap
- 2 Decimal-fraction
- 3 Facet
- 4 Zone
- 5 Phase
- 6 Auto-bias

ANNEXURE 6

Postulates

- 1 Time, Space, Energy, Matter, and Personality are postulated as Five Fundamental Categories.
- 2 Every characteristic can be assigned to one and only one fundamental category.
- 3 Whole, Part, Portion, Organ, and Constituent are postulated as useful concepts.
- 4 Division of a universe on the basis of a characteristic may yield classes containing only wholes, portions, organs, or constituents respectively.
- 5 The physiographical features of the surface of the earth are analogous to the organs of a person, from the point of view of levels in classification.
- 6 The first manifestation of energy in a basic class is its First Round Energy Facet; the second manifestation, the Second Round Energy Facet; and so on
- 7 An Energy Facet can have only one array.
- 8 The first round is started by the basic class.
- 9 Energy can start a new round.
- 10 In any round, any number of levels of personality may occur consecutively.
- 11 In any round, any number of levels of matter may occur consecutively.
- 12 There is no level for energy.
- 13 In any round, the fundamental categories occur in the sequence - Personality, Matter, Energy.
- 14 Space and Time can occur only in the last round.
- 15 Space and Time stand arranged in the sequence - Space and Time.
- 16 A common personality or matter isolate may start a round.
- 17 A common personality or matter isolate may be after-space or after-time.
- 18 The round preceding a common isolate round may end with a space facet or with a time facet, according to the nature of the common isolate initiating it.
- 19 An actand facet should precede and an actor or an instrument facet should succeed the energy (action) isolate concerned, when the result of the action is not an ultimate commodity.
- 20 The product facet should precede and the instrument should succeed the energy (action) isolate concerned, when the product is an ultimate commodity.
- 21 Starter should be omitted if either (1) the subject device number starts a phase, or (2) all the foci in an array are got by subject device; Arrester should be omitted if the subject device number is not followed by a facet belonging to the whole of the class number ending with the subject device number.